

Technical Guide on Internal Audit of Textile Industry

DISCLAIMER

The views expressed in this Technical Guide are those of author(s). The Institute of Chartered Accountants of India may not necessarily subscribe to the views expressed by the author(s).



Internal Audit Standards Board
The Institute of Chartered Accountants of India
(Set up by an Act of Parliament)
New Delhi

© The Institute of Chartered Accountants of India

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form, or by any means, electronic mechanical, photocopying, recording, or otherwise, without prior permission, in writing, from the publisher.

Edition : September, 2012

Committee/Department : Internal Audit Standards Board

E-mail : cia@icai.org

Website : www.icai.org / www.internalaudit.icai.org

Price : ₹ 200/- (*including CD*)

ISBN : 978-81-8441-625-1

Published by : The Publication Department on behalf of the Institute of Chartered Accountants of India, ICAI Bhawan, Post Box No. 7100, Indraprastha Marg, New Delhi - 110 002.

Printed by : Sahitya Bhawan Publications, Hospital Road, Agra - 282 003.

February/2013/1,000 Copies

Foreword

The Indian Textile Industry is one of the leading textile industries in the world. It is a knowledge based research oriented industry and has been slowly but steadily gaining ground due to different reasons, such as, functional requirement, health and safety; cost effectiveness; durability; high strength; light weight; versatility; customization; user friendliness; eco friendliness; logistical convenience, etc.

For addressing these issues, the efforts to integrate numerous compliances and risk management requirements can be challenging for organizations operating in the textile industry. Internal auditor helps the organizations to address significant challenges and risks it faces. This surely demands that internal auditors understand the basic concepts and peculiarities of the textile industry and brace them up to newer challenges.

I am happy that the Internal Audit Standards Board has brought out this Technical Guide on Internal Audit of Textile Industry. This Technical Guide will provide the readers a crisp insight into various technicalities arising in the operations of this industry and covers the relevant issues which the internal auditors must be aware of.

I congratulate CA. Rajkumar S. Adukia, Chairman, Internal Audit Standards Board and the members of the Board on issuance of this Technical Guide. This Technical Guide comprehensively deals with the peculiar aspects of textile industry and provides a step-wise approach for internal audit.

I am sure that this Technical Guide will assist the members and others in efficiently discharging their responsibilities.

September 20, 2012
New Delhi

CA. Jaydeep Narendra Shah
President, ICAI

Preface

India's strong performance and growth in the textile sector is aided by several key advantages that the country enjoys, in terms of easy availability of labour and material, buoyant and large market demand, presence of supporting industries and supporting policy initiatives from the government. It has a unique position as a self-reliant industry, from the production of raw materials to the delivery of finished products, with substantial value-addition at each stage of processing; it is a major contribution to the country's economy. The industry is composed of handlooms, powerlooms and mills. The textile industry, being one of the most significant sectors in the Indian economy, has been a key focus area for the Government of India. A number of policies have been put in place to make the industry more competitive.

The textile industry in India has gone through significant changes in anticipation of increased international competition. Considering this, the Internal Audit Standards Board is issuing this publication "Technical Guide on Internal Audit of Textile Industry" to give an overview of the main activities of the textile industries, the way they work and a perspective from an internal audit viewpoint. This Guide has been divided into various chapters that provide guidance on structure, history, regulatory framework, SWOT analysis of the industry. This Guide, inter alia, provides guidance on aspects involved in various stages of textile industry, such as, spinning, weaving, apparels and also contains internal controls checklist for various processes. This Guide also describes risks associated with textiles industry and issues relating to cost ascertainment. This Guide also contains illustrative checklist for internal audit of major areas of textile industry.

At this juncture, I am grateful to CA. Harsha Mangtani for sharing her experience and knowledge with us and preparing the draft of the Technical Guide and CA. Guru Prasad M for reviewing the draft.

I also wish to thank CA. Jaydeep N. Shah, President, ICAI and CA. Subodh Kumar Agrawal, Vice President, ICAI for their continuous support and encouragement to the initiatives of the Board. I must also thank our colleagues from the Council at the Internal Audit Standards Board, viz., CA. Rajendra Kumar P., CA. Amarjit Chopra, CA. Shiwaji B. Zaware, CA. Ravi Holani, CA. Anuj Goyal, CA. Nilesh S. Vikamsey, CA. Atul C. Bheda, CA. Charanjot Singh Nanda, CA. Pankaj Tyagee, CA. G. Ramaswamy, CA. J. Venkateswarlu, CA. Abhijit Bandyopadhyay, CA. S.

Santhanakrishnan, Shri Prithvi Haldea, Smt. Usha Narayanan, Shri Gautam Guha, Ms. Revathi Bedi, Shri Manoj Kumar ,Shri Sidharth Birla for their vision and support. I also wish to place on record my gratitude for the co-opted members on the Board *viz.*, CA. Porus Doctor, CA. Masani Hormuzd Bhadur, CA. Ghia Tarun Jamnadas, CA. Deepjee A Singhal, CA. Nitin Alshi, CA. Narendra Aneja and CA. Guru Prasad M for their invaluable guidance and also their dedication and support to various initiatives of the Board. I also wish to express my thanks to CA. Jyoti Singh, Secretary, Internal Audit Standards Board and CA. Arti Bansal, Sr. Executive Officer for giving final shape to the Guide.

I firmly believe that this publication would serve as basic guide for the members and other readers interested in the subject.

September 20, 2012
Mumbai

CA. Rajkumar S. Adukia
Chairman
Internal Audit Standards Board

Glossary

ABRASION MARK

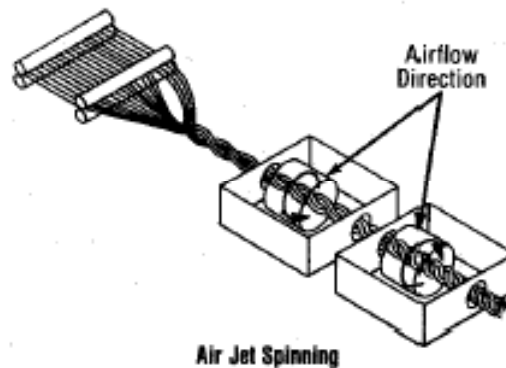
An area where a fabric has been damaged by friction.

ACRYLIC FIBER

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of acrylonitrile units $[-CH_2-CH(CN)-]$ (FTC definition). Acrylic fibers are produced by two basic methods of spinning (extrusion), dry and wet. In the dry spinning method, material to be spun is dissolved in a solvent. After extrusion through the spinneret, the solvent is evaporated, producing continuous filaments which later may be cut into staple, if desired. In wet spinning, the spinning solution is extruded into a liquid coagulating bath to form filaments, which are drawn, dried, and processed.

AIR JET SPINNING

A spinning system in which yarn is made by wrapping fibers around a core stream of fibers with compressed air. In this process, the fibers are drafted to appropriate sliver size, then fed to the air jet chambers where they are twisted, first in one direction, then in the reverse direction in a second chamber. They are stabilized after each twisting operation.



BALE A bag, sack, square or oblong box, or package into which silk, staple fibers, or tow are compressed. The common shipping and storage package for these fibers.

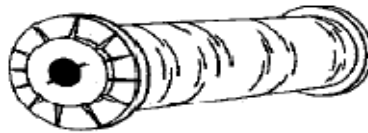
BALL WARP Parallel threads in the form of a twistless rope wound into a large ball. When wound mechanically with quick traverse a ball warp may be made in the form of a large cylindrical package.

BAR CODE Adjacent stripes of varying width used to represent alpha-numeric characters. These permit rapid reading by means of electronic scanners.



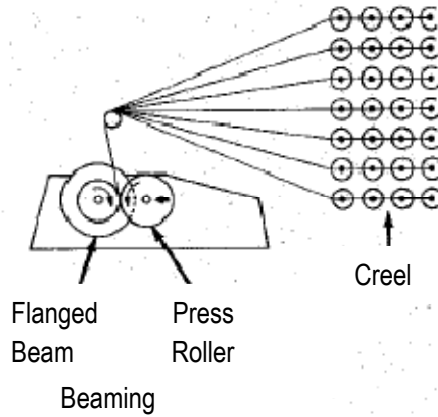
Bar Code

BEAM A cylinder of wood or metal, usually with a circular flange on each end, on which warp yarns are wound for slashing, weaving, and warp knitting.



Beam

BEAMING The operation of winding warp yarns onto a beam usually in preparation for slashing, weaving, or warp knitting. It is also called warping.



BLEACHING

Any of several processes to remove the natural and artificial impurities in fabrics to obtain clear whites for finished fabric or in preparation for dyeing and finishing.

BLEND

- (i) A yarn obtained when two or more staple fibers are combined in a textile process for producing spun yarns (e.g., at opening, carding, or drawing).
- (ii) A fabric that contains a blended yarn (of the same fiber content) in the warp and filling.

BOBBIN

A cylindrical or slightly tapered barrel, with or without flanges, upon which yarn or thread is wound for holding slubbings, rovings, or yarns.

CALENDER

A machine used in finishing to impart a variety of surface effects to fabrics. A calendar, essentially, consists of two or more heavy rollers, sometimes heated, through which the fabric passes under heavy pressure.



Normal Fabric



Calendered Fabric
Effect of Calendering

CAN	A cylindrical container, about 3 feet high and 10 to 12 inches in diameter, that is used to collect sliver delivered by a card, drawing frame, etc.
CARD	A machine used in the manufacture of staple yarns. It's functions are to separate, align, and deliver the fibers in a sliver form and to remove impurities. The machine consists of a series of rolls, the surfaces of which are covered with many projecting wired or metal teeth. Short staple systems employ flat strips covered with card clothing rather than small rolls.
CARDED YARN	A cotton yarn that has been carded but not combed. Carded yarns contain a wider range of fiber lengths and, as a result, are not as uniform or as strong as combed yarns. They are considerably cheaper and are used in medium and course counts.
CARDING	A process in the manufacture of spun yarns whereby the staple is opened, cleaned, aligned, and formed into a continuous, untwisted strand called a sliver.
CHAIN BINDERS	Yarns running in the warp direction on the back of a woven carpet which hold construction yarns together.
CHEESE	A cylindrical package of yarn wound on a flangeless tube.

CHEMICAL FINISHING	Processes in which additives are applied to change the aesthetic and functional properties of a material. Examples are the application of antioxidants, flame-retardant, wetting agents, and stain and water repellents.
CHIFFON	A plain weave, lightweight, sheer, transparent fabric made from fine, highly twisted yarns. It is usually a square fabric, i.e., having approximately the same number of ends and picks and the same count in both warp and filling.
CHROMATOGRAPHY	The generic name of a group of processes for separating and analyzing mixtures of chemical compounds. The separation depends on the redistribution of molecules of the mixture between phases, one of which is thin, often reaching molecular dimensions. For this reason, molecular size and shape are important in the separation, and extremely subtle separations are possible.
CLOTH	A generic term embracing all textile fabrics and felts. Cloth may be formed of any textile fiber, wire, or other material, and it includes any pliant fabric woven, knit, felted, needled, sewn, or otherwise formed.
COARSE THREAD	A yarn larger in diameter than other yarns being used in the fabric.
COATED FABRIC	A fabric to which a substance such as lacquer, plastic, resin, rubber, or varnish has been applied in firmly adhering layers to provide certain properties, such as water impermeability.
COATING	The application of a semi-liquid material such as, rubber, polyvinyl chloride, or polyurethane to one or both sides of a textile material. Once the coating has been dried (and cured, if necessary), it forms a bond with the fabric.
COMBED SLIVER	A continuous band of untwisted fiber, relatively

free of short fibers and trash, produced by combing card sliver.

COMBED YARN

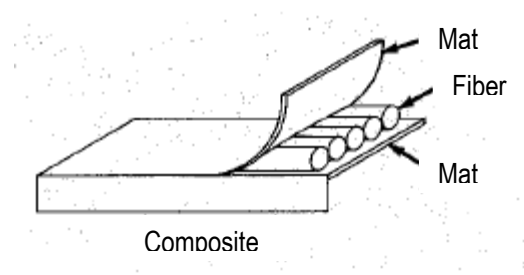
A yarn produced from combed sliver.

COMBING

A step subsequent to carding in cotton and worsted system processing which straightens the fibers and extracts neps, foreign matter, short fibers and other impurities. Combing produces a stronger, more even, more compact, finer, smoother yarn.

COMPOSITE

(i) An article or substance of two or more constituents, generally, with reinforcing elements dispersed in a matrix or continuous phase. (ii) Hard or soft constructions in which the fibers themselves are consolidated to form structures rather than being formed into yarns. Rigidity of these constructions is controlled by the density, the modulus of the load-bearing fibers, and the fraction of fusible fibers. Strength is controlled by adhesion and shear-yield strength of the matrix unless fibers are bonded in a load-transferring matrix. (iii) A structure made by laminating a non-woven fabric with another non-woven, with other materials, or by impregnating a non-woven fabric with resins.



COMPOSITE FIBERS

Fibers composed of two or more polymer types in a sheath-core or side-by-side (bilateral) relation.

CONDITIONING

A process of allowing textile materials (staple, tow, yarns, and fabrics) to reach hygroscopic

equilibrium with the surrounding atmosphere. Materials may be conditioned in a standard atmosphere (65%RH,70°F) for testing purposes or in arbitrary conditions existing in manufacturing or processing areas.

CONE

A conical package of yarn, usually wound on a disposable paper core.

CONVERTED FABRIC

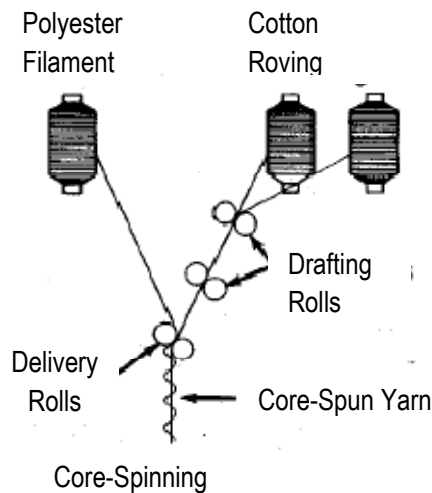
A finished fabric as distinguished from greige fabric.

CONVERTER

An individual or organization which buys greige fabrics and sells them as a finished product to cutters, wholesalers, retailers, and others. The converter arranges for the finishing of the fabric, namely bleaching, mercerizing, dyeing, printing, etc., to the buyers' specifications.

CORE SPINNING

The process of making a corespun yarn. It consists of feeding the core yarn (an elastomeric filament yarn, a regular filament yarn, a textured yarn, or a previously spun yarn) into the front delivery roll of the spinning frame and of covering the core yarn with a sheath of fibers during the spinning operation.



CORE-SPUN YARN	A yarn made by twisting fibers around a filament or a previously spun yarn, thus concealing the core.
COTTON COUNT	The yarn numbering system based on length and weight originally used for cotton yarns and now employed for most staple yarns spun on the cotton, or short-staple, system. It is based on a unit length of 840 yards, and the count of the yarn is equal to the number of 840 yard skeins required to weigh 1 pound. Under this system, the higher the number, the finer the yarn.
COTTON FIBER	A unicellular, natural fiber composed of almost pure cellulose. As taken from plants, the fiber is found in lengths of 3/8 to 2 inches. For marketing, the fibers are graded and classified for length, strength, and color. Core yarns are used in sewing thread, blankets, and socks and also to obtain novelty effects in fabrics.
COUNT	(i) A numerical designation of yarn size indicating the relationship of length to weight. (ii) The number of warp yarns (ends) and filling yarns (picks) per inch in a woven fabric, or the number of wales and courses per inch in a knit fabric. For example, a fabric count of 68 x 52 indicates 68 ends per inch in the warp and 52 picks per inch in the filling.
COURSE	The row of loops or stitches running across a knit fabric, corresponding to the filling in woven fabrics.
COUNT	The number given to a yarn of any material, usually indicating the number of hanks per pound of that yarn. May also refer to the fineness to which a fleece may be spun.
COTTON COUNT	is another measure of linear density. It is the amount of skein material measured in hanks (840 yards) needed to create one pound. Under this system, the higher the number, the finer the

	<p>yarn. In the United States a cotton count between one and 20 are referred to as coarse counts. A regular single knit T-Shirt can be between 20 and 40 count, fine bed sheets are usually in the range of 40 to 80 count.</p>
DEFECTS	<p>A general term that refers to some flaw in a textile product that detracts from either performance or appearance properties.</p>
DEGRADATION	<p>The loss of desirable physical properties by a textile material as a result of some process or physical/ chemical phenomenon.</p>
DENIM	<p>A well-known basic cotton or blended fabric in a right- or left-hand woven twill. Generally, the warp is dyed blue with a weft. A firm 2 x 1 or 3 x 1 twill-weave fabric, often having a whitish tinge, obtained by using white filling yarns with colored warp yarns. Heavier weight denims, usually blue or brown, are used for dungarees, work clothes, and men's and women's sportswear. Lighter weight denims with softer finish are made in a variety of colors and patterns and are used for sportswear and draperies.</p>
DENSITY	<p>The mass per unit volume (usually expressed as grams per cubic centimeter).</p>
DENT	<p>On a loom, the space between the wires of a reed.</p>
DIP	<ul style="list-style-type: none"> (i) Immersion of a textile material in some processing liquid. The term is usually used in connection with a padding or slashing process. (ii) The rubber compound with which tire cords and other in-rubber textiles are treated to give improved adhesion to rubber.
DISPERSION	<ul style="list-style-type: none"> (i) A system consisting of finely divided particles and the medium in which they are distributed.

- (ii) Separation of light into colors by diffraction or refraction.
- (iii) A qualitative estimation of the separation and uniform distribution of fibers in the liquid during the production of a wet-formed non-woven fabric.

DOFF

A set of full bobbins produced by one machine (a roving frame, a spinning frame, or a manufactured filament-yarn extrusion machine).

DOFFER

- (i) The last or delivery cylinder of the card from which the sheet of fibers is removed by the doffer comb.
- (ii) An operator who removes full bobbins, spools, containers, or other packages from a machine and replaces them with empty ones.

DOFFER COMB

A reciprocating comb, the teeth of which oscillate close to the card clothing of the doffer to strip the web of fibers from the card.

DOFFING

The operation of removing full packages, bobbins, spools, roving cans, caps, etc., from a machine and replacing them with empty ones.

DOUBLE END

Two ends woven as one in a fabric. A double end may be intentional for fabric styling, or accidental, in which case a fabric defect results.

DOUBLING

- (i) A process for combining several strands of sliver, roving, or yarn in yarn manufacturing.
- (ii) The process of twisting together two or more singles or plied yarns, i.e., plying.
- (iii) A British term for twisting.
- (iv) The term doubling is sometimes used in a sense opposite to singling. This is unintentional plying.
- (v) A yarn, considerably heavier than normal,

produced by a broken end becoming attached to and twisting into another end.

DOWNGRADE

In quality control, the lowering of the grade and/or value of a product due to the presence of defects.

DOWNTWISTER

A cap, ring, or flyer twisting frame.

DRAFT

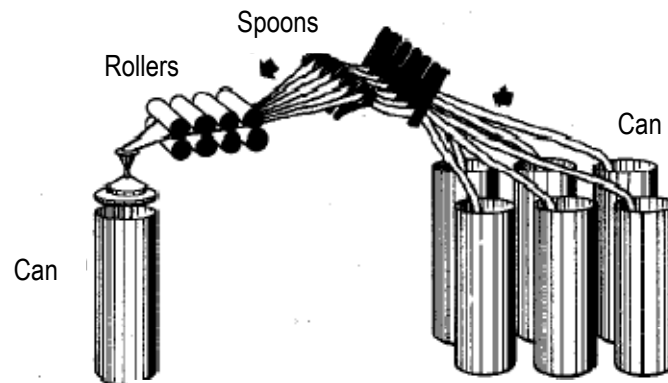
In weaving, a pattern or plan for drawing-in.

DRAW-FRAME BLENDS

Blends of fibers made at the draw frame by feeding in ends of appropriate card sliver. This method is used when blend uniformity is not a critical factor.

DRAWING

- (i) The process of attenuating or increasing the length per unit weight of laps, slivers, slubbings, or rovings.
- (ii) The hot or cold stretching of continuous filament yarn or tow to align and arrange the crystalline structure of the molecules to achieve improved tensile properties.



Courtesy of Bibb Manufacturing Company
Drawing Silver

DRY CLEANING

Removing dirt and stains from fabrics or garments by processing in organic solvents (chlorinated hydrocarbons or mineral spirits).

DYEING	A process of coloring fibers, yarns, or fabrics with either natural or synthetic dyes.
DYES	Substances that add color to textiles. They are incorporated into the fiber by chemical reaction, absorption, or dispersion. Dyes differ in their resistance to sunlight, perspiration, washing, gas, alkalies, and other agents; their affinity for different fibers; their reaction to cleaning agents and methods; and their solubility and method of application.
EMBROIDERY	Ornamental designs worked on a fabric with threads. Embroidery may be done either by hand or by machine.
END	<ul style="list-style-type: none"> (i) An individual warp yarn. A warp is composed of a number of ends. (ii) An individual sliver, slubbing, roving, yarn, thread, or cord. (iii) A short length or remnant of fabric.
ENDS PER INCH (or E.P.I.)	is the number of warp threads per inch of woven fabric. In general, the higher the ends per inch, the finer the fabric is.
ENERGY ABSORPTION	The energy required to break or elongate a fiber to a certain point.
ENTERING	The process of threading each warp yarn on a loom beam through a separate drop wire, heddle, and reed space in preparation for weaving. This process may be done by hand or by a semi-automatic machine.
EXTRACTION	Removal of one substance from another, often accomplished by means of a solvent.
FABRIC	A planar textile structure produced by interlacing yarns, fibers, or filaments.
FIBER	A unit of matter, either natural or manufactured, that forms the basic element of fabrics and other textile structures. A fiber is characterized by

having a length of at least 100 times its diameter or width. The term refers to units that can be spun into a yarn or made into a fabric by various methods including weaving, knitting, braiding, felting, and twisting. The essential requirements for fibers to be spun into yarn include a length of at least 5 millimeters, flexibility, cohesiveness, and sufficient strength. Other important properties include elasticity, fineness, uniformity, durability, and luster.

FILAMENT

A fiber of an indefinite or extreme length such as found naturally in silk. Manufactured fibers are extruded into filaments that are converted into filament yarn, staple, or tow.

FILAMENT YARN

A yarn composed of continuous filaments assembled with or without twist.

FINISHING

All the processes through which fabric is passed after bleaching, dyeing, or printing in preparation for the market or use. Finishing includes such operations as heat-setting, napping, embossing, pressing, calendering, and the application of chemicals that change the character of the fabric. The term finishing is also sometimes used to refer collectively to all processing operations above, including bleaching, dyeing, printing, etc.

FLAME RESISTANT

A term used to describe a material that burns slowly or is self-extinguishing after removal of an external source of ignition. A fabric or yarn can be flame resistance because of the innate properties of the fiber, the twist level of the yarn, the fabric construction, or the presence of flame retardants, or because of a combination of these factors.

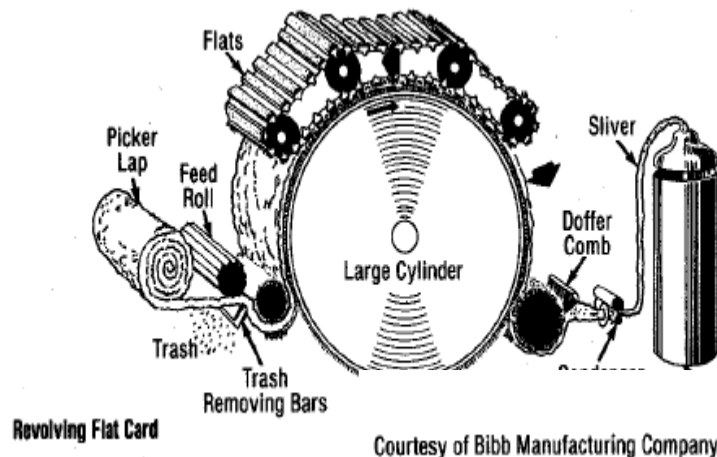
FLAT

In carding, one of the parts forming an endless chain that partially surrounds the upper portion of the cylinder and gives the name to a revolving flat card. Flats are made of cast iron, T-shaped in section, about 1 inch wide, and as long as the

width of the cylinder. One side of the flat is nearly covered with fine card clothing, and the flats are set close to the teeth of the cylinder so as to work point against point. A chain of flats contains approximately 110 flats and operates at a surface speed of about 3 inches per minute.

FLAT CARD

The type of card used for cotton fibers and for cotton-system processing. It is named for the flat wire brushes called flats that are assembled on an endless chain that partially surrounds the main cylinder. The staple is worked between the flats and cylinder, transferred to a doffer roll, and peeled off as a web that is condensed into a sliver.



FLY

The short, waste fibers that are released into the air in textile processing operations such as, picking, carding, spinning, and weaving.

GAUGE

- (i) A generic term for various measurement instruments such as pressure or thickness gauges.
- (ii) The number of needles per given distance in a knitting machine.

- (iii) The thickness of the knitting needle in the shank and the hook.
- (iv) The number of wales per inch in a knit fabric.
- (v) On spinning or twisting frames, the distance from the center of one spindle to the center of the next spindle in the same row.

GREIGE FABRIC

An unfinished fabric just off the loom or knitting machine. The woven fabric may be dyed later after weaving, as in piece dyed fabrics.

HANK

- (i) A skein of yarn.
- (ii) A standard length of slubbing, roving, or yarn. The length is specified by the yarn numbering system in use; e.g., cotton hanks have a length of 840 yards.
- (iii) A term applied to slubbing or roving that indicates the yarn number (count); e.g., a 1.5 hank roving.

HARDNESS

- (i) When used in reference to water, hardness is the total parts per million (ppm) of calcium and CaCO_3 plus the magnesium expressed as equivalent CaCO_3 [ppm hardness (as CaCO_3) = (ppm Ca x 2.497 + ppm Mg x 4.116)].
- (ii) Used in reference to pulp to denote the degree of delignification.

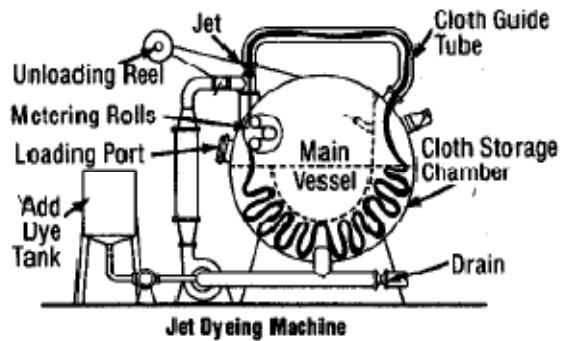
HOLES (TOW)

In tow opening processes, partial or complete filament breakage within a confined spread of tow, usually circular or oval in shape. Not to be confused with splitting or partial crimp deregistration, which are linear.

INDIGO

Originally, a natural blue vat dye extracted from plants, especially the *Indigofera tinctoria* plant. Most indigo dyes today are synthetic. They are frequently used on dungarees and denims.

INSPECTION	The process of examining textiles for defects at any stage of manufacturing and finishing.
JACKET	<ul style="list-style-type: none"> (i) A woven or felted tubular sleeve for covering and shrinking on a machine roll. (ii) A short coat. (iii) In polymer manufacture, an external shell around a reaction vessel. For example, jacketed vessels are used when heat-transfer medium is circulated around the vessel.
JACQUARD	A system of weaving that utilizes a highly versatile pattern mechanism to permit the production of large, intricate designs. The weave pattern is achieved by a series of punched cards. Each card perforation controls the action of one warp thread for the passage of one pick. The machine may carry a large number of cards, depending upon the design, because there is a separate card for each pick in the pattern. Jacquard weaving is used for tapestry, brocade, damask, brocatelle, figured necktie and dress fabrics, and some floor coverings. A similar device is used for the production of figured patterns on some knit goods.
JEAN	Cotton twill fabric, similar to denim, but lighter and finer, in a 2/1 weave for sportswear and linings.
JET	A device used to bulk yarns by introducing curls, coils, and loops that are formed by the action of a high velocity stream, usually of air or steam.
JET DYEING MACHINE	A high-temperature piece dyeing machine that circulates the dye liquor through a Venturi jet, thus imparting a driving force to move the fabric. The fabric, in rope form, is sewn together to form a loop.

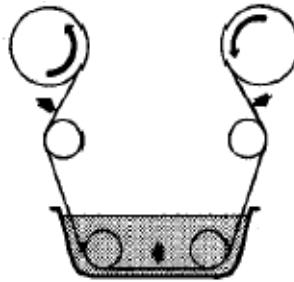


JET LOOM

A shuttleless loom that employs a jet of water or air to carry the filling yarn through the shed.

JIG

A machine in which fabric in open width-form is transferred repeatedly from one roller to another, passing each time through a bath of relatively small volume. Jigs are used for scouring, dyeing, bleaching, and finishing.



Jig

JUTE

A bast fiber used for sacking, burlap, and twine as a backing material for tufted carpets.

KAPOK

Short, lightweight cotton-like fibers from the seed pod of trees of the family *Bombacaceae*. A very brittle fiber, it is generally not spun. It is used for stuffing cushions, mattresses, etc., and for life jackets because of its buoyancy and moisture resistance.

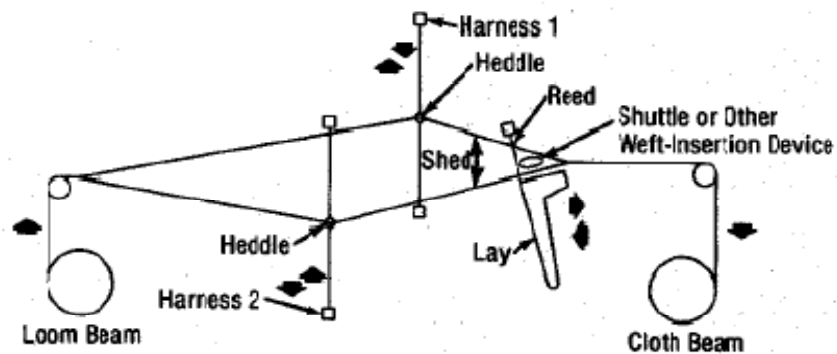
KHAKI

- (i) A light yellowish brown.
- (ii) A khaki-colored cloth of cotton, wool, or combinations of these fibers with

manufactured fibers used primarily in military uniforms and work-clothes.

KNITTING	A method of constructing fabric by interlocking series of loops of one or more yarns.
LAP	A continuous, considerably compressed sheet of fibers that is rolled under pressure into a cylindrical package, usually weighing between 40 and 50 pounds. The lap is used to supply the card.
LAPPING	A term describing the movement of yarn guides between needles, at right angles to the needle bar, or laterally in relation to the needle bar, or laterally in relation to the needle bar during warp knitting.
LEA	<ul style="list-style-type: none">(i) One-seventh of an 840-yard cotton hank, i.e., 120 yards.(ii) A standard skein with 80 revolutions of 1.5 yards each (total length of 120 yards). It is used for strength tests.(iii) A unit of measure, 300 yards, used to determine the yarn number of linen yarn. The number of leas in one pound is the yarn number.
LINEN	Cellulosic fibers derived from the stem of the flax plant or a fabric made from these fibers. Linen fibers are much stronger and more lustrous than cotton; they yield cool, absorbent fabrics that wrinkle easily. Fabrics with linen-like texture and coolness but with good wrinkle resistance can be produced from manufactured fibers and blends.
LOOM	A machine for weaving fabric by interlacing a series of vertical, parallel threads (the warp) with a series of horizontal, parallel threads (the filling). The warp yarns from a beam pass through the heddles and reed, and the filling is shot through the "shed" of warp threads by means of a shuttle or other device and is settled

in place by the reed and lay. The woven fabric is then wound on a cloth beam. The primary distinction between different types of looms is the manner of filling insertion. The principal elements of any type of loom are the shedding, picking, and beating-up devices. In shedding, a path is formed for the filling by raising some warp threads while others are left down. Picking consists essentially of projecting the filling yarn from one side of the loom to the other. Beating-up forces the pick, that has just been left in the shed, up to the fell of the fabric. This is accomplished by the reed, which is brought forward with some force by the lay.



Elements of the Loom

- LOOM-FINISHED** A term describing fabric that is sold in the condition in which it comes from the loom.
- LOOM FLY** Waste fibers that are inadvertently woven into a fabric.
- LOT** A unit of production or a group of other units or packages that is taken for sampling or statistical examination, having one or more common properties and being readily separable from other similar units.
- LUBRICANT** An oil or emulsion finish applied to fibers to prevent damage during textile processing or to knitting yarns to make them more pliable.

**MANUFACTURED
(MAN-MADE) FIBER**

A class name for various genera of fibers (including filaments) produced from fiber-forming substances which may be:

- (i) polymers synthesized from chemical compounds, e.g., acrylic, nylon, polyester, polyethylene, polyurethane, and polyvinyl fibers;
- (ii) modified or transformed natural polymers, e.g., alginic and cellulose-based fibers such as acetates and rayons; and
- (iii) minerals, e.g., glasses. The term manufactured usually refers to all chemically produced fibers to distinguish them from the truly natural fibers such as, cotton, wool, silk, flax, etc.

MENDING

A process in woven fabric manufacture in which weaving imperfections, tears, broken yarns, and similar defects are repaired after weaving; especially on woolen and worsted fabrics to prepare them for dyeing, finishing, or other processing.

MERCERIZATION

A treatment of cotton yarn or fabric to increase its luster and affinity for dyes. The material is immersed under tension in a cold sodium hydroxide (caustic soda) solution in warp or skein form or in the piece, and is later neutralized in acid. The process causes a permanent swelling of the fiber and thus increases its luster.

MIXED END or FILLING

Warp or filling yarn differing from that normally used in the fabric, e.g., yarn with the incorrect twist or number of plies, yarn of the wrong color, or yarn from the wrong lot.

**MOISTURE-FREE
WEIGHT**

- (i) The constant weight of a specimen obtained by drying at a temperature of 105°C in a current of desiccated air.
- (ii). The weight of a dry substance calculated

from an independent determination of moisture content (e.g., by distillation with an immiscible solvent or by titration with Fischer reagent).

MOISTURE PROPERTIES

All fibers when exposed to the atmosphere pick up some moisture; the quantity varies with the fiber type, temperature, and relative humidity. Measurements are, generally, made at standard conditions, which are fixed at 65% RH and 70°F. Moisture content of a fiber or yarn is usually expressed in terms of percentage regain after partial drying.

MOISTURE REGAIN

The percentage of moisture in a textile material brought into equilibrium with a standard atmosphere after partial drying, calculated as a percentage of the moisture-free weight. (Also see STANDARD MOISTURE REGAIN.)

NAP

A downy surface given to a cloth when part of the fiber is raised from the basic structure.

NAPPING

A finishing process that raises the surface fibers of a fabric by means of passage over rapidly revolving cylinders covered with metal points or teasel burrs. Outing, flannel, and wool broadcloth derive their downy appearance from this finishing process. Napping is also used for certain knit goods, blankets, and other fabrics with a raised surface.

NATURAL FIBER

A class name for various genera of fibers (including filaments) of:

- (i) animal (i.e., silk and wool);
- (ii) mineral (i.e., asbestos); or
- (iii) vegetable origin (i.e., cotton, flax, jute, and ramie).

NEEDLE

- (i) A thin, metal device, usually with an eye at one end for inserting the thread, used in sewing to transport the thread.

- (ii) The portion of a knitting machine used for intermeshing the loops. Several types of knitting needles are available. (Also see SPRING NEEDLE and LATCH NEEDLE.)
- (iii) In non-wovens manufacture, a barbed metal device used for punching the web's own fibers vertically through the web.

NEP A small knot of entangled fibers that usually will not straighten to a parallel position during carding or drafting.

NET An open fabric made by knotting the intersections of thread, cord, or wires to form meshes. Net can be made by hand or machine in a variety of mesh sizes and weights matched to varying end uses, i.e., veils, curtains, fish nets, and heavy cargo nets.

NOIL A short fiber that is rejected in the combing process of yarn manufacture.

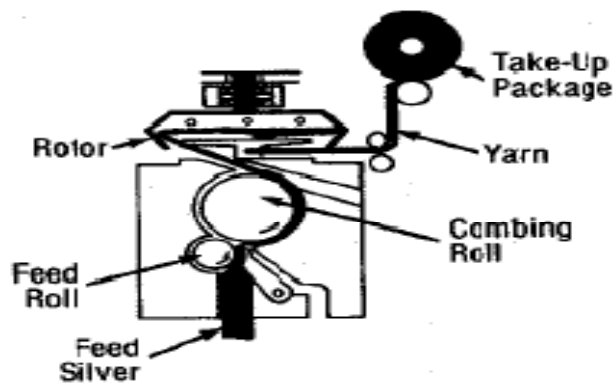
- NOZZLE**
- (i) The spout through which something is discharged, i.e., oil in finish application or fibers in web laying.
 - (ii) A term sometimes used to refer to spinnerets.

NYLON FIBER A manufactured fiber in which the fiber forming substance is any long chain synthetic polyamide having recurring amide groups (-NH-CO-) as an integral part of the polymer chain (FTC definition). The two principal nylons are nylon 66, which is polyhexamethylenediamine adipamide, and nylon 6, which is polycaprolactam. Nylon 66 is so designated because each of the raw materials, hexamethylenediamine and adipic acid, contains six carbon atoms. In the manufacture of nylon 66 fiber, these materials are combined, and the resultant monomer is then polymerized. After polymerization, the material is hardened into a translucent ivory-white solid that is cut or broken into fine chips, flakes, or pellets.

This material is melted and extruded through a spinneret while in the molten state to form filaments that solidify quickly as they reach the cooler air. The filaments are then drawn, or stretched, to orient the long molecules from a random arrangement to an orderly one in the direction of the fiber axis. This drawing process gives elasticity and strength to the filaments.

OPEN-END SPINNING

A system of spinning based on the concept of introducing twist into the yarn without package rotation by simply rotating the yarn end at a gap or break in the flow of the fibers between the delivery system and the yarn package. Because the twisting element can be compact and the mass of material to be rotated is small, very high twisting speeds can be attained. The process, in a sense combines the traditional processes of roving and spinning in one operation. Present work is directed toward incorporating the drafting operation into the process by using card sliver as the feedstock. This can facilitate process linking.

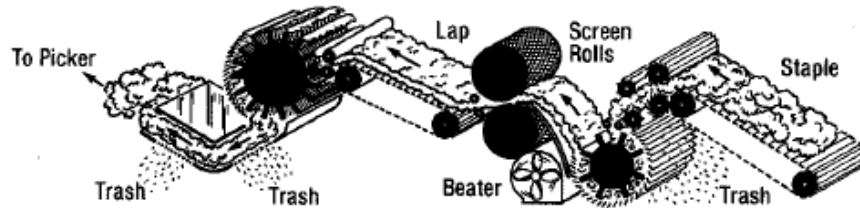


Open-End Spinning

OPENING

1. A preliminary operation in the processing of staple fiber. Opening separates the compressed masses of staple into loose tufts and removes the heavier impurities. 2. An operation in the

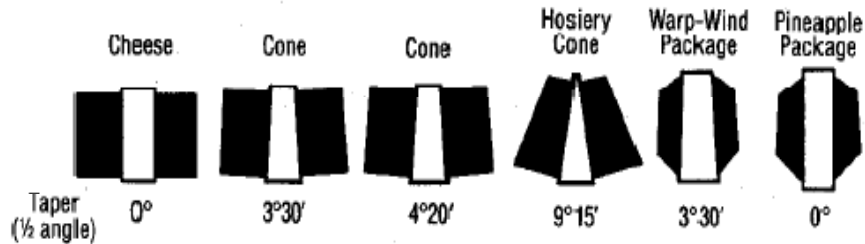
processing of tow that substantially increases the bulk of the tow by separating the filaments and deregistering the crimp.



Opening Staple

PACKAGES

A large selection of forms for winding yarn is available to meet the requirements of existing machinery and a variety of package builds is used to ensure suitable unwinding in later stages of manufacturing. Since a package with flanges cannot be unwound easily and quickly by pulling the yarn off overend, most packages are flangeless with self-supporting edges. Some can be unwound at speeds up to 1500 yd/min. The accompanying diagram shows six common types of yarn packages.



Six Yarn Packages in Common Use

PATTERN

- (i) An arrangement of form; a design or decoration such as the design of woven or printed fabrics.
- (ii) A model, guide, or plan used in making things, such as a garment pattern.

pH

Value indicating the acidity or alkalinity of a material. It is the negative logarithm of the

effective hydrogen ion concentration. A pH of 7.0 is neutral; less than 7.0 is acidic; and more than 7.0 is basic.

PICK A single filling thread carried by one trip of the weft-insertion device across the loom. The picks interlace with the warp ends to form a woven fabric.

PICK COUNT The number of filling yarns per inch or per centimeter of fabric.

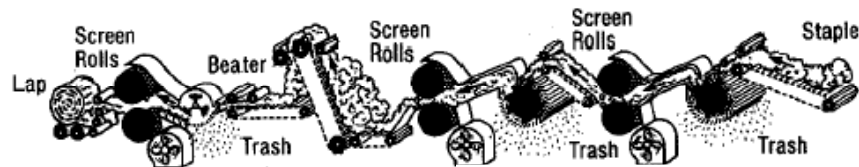
POCK PER INCH (or P.P.I.) is the number of weft threads per inch of woven fabric. A pick is a single weft thread, hence the term. In general, the higher the picks per inch, the finer the fabric is.

PICK COUNTER

- (i) A mechanical device that counts the picks as they are inserted during weaving.
- (ii). A mechanical device equipped with a magnifying glass used for counting picks (and/or ends) in finished fabrics.

PICKER

- (i) A machine that opens staple fiber and forms a lap for the carding process used in the production of spun yarns.
- (ii) That part of the picking mechanism of the loom that actually strikes the shuttle.



Picker

PILE

- (i) A fabric effect formed by introducing tufts, loops, or other erect yarns on all or part of the fabric surface. Types are warp, filling, and knotted pile, or loops produced by weaving an extra set of yarns over wires that are then drawn out of the fabric. Plain

wires leave uncut loops; wires with a razor-like blade produce a cut-pile surface. Pile fabric can also be made by producing a double-cloth structure woven face to face, with an extra set of yarn interlacing with each cloth alternately. The two fabrics are cut apart by a traversing knife, producing two fabrics with a cut-pile face. Pile should not be confused with nap. Corduroys are another type of pile fabric, where long filling floats on the surface are slit, causing the pile to stand erect.

- (ii) In carpets, pile refers to the face yarn, as opposed to backing or support yarn. Pile carpets are produced by either tufting or weaving.

PILL A small accumulation of fibers on the surface of a fabric. Pills, which can develop during wear, are held to the fabric by an entanglement with surface fibers of the material, and are usually composed of the same fibers from which the fabric is made.

PILLING The tendency of fibers to work loose from a fabric surface and form balled or matted particles of fiber that remain attached to the surface of the fabric.

PLUCKING A condition found at the feed roll and lickerin section of the card when larger than normal clusters of fiber are pulled from the lap by the lickerin. This situation is normally caused by uneven laps or the inability of the feed rolls to hold the lap sheet while small clusters of fibers are being pulled from the lap by the lickerin. Plucking inevitably produces flaky webs.

PLY (i) The number of singles yarns twisted together to form a plied yarn, or the number of plied yarns twisted together to form cord.

- (ii). An individual yarn in a plied yarn or cord.
- (iii) One of a number of layers of fabric (ASTM).
- (iv) The number of layers of fabric, as in a shirt collar, or of cord in a tire.

POLYESTER FIBER

A manufactured fiber in which the fiber-forming substance is any long chain synthetic polymer composed of at least 85% by weight of an ester of dihydric alcohol and terephthalic acid (FTC definition). The polymer is produced by the reaction of ethylene glycol and terephthalic acid or its derivatives. Fiber forms produced are filament, staple, and tow. The process of production resembles that of nylon. Polymerization is accomplished at a high temperature, using a vacuum by one of two methods.

- (i) The glycol and a terephthalate ester react to form a polymer chain, releasing methanol; or
- (ii) the glycol and terephthalic acid react directly to form the polymer with water as the by-product. As with nylon, the filaments are spun in a melt-spinning process, then stretched several times their original length, which orients the long chain molecules and gives the fiber strength.

POPCORN

- (i) A special-effect yarn containing short, thick spots.
- (ii) In polymer manufacture a term used to describe oversize, deformed chip.

POPLIN

A plain-weave fabric of various fibers characterized by a rib effect in the filling direction.

POROSITY

The ratio of the volume of air or void contained within the boundaries of a material to the total volume (solid matter plus air or void) expressed

as a percentage.

$$\% \text{ Porosity} = \frac{V_v \times 100}{V_t}$$

where: V_v = volume of voids
 V_t = total volume

PRESSURE DROP

(i) A decrease in pressure that is caused by friction between a flowing liquid and a constricting container. The pressure drop is increased by a reduction in diameter of the container.

(ii) The change in pressure across a filter.

QUALITY

See SECONDS and YARN QUALITY.

RAPIER LOOMS

Looms in which either a double or single rapier (thin metallic shaft with a yarn gripping device) carries the filament through the shed. In a single rapier machine, the yarn is carried completely across the fabric by the rapier. In the double machine, the yarn is passed from one rapier to the other in the middle of the shed.

RAW FIBER

A textile fiber in its natural state, such as silk "in the gum" and cotton as it comes from the bale.

RING

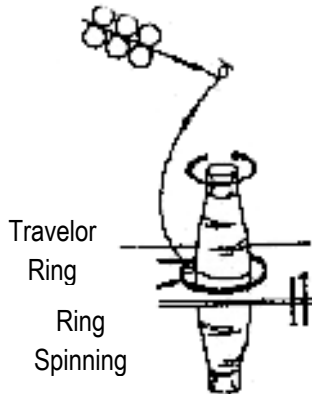
(i) A narrow band around hosiery appearing different from the rest of the hose. Principal causes: variations in yarn size, dye, absorption, or luster.

(ii) The device that carries the traveler up and down the package in ring spinning.

RING-SPINNING

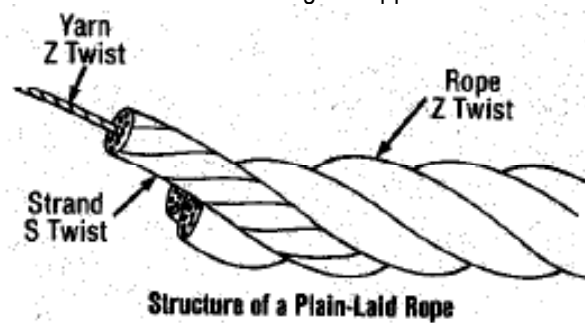
A system of spinning using a ring-and-traveler takeup wherein the drafting of the roving and twisting and winding of the yarn onto the bobbin proceed simultaneously and continuously. Ring frames are suitable for spinning all counts up to 150's, and they usually give a stronger yarn and are more productive than mule spinning frames. The latest innovation in ring spinning involves the use of a revolving ring to increase

productivity. Ring spinning equipment is also widely used to take-up manufactured filament yarns and insert producer-twist at extrusion.



ROPE

- (i) A heavy, strong cord, made from either natural or manufactured fibers or from wire, in a wide range of diameters. Yarns are twisted together to form strands. These strands are then twisted together in the opposite direction to form the rope. The fact that the twist directions alternate at different stages of rope assembly assures that the rope will be twist-stable and will not kink during use. Also called cord.
- (ii) Fabric in process without weft tension, thus having the appearance of a thick rope.



ROTOR SPINNING

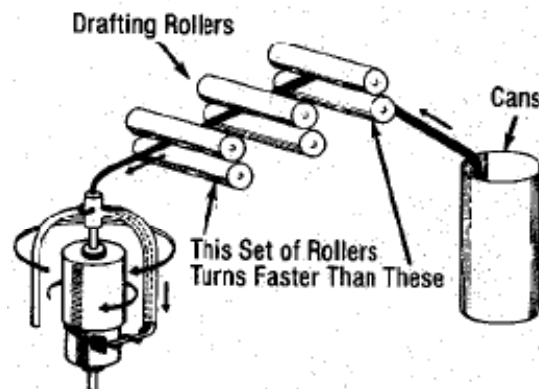
See OPEN-END SPINNING.

ROVING

- (i) In spun yarn production, an intermediate state between sliver and yarn. Roving is a condensed sliver that has been drafted, twisted, doubled, and redoubled. The product of the first roving operation is sometimes called slubbing.
- (ii) The operation of producing roving (see - 1).
- (iii) In the manufacture of composites, continuous strands of parallel filaments.

ROVING FRAME

A general name for all of the machines used to produce roving, different types of which are called slubber, intermediate, fine, and jack. Roving frames draft the stock by means of drafting rolls, twist it by means of a flyer, and wind it onto a bobbin.

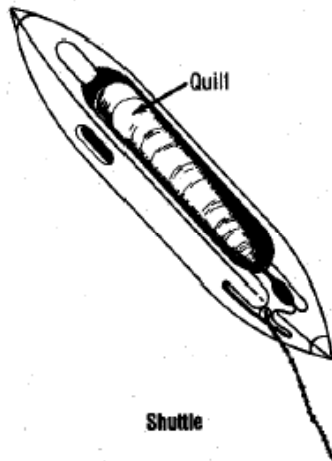


The Roving Operation

SATURATION

- (i) The maximum intensity or purity of a color. If the color is as brilliant as possible, it is at saturation; if the color is subdued or grayed, it is dull, weak, and low in intensity.
- (ii). The upper limit concentration of a solute in a solvent, i.e., no more solute can be dissolved at a fixed temperature and pressure.

SATURATION VALUE	The maximum amount of dye that can be absorbed by a textile fiber under defined conditions.
SCORCHING	The tendering of a fiber surface by heat so as to change the color and texture of the surface.
SCOURING	An operation to remove the sizing and tint used on the warp yarn in weaving and, in general, to clean the fabric prior to dyeing.
SECONDS	(i) Imperfect fabrics (woven or knitted) containing flaws in the weave, finish, or dyeing, and sold as "seconds." (ii). See YARN QUALITY.
SHAFT	A term often used with reference to satins indicating the number of harnesses employed to produce the weave.
SHRINKAGE	Widthwise or lengthwise contraction of a fiber, yarn, or fabric, usually after wetting a re-drying or on exposure to elevated temperature.
SHUTTLE	A boat-shaped device, usually made of wood with a metal tip that carries filling yarns through the shed in the weaving process. It is the most common weft-insertion device. The shuttle holds a quill, or pirn, on which the filling yarn is wound. It is equipped with an eyelet at one end to control rate. The filling yarn is furnished during the weaving operation.



SINGEING

The process of burning off protruding fibers from yarn or fabric by passing it over a flame or heated copper plates. Singeing gives the fabric a smooth surface and is necessary for fabrics that are to be printed and for fabrics where smooth finishes are desired.

SINGLE-KNIT FABRIC

Also called plain knit, a fabric constructed with one needle bed and one set of needles.

SINGLES YARN

The simplest strand of textile material suitable for operations such as weaving and knitting. A singles yarn may be formed from fibers with more or less twist; from filaments with or without twist; from narrow strips of material such as paper, cellophane, or metal foil; or from monofilaments. When twist is present, it is all in the same direction.

SIZING

- (i) A generic term for compounds that are applied to warp yarn to bind the fiber together and stiffen the yarn to provide abrasion resistance during weaving. Starch, gelatin, oil, wax, and manufactured polymers such as polyvinyl alcohol, polystyrene, polyacrylic acid, and polyacetates are employed.
- (ii) The process of applying sizing compounds.

	(iii) The process of weighing sample lengths of yarn to determine the count.
SLIVER	A continuous strand of loosely assembled fibers without twist. Sliver is delivered by the card, the comber, or the drawing frame. The production of sliver is the first step in the textile operation that brings staple fiber into a form that can be drawn (or reduced in bulk) and eventually twisted into a spun yarn.
SLUB	A yarn defect consisting of a lump or thick place on the yarn caused by lint or small lengths of yarn adhering to it. Generally, in filament yarn, a slub is the result of broken filaments that have stripped back from the end to which they are attached.
SLUB YARN	Any type of yarn that is irregular in diameter; the irregularity may be purposeful or the result of error.
SPINDLE	A slender, upright, rotating rod on a spinning frame, roving frame, twister, winder, or similar machine to twist into thread the fibers drawn from the mass on the distaff, and on which the thread is wound as it is spun.. A bobbin is placed on the spindle to receive the yarn as the spindle is rotated at high speed.
SPINNING	The process or processes used in the production of single yarns or of fabrics generated directly from polymer.
SPINNING FRAME	A machine used for spinning staple yarn. It drafts the roving to the desired size, inserts twist, and winds the yarn onto a bobbin. The term is, generally, used to indicate a ring spinning frame, although it does cover flyer spinning and cap spinning on the worsted system.
SPUN YARN	(i) A yarn consisting of staple fibers usually bound together by twist.

	(ii) A meltspun fiber before it is drawn.
STITCHING	The process of passing a fiber or thread through the thickness of fabric layers to secure them. In composite manufacture, stitching is used to make preforms or to improve damage tolerance of complex-shaped parts.
TAKE-UP (TWIST	The change in length of a filament, yarn, or cord caused by twisting, expressed as a percentage of the original (untwisted) length.
TEX	(i) A unit for expressing linear density, equal to the weight in grams of 1 kilometer of yarn, filament, fiber, or other textile strand. (ii) The system of yarn numbering based on the use of tex units.
TEXTILE	Originally, a woven fabric; now applied generally to any one of the following (i) Staple fibers and filaments suitable for conversion to or use as yarns, or for the preparation of woven, knit, or non-woven fabrics. (ii) Yarns made from natural or manufactured fibers. (iii) Fabrics and other manufactured products made from fibers as defined above and from yarns.(iv) Garments and other articles fabricated from fibers, yarns, or fabrics when the products retain the characteristic flexibility and drape of the original fabrics.
TEXTILE MATERIAL	A general term for fibers, yarn intermediates, yarn, fabrics, and products made from fabrics that retain more or less completely the strength, flexibility, and other typical properties of the original fiber or filaments.
TEXTILE PROCESSING	Any mechanical operation used to translate a textile fiber or yarn to a fabric or other textile material. This includes operations such as opening, carding, spinning, plying, twisting, texturing, coning, quilling, beaming, slashing, weaving, and knitting.

TEXTURE	A term describing the surface effect of a fabric, such as dull, lustrous, wooly, stiff, soft, fine, coarse, open, or closely woven, i.e., the structural quality of a fabric.
TEXTURED	An adjective used to describe continuous filament manufactured yarns (and woven and knit fabrics made therefrom) that have been crimped or have had random loops imparted, or that have been otherwise modified to create a different surface texture.
TEXTURED YARNS	Yarns that develop stretch and bulk on subsequent processing. When woven or knitted into fabric, the cover, hand, and other aesthetics of the finished fabric better resemble the properties of a fabric constructed from spun yarn.
TEXTURING	The process of crimping, imparting random loops, or otherwise modifying continuous filament yarn to increase cover, resilience, abrasion resistance, warmth, insulation, and moisture absorption or to provide a different surface texture. Texturing methods can be placed roughly into six groups.
THREAD	<ul style="list-style-type: none"> (i) A slender, strong strand or cord, especially one designed for sewing or other needlework. Most threads are made by plying and twisting yarns. A wide variety of thread types are in use today, e.g., spun cotton and spun polyester, core-spun cotton with a polyester filament core, polyester or nylon filaments (often bonded), and monofilament threads. (ii) A general term for yarns used in weaving and knitting, as in “thread count” and “warp thread”.
THREAD COUNT	<ul style="list-style-type: none"> (i) The number of ends and picks per inch in a woven cloth.

	(ii) The number of wales and courses per inch in a knit fabric.
TINT	Coloration that produces a very pale shade. A tint usually represents the minimum amount of color that will give perceptible appearance of coloration. In yarn processing, fugitive tints are used for identification, then removed in wet processing.
TWIST	The number of turns about its axis per unit of length of a yarn or other textile strand. Twist is expressed as turns per inch (tpi), turns per meter (tpm), or turns per centimeter (tpcm).
TWO-FOR-ONE TWISTER	A twister that inserts twist at a rate of twice the spindle speed. For example, at a spindle speed of 2,000 rpm, 4,000 turns per minute are inserted in the yarn.
VEGETABLE FIBER	A textile fiber of vegetable origin, such as cotton, kapok, jute, ramie, and flax.
VISCOSE	A special form of rayon that is produced by putting wood pulp or cotton linters through a specialized spinning and chemical process. Viscose yarn is popular in high end upholstery fabrics, particularly viscose chenilles, because of the yarn's lustrous appearance and strength.
WARP	(i) The set of yarn in all woven fabrics, that runs lengthwise and parallel to the selvage and is interwoven with the filling. (ii) The sheet of yarns wound together on a beam for the purpose of weaving or warp knitting.
WARP BEAM	A large spool or flanged cylinder around which the warp threads, or ends, are wound in a uniform and parallel arrangement. (also see Beam.)
WASTE	By-products created in the manufacture of fibers, yarns, and fabrics.

WEAVE

A system or pattern of intersecting warp and filling yarns. There are three basic two dimensional weaves: plain, twill, and satin. All other weaves are derived from one or more of these types.

WEAVING

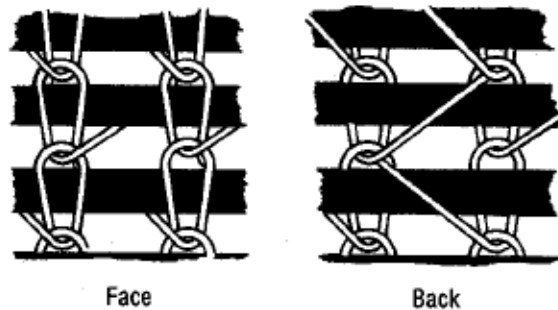
The method or process of interlacing two yarns of similar materials so that they cross each other at right angles to produce woven fabric. The warp yarns, or ends, run lengthwise in the fabric, and the filling threads (weft), or picks, run from side to side. Weaving can be done on a power or handloom or by several hand methods. (also see LOOM)

WEFT

See FILLING.

WEFT INSERTION

(i) Any one of the various methods, shuttle, rapier, water jet, etc., for making a pick during weaving. (ii) A marriage of warp knitting and weaving brought about by inserting a length of yarn across the width of the knitting elements and fastening the weft yarn between the needle loop and the underlap.



Fabrics Produced by Weft Insertion during Warp Knitting

WARP

The yarns which run vertically or lengthwise in woven goods. The warp yarns are threaded through the loom before weaving begins. In upholstery fabrics, the warp yarns are typically finer than the fill or weft yarns, but not always.

WEFT	The cross-wise or filling pick yarns in a woven cloth, as opposed to the warp yarns. This term is popular in hand weaving circles in the USA, while in the industry the term filling is more popular, however both words have the same meaning.
WIDTH	A horizontal measurement of a material. In woven fabric, it is the distance from selvage to selvage, and in flat-knit fabric, the distance from edge to edge.
WORKING LOSS	The irrecoverable loss of weight or yardage of a textile material that occurs during a textile process.
WINDING	This spinning term refers to winding the finished yarn onto a bobbin and secured to prevent unraveling.
YARDAGE	The amount or length of a fabric expressed in yards.
YARD GOODS	Fabric sold on a retail basis by the running yard.
YARN	A generic term for a continuous strand of textile fibers, filaments, or material in a form suitable for knitting, weaving, or otherwise intertwining to form a textile fabric. Yarn occurs in the following forms: (i) a number of fibers twisted together (spun yarn); (ii) a number of filaments laid together without twist (a zero-twist yarn); (iii) a number of filaments laid together with a degree of twist; (iv) a single filament with or without twist (a monofilament); or (v) a narrow strip of material, such as paper, plastic film, or metal foil, with or without twist, intended for use in a textile construction.
YARN NUMBER	A relative measure of the fineness of yarns. Two classes of systems are in use: (i) Direct yarn number (equal to linear density) is the mass per unit length of yarn. This system is used for silk and manufactured filament yarns. (ii) Indirect

yarn number (equal to the reciprocal of linear density) is the length per unit mass of yarn. This system is used for cotton, linen, and wool-type spun yarns.

YARN COUNT

Cotton Count	c.c.
Jute Count	j.c.
Linen Lea	l.l.
Metric Count	m.c.
Tex	Tex
Wool Count	W
Woolen Count	w/c
Woolen Run	w.r.
Worsted Count	w.c.
Plied Yarn	Singles denier/number of plies, e.g., 70/3
Cable Yarn	Singles denier/number of plies/number of cabled plies, e.g., 70/3/2
Filament Yarn	Total denier/filament count, e.g., 70/36

Contents

<i>Foreword</i>	<i>iii</i>
<i>Preface</i>	<i>v</i>
<i>Glossary</i>	<i>vii</i>
Overview of Technical Guide	1-3
Part I: Internal Audit Function – Theoretical Framework	5-17
Chapter 1: Internal Control and Internal Audit	7-13
Chapter 2: Internal Audit Charter and Standards.....	14-17
Part II: Introduction to Textile Industry	19-60
Chapter 3: Overview and Structure of Textile Industry in India	21-26
Chapter 4: Regulations Related to Textile Industry in India	27-34
Chapter 5: SWOT Analysis of Indian Textile Industry	35-38
Chapter 6: Spinning	39-45
Chapter 7: Weaving	46-53
Chapter 8: Apparels	54-60
Part III: Practice Guide for Internal Audit	61-76
Chapter 9: Internal Audit Processes	63-72
Chapter 10: Conducting Internal Audit.....	73-76
Part IV: Risk Assessment and Internal Audit Function in Textile Industry	77-159
Chapter 11: Enterprise Risk Management and Internal audit.....	79-83
Chapter 12: Identification of Major Risks in Textile Industry	84-97
Chapter 13: Records Maintenance in Textile industry.....	98-119
Chapter 14: Understanding of Audit Segments and its Aspects in Textile Industry	120-159
Part V: Concluding Internal Audit and Reporting Audit Findings .	161-167
Chapter 15: Concluding Internal Audit Procedures	163-167

Appendix	169-196
Abbreviations and Symbols	171-172
Measures, Weights, Equivalents	173-175
Temperature Conversion	176
Specific Gravity and Moisture Content of Common Fibers	177
Yarn Number Conversion Table	178-181
Yarn Number Conversion Formulas	182-183
Calculations for Fabric Weight	184-185
Stress-Strain Calculations	186
Textile Moisture Calculations	187
Wet Processing Calculations	187
Weaving Guides - Diameters of Spun Yarns of Different Cotton Counts	188-189
Weaving Guides - Loom Reed Air Space	190
Unit of Measures and Section Wise Formulas–Spinning.....	191-196
List of Related Websites	197

Overview of Technical Guide

Part I: Internal Audit Function – Theoretical Framework

For an internal auditor to effectively discharge his function, he must have a sound conceptual understanding of internal control framework applicable standards, audit risk, materiality and so on. While internal audit may be performed based on checklist and internal control questionnaires, a good understanding of underlying concepts helps the Internal auditor perform a qualitatively better job. It is expected that this part of Technical Guide would give those additional inputs to internal auditor that would make him aware of the theoretical underpinnings to what he is doing.

Part II: Introduction to Textile Industry

The textile industry includes agriculture (cotton), cloth, garments, merchandising, etc. in broad spectrum of industry. If we look into the macro of the industry then Spinning mills, Weaving mills, Process House, Garment Factories, etc. are various segments.

This part of technical guide deals with knowledge of the Textile Industry in depth and its regulatory framework and includes following:

- Overview and structure of Textile Industry in India;
- Regulations regarding textile in India;
- SWOT analysis of Indian Textile Industry;
- Process of spinning;
- Process of weaving including process house;
- Process of making apparels.

Part III: Practice Guide to Internal Audit

This section is divided into two major parts *viz.*, internal audit process and conducting phase, which are briefly discussed below:

- (i) **Internal Audit Process** – This section deals with various steps involved in planning like, from planning the annual internal audit programme to a more detailed plan for individual audits.

- It also involves gaining:
 - Understanding of the organization and its operations,
 - Controls and management assertions,
 - Desk review including analytical review,
 - Identification of legal compliances to be made,
 - Assessment of inherent risk and controls risks,
 - Documentation internal.
 - At the end of this phase internal auditor determines the nature, timing and extent of internal audit procedures to be applied.
- (ii) **Conducting Phase** – In this phase the auditor goes through audit procedures in areas identified for audit, gathers evidence applying different techniques including sampling. A well documented internal audit program helps internal auditor to delegate and supervise internal audit project efficiently.

Part IV: Risk Assessment and Internal Audit Function in Textile

Value of any enterprises is *maximized* when management sets *strategy and objectives* to strike an *optimal balance* between growth and return goals and related risks, and efficiently and effectively deploys resources in pursuit of the entity's objectives.

Internal control is an integral part of enterprise risk management. This enterprise risk management framework encompasses internal control, forming a more robust conceptualization and tool for management.

This section includes:

- Enterprises Risk Management and Internal Audit (In view of SIA 13)
- Identification of 12 anticipated Risks areas in Textile Industry
- Standardized questionnaire/ Checklist for broad areas have been provided in this part.

Part V: Concluding the Audit and Reporting Audit Findings

Closing Phase — At closing phase of internal audit, an internal auditor must ensure whether:

- All areas of audit programme have been completed
- Review of field work done by the internal audit staff
- Review of analytical tests conducted by the internal audit staff
- Evaluation of internal audit evidence gathered
- Drafting of preliminary audit observation
- Discussion with HOD of Audited Department.

Reporting Phase — Final deliverable of internal audit process is the Audit Report. This chapter deals with contents, documentation and quality of audit report.

In today's environment, role of internal auditor does not ends after submission of his report of findings and suggestions for improvement but also includes follow-up of its compliance/action taken and also report the progress during next review.

Part I
Internal Audit Function –
Theoretical Framework

Chapter 1

Internal Control and Internal Audit

Internal Control

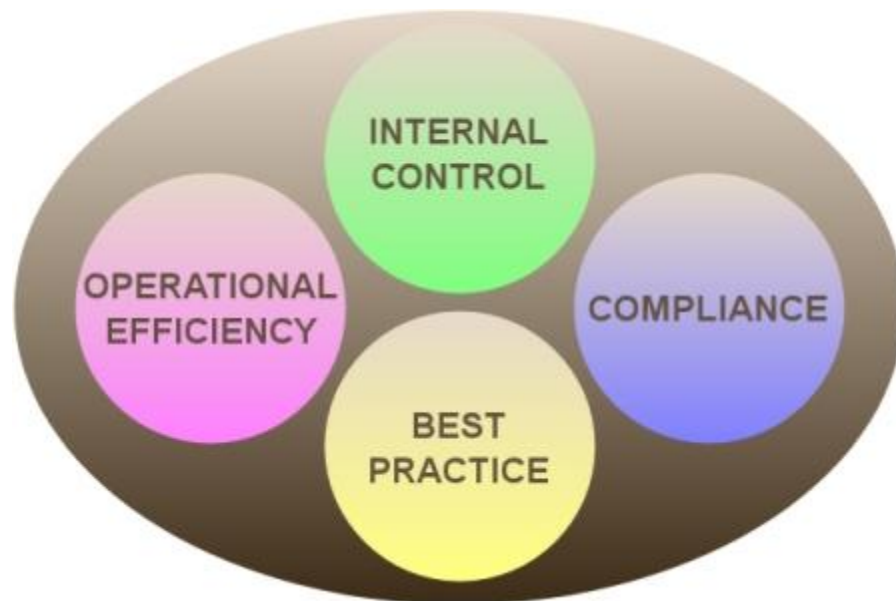
1.1 Internal control is an integral process that is operated by an organization's management and personnel and is designed to address risks and to provide reasonable assurance that in pursuit of organization's mission, the following general objectives are achieved:

- Executing orderly, ethical, economical efficient, and effective operations;
- Fulfilling accountability obligations;
- Complying with applicable laws and regulations;
- Safeguarding resources against loss, misuse and damage.

1.2 The Committee of Sponsoring Organizations (COSO) has developed an internal control framework that has come to be accepted as the standard all over the world. The key concepts of COSO framework include:

- Internal controls are an on-going process, a means to an end, and not an end in themselves;
- Internal controls are affected by people at all levels of an organization and not just policies and their documentation; and
- Internal controls will never eliminate risks but can provide a reasonable assurance that controls are in place to mitigate risks.

1.3 Internal control is not a single measure but a series of prescriptions of do's and don'ts that touch every activity of the organization. In that sense it is an integral part of the organization. Also, internal control is not something which is separate from the people who operate them. It is part of the roles and responsibilities of the persons working in the organization. As all organizations exist for a purpose, the basic objective of internal control is to ensure that the organization achieves its mission; in other words, it aims to minimize the risks that the organization may not be able to achieve its mission.



1.4 Any system of internal control can provide only reasonable assurance as it would not be economical to provide an absolute assurance. This recognizes the fact that there are costs associated with any internal control and such costs should not exceed benefit derived from it. Moreover, excessive controls may result in employees circumventing them and, this could also result in delays and inefficiencies in operations.

1.5 Apart from ensuring ethical, efficient, economical and effective operations, one of the main objectives of internal control in any sector is to safeguard resources which are acquired with invested money. With the extensive use of Information Technology in many organizations, internal controls related to IT have also assumed great deal of importance. Managers of organizations where IT is used should be aware of risks of poor controls in IT systems, particularly, where they deal with payroll, procurement, stores, etc.

1.6 Internal control system exists to help organizations to meet their goals and objectives. They enable management to deal with the changes in internal and external environments. They also promote efficiency, reduce risk of loss, and help ensure financial statement reliability and compliance with laws and regulations. COSO Framework for internal control system consists of five interrelated and equally important components:

- Control environment

- Risk assessment
- Control activities
- Information and communication
- Monitoring

(i) *Control environment* sets the tone of an organization, influencing the control consciousness of its staff. It is the foundation for all other components of internal control, providing discipline and structure. This is, as already pointed out, determined by the management. Elements of control environment include:

- Personal and professional integrity and ethical values of the organization;
- Commitment to competence;
- The 'tone at the top';
- Organizational structure; and
- Human resource policies and practices;

(ii) *Risk assessment* is the process of identifying and analyzing relevant risks to the achievement of organization's objectives and determining the appropriate response. Elements of risk assessment are:

- (a) *Risk identification*— The organization must identify risks that any of its stated objectives would not be achieved. To illustrate, an organization involved with conducting an examination, evaluating the answer papers and declaring results should assess the risk that any of these activities is not done properly. Once a risk (e.g., risk of breach of confidentiality of question paper) is identified, the organization should provide adequate internal control measures to reduce / eliminate the risk.
- (b) *Risk evaluation*— Risk evaluation involves assessing the significance of the risk (in terms of its gravity) and the possibility of the risk actually materializing. This requires the organization to categorize risks as high, medium or low based on some judgment. The idea is for the organization to address the high category risks. In the above example, significance and possibility of risk i.e., breach of confidentiality would be considered very high.
- (c) *Risk assessment*— Risk assessment requires the organization to understand how much risk it is able to take. This is important because any risk mitigation comes at a cost.

Technical Guide on Internal Audit of Textile Industry

- (d) *Developing a response*— After having identified the risks, evaluated and assessed them, the organization must develop a response to mitigate (reduce/ eliminate) the risk. Appropriate response could involve transfer, tolerate, terminate or treat the risk. Obtaining insurance is an example of transferring the risk. Sometimes, it may be better to live with a risk that is too expensive to treat. Where the risk is too big, it might be better to terminate the activity altogether. Lastly, which is in most cases, the organization would like to treat the risk by adopting suitable control activities. The table below gives some examples of risk handling:

Risk	Response	Action
Breach of confidentiality of any contract	Treat	(a) Handled by a very few selected individuals; and (b) roles and responsibilities clearly established.
Fire	Partly Treat	Ensure that (a) there are no combustible material in the premises; (b) the electrical wiring is proper;
	Partly Transfer	Take Fire Insurance
Financial risk in operating commercial infrastructure venture such as, a toll bridge	Transfer	Sign a Build Operate Transfer agreement which passes the risk to private partner.
Risk of use of official resources (stationery, etc) for personal use	Tolerate	Expenses on controlling this would be disproportionately large compared to corresponding benefit.

(iii) *Control activities* are the policies and procedures established to address risks and to achieve the organization's objectives. There are two types of controls.

- *Preventive Control*: This type of internal control would prevent a risk from occurring. An example of this would be barring the physical access to cash chest or the place from where cashier operates.

Internal Control and Internal Audit

- *Detective Control:* Detective controls are measures that would point to misdeeds through reconciliation/ review. Any kind of reconciliation (bank reconciliation), post audit, etc. would fall under this category as they help detect if something had gone wrong.

No control system is complete unless there is corrective procedure implemented to avoid or minimize repetitive occurrence. As a general rule, preventive controls are more expensive than detective controls. Any good system of internal control should have good mixture of the two. Also, it would not be prudent to place excessive reliance on preventive control to the exclusion of detective control because once a prevent control is compromised, there is no way to detect that an illegal act has or is occurring.

To be effective control activities must be:

- a. Appropriate
- b. Function consistently
- c. Cost effective
- d. Comprehensive
- e. Directly relate to control objectives.

Some examples of control activities are:

- (i) **Authorizations and approvals:** Authorization is the principal means of ensuring that only valid transactions and events are initiated as intended by the management. Authorization procedures must be well documented and clearly communicated to managers and employees. These should include specific conditions and terms under which authorizations are to be made.
- (ii) **Segregation of duties:** To reduce the risk of error, waste, or wrongful acts and the risk of not detecting them, no single individual or team should control all key stages of transaction or event. Therefore, duties and responsibilities should be so assigned to a number of individuals that there are enough checks and balances. Notwithstanding separation of duties, collusion can still take place, which can reduce or destroy the effectiveness of this internal control.

Control over access to resources and records: Restricting access to resources to authorized individuals reduces the risk of loss or misuse of resources. All assets must be protected against loss and misuse by implementing this control. Facilities such as a photocopier, telephone, internet, vehicle, etc. also require protection against improper use.

Technical Guide on Internal Audit of Textile Industry

Verifications: Transactions or events (receipt of goods supplied or cash balance at the end of day) are verified to ensure correctness and validity. Personal records/ service books are periodically verified to ensure their correctness.

Reconciliations: This is one of the most commonly used and effective detect control measure in any organization. Reconciliation is done of one set of records with another.

Reviews and post audit play an important role in ensuring that activities have taken place in accordance with the intents and objects of management. A review of financial statements can reveal if there have been any discrepancies pointing to wrongdoing. A procurement process can be post audited to make sure that it complies with all the regulations.

Supervision: Supervision (assigning, reviewing, approving and guiding, training) is an important and high level internal control. This is something that is done at different levels of management periodically.

Information and communication are essential to realizing all internal control objectives. 'Management's ability to make appropriate decisions is affected by (appropriate, timely, current, accurate and accessible) information'. Effective communication should flow down, across and up the organization, through all components and the entire structure.

Internal control system should be monitored to assess the quality of the system's performance over time. Monitoring is accomplished through routine activities, separate evaluations or a combination of both.

Internal Audit

Internal audit is an independent management function, which involves a continuous and critical appraisal of the functioning of an entity with a view to suggest improvements thereto and add value to and strengthen the overall governance mechanism of the entity, including the entity's strategic risk management and internal control system.

It seeks to find out whether all other controls are satisfactorily working in practice by subjecting them to compliance tests. Where the compliance is either weak or absent, the internal audit conducts substantive checks in order to evaluate the impact of the non-compliance. Thus, it provides the management with a periodical assessment of the functioning of internal controls within the organization and recommends measures for strengthening them.

1.8 Traditionally, internal audit was seen more as an inspection mechanism concerned with identifying and reporting compliance with rules and procedures. While this objective remains relevant even today, internal auditors are now looked upon more as assurance providers to endorse soundness of processes within the organization. While the establishment and monitoring of the internal controls is the primary responsibility of the management, internal auditor supplements by providing an independent and objective assessment on their adequacy and offers suggestions for improvement. The purpose of internal audit is to evaluate effectiveness of management control systems and procedures and to assess whether resources are managed in conformity with the laid down systems, principles and practices of financial control. Thus, internal audit is a key element of good governance.

1.9 While internal auditors are a part of overall internal control system, they are not responsible for implementing specific control procedures. The internal auditors' role is to audit organization's internal control policies, practices and procedures to ensure that controls are adequate to achieve organization's mission. It is the responsibility of management to establish an effective internal control environment in their organization. As part of internal controls the management is expected to plan, implement, supervise, and monitor the internal controls.

1.10 While as a principle internal audit should not be involved in any management functions, its services could be utilized in the following:

- participating in committees in an advisory (non-decision making) capacity;
- providing advice on internal controls; and
- answering technical questions; and providing training.

To sum up, the internal auditor should appreciate the role that internal controls play in minimizing the many risks the organization faces in its day to day operations. The risks are not necessarily always financial. There are risks to effective and efficient operations. While all of us are aware of internal controls intuitively, an internal auditor should specifically identify and document the internal controls in a given area so that he can test their effectiveness in operation.

Chapter 2

Internal Audit Charter and Standards

2.1 The internal audit charter is a formal document that establishes the nature, role and functioning of the internal audit in the organization. It sets out the internal audit's mandate. The mission of the internal audit function is to provide independent assurance that internal controls are functioning effectively so that the organization achieves its objectives and in doing so it also complies with all applicable laws. More specifically, internal auditor's objectives should include ensuring that the departments are:

- Carrying out their activities and programs as authorized by appropriate authority which yield results that are consistent with established goals and objectives;
- Using resources in an economical and efficient manner;
- Identifying, measuring, classifying and reporting financial and operating events in an accurate and timely manner in accordance with applicable codes, guidelines and government orders; and
- Safeguarding assets under their control.

In order to ensure effective functioning of the internal audit, it is absolutely important that it has:

- Access to all documents, records, books of accounts, computer systems, files, etc. as necessary for the performance of internal audit;
- Cooperation from all the key personnel and the staff of the department in providing the required information and explanations within the reasonable time;

2.2 Internal Audit Standard Board of Institute of Chartered Accountants of India has issued, till the date, seventeen Standards on Internal Audit. Certain relevant extract from the same on the various aspects of the Internal Audit and Internal Auditor have been given in below paragraph:

Integrity, Objectivity and Independence

2.3 The internal auditor should be straightforward, honest and sincere in his approach to his professional work. He must be fair and must not allow prejudice or bias to override his objectivity. He should maintain an impartial attitude. He should not only be independent in fact but also appear to be independent. The internal auditor should not, therefore, to the extent possible, undertake activities, which are or might appear to be incompatible with his independence and objectivity. For example, to avoid any conflict of interest, the internal auditor should not review an activity for which he was previously responsible. It is also expected from the management to take steps necessary for providing an environment conducive to enable the internal auditor to discharge his responsibilities independently and also report his findings without any management interference. **The internal auditor should immediately bring any actual or apparent conflict of interest to the attention of the appropriate level of management so that necessary corrective action may be taken.** (SIA 2 Basic Principles Governing Internal Audit)

2.4 The terms of internal audit engagement define the scope, authority, responsibility, confidentiality, limitations, reporting, compliance with standards and compensation of the internal auditors. The terms of internal audit engagement lay down clarity between the internal auditors and the users of their services for inculcating professionalism and avoiding misunderstanding as to any aspect of the engagement.

Standard on Internal Audit (SIA) 8 “Terms of Internal Audit Engagement” provides guidance in respect of terms of engagement of the internal audit activity whether carried out in house or by an external agency. SIA 8 requires that the terms of engagement should indicate areas where internal auditors are expected to make their recommendations and value added comments. It should also clearly mention the responsibility of the auditee vis-à-vis the internal auditor. Further, the management of the auditee is responsible for providing timely and accurate data, information, records, personnel, etc., and for extending co-operation to the internal audit team.

Role of the Internal Auditor in Evaluating Internal Controls

2.5 Internal auditor should examine the continued effectiveness of the internal control system through evaluation and make recommendations, if any, for improving that effectiveness. However, the internal auditor is not vested with management's primary responsibility for designing, implementing, maintaining and documenting internal control. Internal audit function adds value to an organization's internal control system by bringing a systematic, disciplined approach to the evaluation of risk and by making recommendations to strengthen the effectiveness of risk management efforts. The internal auditor should focus towards improving the internal control structure and promoting better corporate governance. (Para 8 of SIA12-Internal control evaluation)

The broad areas of review by the internal auditor in evaluating the internal control system, *inter alia*, are:

- Mission, vision, ethical and organizational value-system of the entity.
- Personnel allocation, appraisal system, and development policies.
- Accounting and financial reporting policies and compliance with applicable legal and regulatory standards.
- Objective of measurement and key performance indicators.
- Documentation standards.
- Risk management structure.
- Operational framework.
- Processes and procedures followed.
- Degree of management supervision.
- Information systems, communication channels.
- Business Continuity and Disaster Recovery Procedures.

2.6 The internal auditor would have to familiarize himself with the control procedures and systems in force in the areas selected for audit. Identification of key control areas and SWOT (strength, weakness, opportunity, threat) analysis, using data flow diagrams and appropriate systems flowchart, updated from year to year, would be extremely effective in gaining an insight into the production and revenue earning activities and would facilitate a regular feedback to the management on the weakness in existing systems.

The internal auditor would be required to satisfy himself as to the proper and satisfactory implementation of the policies, guidelines and goals laid down by

the management, apart from the internal controls and procedures examined by him. The internal auditor should also include a checklist of statutory provisions applicable to the enterprise under audit, which must be updated from time to time and checked for compliance. In particular, review of provisions applicable to enterprises which are incorporated under the Companies Act, 1956 is necessary. With this kind of a background in mind, the internal auditor would be in a position to compile a comprehensive internal audit plan which would yield result-oriented reports.

Review of Information Technology Environment

2.7 The use of ERP system to manage processes across various units is very common these days but due to this the overall objective and scope of an internal audit does not change. However, the use of computer changes the processing, storage, retrieval and communication of data and information and the interplay of processes, systems and control procedures. Thus, this would affect the internal control systems employed by the entity.

The internal auditor should review the robustness of the IT environment and consider any weakness or deficiency in the design and operation of any IT control within the entity, by reviewing:

- a) System Audit reports of the entity, conducted by independent Information System auditors;
- b) Reports of system breaches, unsuccessful login attempts, passwords compromised and other exception reports;
- c) Reports of network failures, virus attacks and threats to perimeter security, if any;
- d) General controls like, Segregation of duties, physical access records, logical access controls;
- e) Application controls like input, output, processing and run-torun controls; and
- f) Excerpts from the IT policy of the entity relating to business continuity planning, crisis management and disaster recovery procedures.

Part II
Introduction to Textile Industry

Chapter 3

Overview and Structure of Textile Industry in India

Meaning of Textile

3.1 The term 'textile' is a Latin word originating from the word 'texere' which means 'to weave'. Textile refers to a flexible material comprising of a network of natural or artificial fibers, known as yarn. Textiles are formed by weaving, knitting, crocheting, knotting and pressing fibers together. Textile Museum is that specialized category of museum which primarily preserves different types of textile and textile products.

History of Textile Industry in India

3.2 India has been well known for textile goods since very ancient times. The traditional textile industry of India was virtually decayed during the colonial regime. However, the modern textile industry took birth in India in the early nineteenth century when the first textile mill in the country was established at fort gloster near Calcutta in 1818.

The cotton textile industry, however, made its real beginning in Bombay, in 1850s. The first cotton textile mill of Bombay was established in 1854 by a Parsi cotton merchant then engaged in overseas and internal trade. Indeed, the vast majority of the early mills were the handiwork of Parsi merchants engaged in yarn and cloth trade at home and Chinese and African markets.

The first cotton mill in Ahmedabad, which was eventually to emerge as a rival centre to Bombay, was established in 1861. The spread of the textile industry to Ahmedabad was largely due to the Gujarati trading class.

The cotton textile industry made rapid progress in the second half of the nineteenth century and by the end of the century there were 178 cotton textile mills; but during the year 1900 the cotton textile industry was in bad state due to the great famine and a number of mills of Bombay and Ahmedabad were to be closed down for long periods.

The two world War and the Swadeshi movement provided great stimulus to the Indian cotton textile industry. However, during the period 1922 to 1937 the industry was in doldrums and during this period a number of the

Bombay mills changed hands. The second World War, during which textile import from Japan completely stopped, however, brought about an unprecedented growth of this industry. The number of mills increased from 178 with 4.05 lakh looms in 1901 to 249 mills with 13.35 lakh looms in 1921 and further to 396 mills with over 20 lakh looms in 1941. By 1945 there were 417 mills employing 5.10 lakh workers.

3.3 The cotton textile industry is rightly described as a Swadeshi industry because it was developed with indigenous entrepreneurship and capital and in the pre-independence era the Swadeshi movement stimulated demand for Indian textile in the country.

The partition of the country at the time of independence affected the cotton textile industry also. The Indian union got 409 out of the 423 textiles mills of the undivided India. 14 mills and 22 per cent of the land under cotton cultivation went to Pakistan. Some mills were closed down for some time. For a number of years since independence, Indian mills had to import cotton from Pakistan and other countries.

After independence, the cotton textile industry made rapid strides under the Plans. Between 1951 and 1982 the total number of spindles doubled from 11 million to 22 million. It increased further to well over 26 million by 1989-90.

Role of Indian Textile Industry in the Economy

3.4 The Indian textile industry has a significant presence in the economy as well as in the international textile economy. Its contribution to the Indian economy is manifested in terms of its contribution to the industrial production, employment generation and foreign exchange earnings. It contributes 20 percent of industrial production, 9 percent of excise collections, and 18 percent of employment in the industrial sector, nearly 20 percent to the country's total export earning and 4 percent to the Gross Domestic Product.

India is the world's second largest producer of textiles after China. It is the world's third largest producer of cotton – after China and the USA, – and the second largest cotton consumer after China. The textile industry in India is one of the oldest manufacturing sectors in the country and is currently its largest.

The textile sector also has a direct link with the rural economy and performance of major fibre crops and crafts such as, cotton, wool, silk, handicrafts and handlooms, which employ millions of farmers and crafts persons in rural and

Overview and Structure of Textile Industry in India

semi-urban areas. It has been estimated that one out of every six households in the country depends directly or indirectly on this sector.

3.5 India has several advantages in the textile sector, including abundant availability of raw material and labour. It is the second largest player in the world cotton trade. It has the largest cotton acreage, of about nine million hectares and is the third largest producer of cotton fibre in the world. It ranks fourth in terms of staple fibre production and fourth in polyester yarn production. The textile industry is also labour intensive, thus, India has an advantage.

3.6 The key advantages of the Indian textile industry are as follows:

- India is the third largest producer of cotton with the largest area under cotton cultivation in the world. It has an edge in low cost cotton sourcing compared to other countries.
- Average wage rates in India are 50-60 per cent lower than that in developed countries, thus, enabling India to benefit from global outsourcing trends in labour intensive businesses such as, garments and home textiles.
- Design and fashion capabilities are key strengths that will enable Indian players to strengthen their relationships with global retailers and score over their Chinese competitors.
- Production facilities are available across the textile value chain, from spinning to garments manufacturing. The industry is investing in technology and increasing its capacities which should prove a major asset in the years to come.
- India has gathered experience in terms of working with global brands and this should benefit Indian vendors.

Size of Textile Industry in India

3.7 The textile industry in India covers a wide gamut of activities ranging from production of raw material like cotton, jute, silk and wool to providing high value-added products such as fabrics and garments to consumers. The industry uses a wide variety of fibres ranging from natural fibres like, cotton, jute, silk and wool to man made fibres like, polyester, viscose, acrylic and multiple blends of such fibres and filament yarn.

The textile industry plays a significant role in Indian economy by providing direct employment to an estimated 35 million people, by

Technical Guide on Internal Audit of Textile Industry

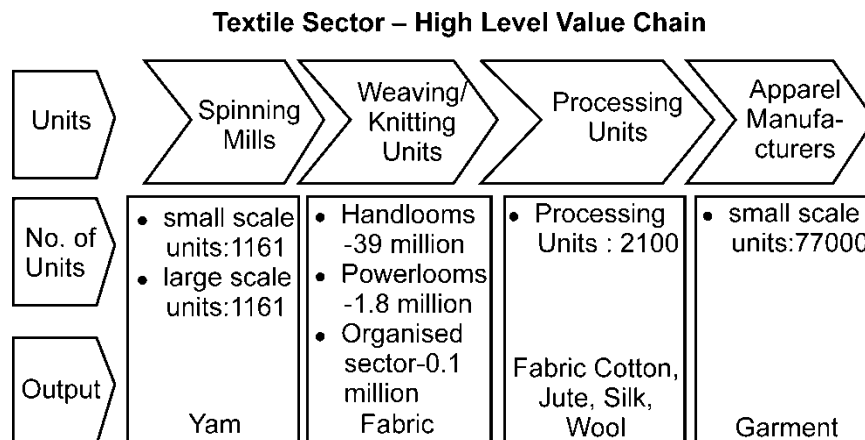
contributing 4 per cent of GDP and accounting for 35 per cent of gross export earnings. The textile sector contributes 14 per cent of the value-addition in the manufacturing sector. Estimates say that the textile sector might achieve about 15 to 18 per cent growth this year following dismantling of MFA.

3.8 With the growing awareness in the industry of its strengths and weakness and the need for exploiting the opportunities and averting threats, the government has initiated many policy measures as follows:

- The Technology Up gradation Fund Scheme (TUFS) was launched in April 99 to provide easy access to capital for technological up gradation by various segments of the Industry.
- The Technology Mission on Cotton (TMC) was launched in February 2000 to address issues relating to the core fibre of cotton like, low productivity, contamination, obsolete ginning and pressing factories, lack of storage facilities and marketing infrastructure.
- A New Long Term Textiles and Garments Export Entitlement (Quota) Policies 2000-2004 was announced for a period of five years with effect from 1.1.2000 to 31.12.2004 covering the remaining period of the quota regime.

Segment Analysis

3.9 India's textile industry comprises mostly small-scale, non-integrated spinning, weaving, finishing, and apparel-making enterprises. The figure below depicts the overall value chain and the number and type of units within the industry.



Structure of Indian Textile Industry

3.10 The textile sector in India is one of the worlds largest. The textile industry today is divided into three segments:

1. Cotton Textiles
2. Synthetic Textiles
3. Other like Wool, Jute, Silk, Denim etc.

All segments have their own place but even today cotton textiles continue to dominate with 73% share. The structure of cotton textile industry is very complex with co-existence of oldest technologies of hand spinning and hand weaving with the most sophisticated automatic spindles and loom. The structure of the textile industry is extremely complex with the modern, sophisticated and highly mechanized mill sector on the one hand and hand spinning and hand weaving (handloom sector) on the other in between falls the decentralized small scale power loom sector.

Unlike other major textile-producing countries, India's textile industry is comprised mostly of small-scale, non-integrated spinning, weaving, finishing, and apparel-making enterprises. This unique industry structure is primarily a legacy of government policies that have promoted labor-intensive, small-scale operations and discriminated against larger scale firms.

Composite Mills

3.11 Relatively large-scale mills that integrate spinning, weaving and, sometimes, fabric finishing are common in other major textile-producing countries. In India, however, these types of mills now account for about only 3 percent of output in the textile sector. About 276 composite mills are now operating in India, most owned by the public sector and many deemed financially sick.

Spinning

3.12 Spinning is the process of converting cotton or man made fiber into yarn to be used for weaving and knitting. This mills are chiefly located in North India. Spinning sector is technology intensive and productivity is affected by the quality of cotton and the cleaning process used during ginning. Largely due to deregulation beginning in the mid-1980s, spinning is the most consolidated and technically efficient sector in India's textile

Technical Guide on Internal Audit of Textile Industry

industry. Average plant size remains small, however, and technology outdated, relative to other major producers.

Weaving and Knitting

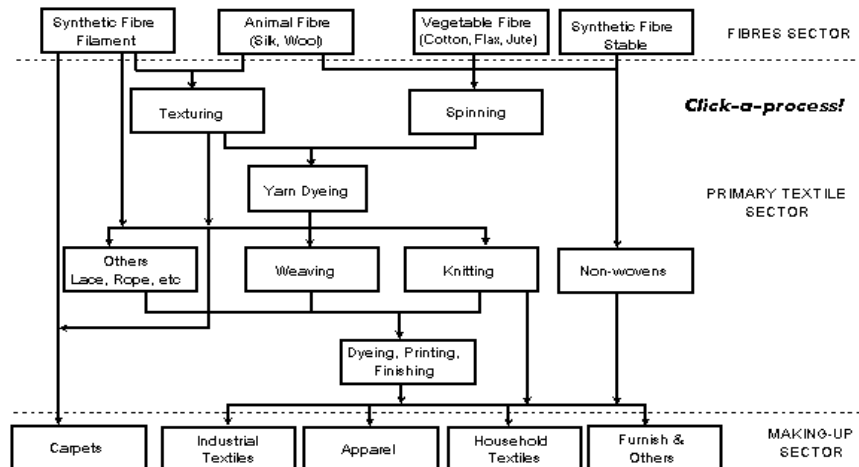
3.13 The weaving and knitting sector lies at the heart of the industry. In 2004-05, of the total production from the weaving sector, about 46 percent was cotton cloth, 41 percent was 100% non-cotton including khadi, wool and silk, and 13 percent was blended cloth. Three distinctive technologies are used in the sector handlooms, power looms and knitting machines. Weaving and knitting converts cotton, manmade, or blended yarns into woven or knitted fabrics. India's weaving and knitting sector remains highly fragmented, small-scale, and labour-intensive.

Fabric Finishing

3.14 Fabric finishing (also referred to as processing), which includes dyeing, printing, and other cloth preparation prior to the manufacture of clothing, is also dominated by a large number of independent, small-scale enterprises. Overall, about 2,300 processors are operating in India, including about 2,100 independent units and 200 units that are integrated with spinning, weaving, or knitting units.

Clothing

3.15 Apparel is produced by about 77,000 small-scale units classified as domestic manufacturers, manufacturer exporters, and fabricators (sub-contractors).



Chapter 4

Regulations Related to Textile Industry in India

Government Policies and Regulations relating to Textile Industry in India

4.1 The Indian textile industry is one of the largest industries in the world. As being one of the most significant sectors in the Indian economy, it has been a key focus area for the Government of India. The Ministry of Textiles in India has formulated numerous policies and schemes for the development of the textile industry in India. In this chapter major rules and regulation regarding textile industry have been explained in brief.

The Ministry of Textiles

4.2 The Ministry of Textiles is responsible for policy formulation, planning, and development export promotion and trade regulation in respect of the textile sector. This includes all natural and manmade cellulosic fibres that go into the making of textiles, clothing and handicrafts.

The Multi-Fibre Agreement (MFA)

4.3 The Multi-Fibre Agreement (MFA), that had governed the extent of textile trade between nations since 1962, expired on January 1, 2005. It is expected that, post-MFA, most tariff distortions would gradually disappear and firms with robust capabilities will gain in the global trade of textile and apparel.

National Textile Policy, 2000

4.4 Faced with new challenges and opportunities in a changing global trade environment, the GOI unveiled its National Textile Policy 2000 (NTP 2000) on November 2, 2000. The NTP 2000 aims to improve the competitiveness of the Indian textile industry. The NTP 2000 opens the country's apparel sector to large firms and allows up to 100 percent FDI in

Technical Guide on Internal Audit of Textile Industry

the sector without any export obligation. The National Textile Policy was formulated keeping in mind the following objectives:

- Development of the textile sector in India in order to nurture and maintain its position in the global arena as the leading manufacturer and exporter of clothing.
- Maintenance of a leading position in the domestic market by doing away with import penetration.
- Injecting competitive spirit by the liberalisation of stringent controls.
- Encouraging Foreign Direct Investment as well as research and development in this sector.
- Stressing on the diversification of production and its upgradation taking into consideration the environmental concerns.
- Development of a firm multi-fibre base along with the skill of the weavers and the craftsmen.

Export Promotion Capital Goods (EPCG) Scheme

4.5 To promote modernization of Indian industry, the Government of India set up the Export Promotion Capital Goods (EPCG) scheme, which permits a firm importing new or secondhand capital goods for production of articles for export to enter the capital goods at preferential tariffs, provided that the firm exports at least six times the C.I.F. value of the imported capital goods within 6 years. Any textile firm planning to modernize its operations had to import at least \$4.6 million worth of equipment to qualify for duty-free treatment under the EPCG scheme.

Export-Import Policy

4.6 The GOIs EXIM policy provides for a variety of largely export-related assistance to firms engaged in the manufacture and trade of textile products. This policy includes fiscal and other trade and investment incentives contained in various programs.

Duty Entitlement Passbook Scheme (DEPB)

4.7 DEPB is available to Indian export companies and traders on a pre- and post-export basis. The pre-export credit requires that the beneficiary firm has exported during the preceding 3-year period. The post-export credit is a transferable credit that exporters of finished goods can use to pay or

offset customs duties on subsequent imports of any unrestricted products. Now from 30th Sept 2011 the scheme of DEPB has been abolished and DDBK are taken place against the same.

Duty Drawback Scheme (DDBK)

4.8 Expansion of Duty Drawback Scheme from 2835 items to approximately 4000 items, adding 1100 from the DEPB schedule, will make Duty Drawback all encompassing without leaving any product from the existing DEPB Rates.

The Agreement on Textiles and Clothing (ATC)

4.9 The Agreement on Textiles and Clothing (ATC) promises abolition of all quota restrictions in international trade in textiles and clothing by the year 2005. This provides tremendous scope for export expansion from developing countries.

Guidelines of the revised Textile Centers Infrastructure Development Scheme (TCUDS)

4.10 TCIDS Scheme is a part of the drive to improve infrastructure facilities at potential Textile growth centres and therefore, aims at removing bottlenecks in exports.

Under the Scheme funds can be given to Central/ State Government Departments/ Public Sector Undertakings/ Other Central /State Governments agencies/or recognized industrial association or entrepreneur bodies for development of infrastructure directly benefiting the textile units. The fund would not be available for individual production units.

Technology Upgradation Fund Scheme (TUFS)

4.11 Recognizing that technology is the key to being competitive in the global market, the Government of India established the Technology Upgradation Fund Scheme (TUFS) to enable entities to access low-interest loans for technology upgradation. Under this scheme, the Government reimburses 5 per cent of the interest rates charged by the banks and financial institutions, thereby ensuring credit availability for upgradation of the technology at global rates. Under the TUF Scheme, launched on April 1, 1999, loans amounting to Rs. 149 billion have been disbursed to around 6,739 applicants.

Technical Guide on Internal Audit of Textile Industry

At present, this is the only scheme through which Government can assist the industry which provides for reimbursing 5% interest on the loans/finance raised from designated financial institutions for bench marked projects of modernization. IDBI, SIDBI, IFCI have been designed as nodal agencies for large and medium small scale industry and jute industry respectively. They have co-opted 148 leading commercial banks/cooperative banks and financial institutions like, State Finance Corporations and State Industrial Development Corporation, etc.

Handlooms will now be covered under the TUF scheme.

Scheme for Integrated Textile Parks (SITP)

4.12 Manufacturing is a thrust area for the government, as Indian industry and the government see foreign companies more as partners in building domestic manufacturing capabilities rather than a threat to Indian businesses. Following this through, the Central Government as well as various States has executed Schemes such as, Schemes for Integrated Textile and Apparel Parks.

To provide the industry with world-class infrastructure facilities for setting up their textile units, Government has launched the Scheme for Integrated Textile Parks (SITP) by merging the Scheme for Apparel Parks for Exports (APE) and Textile Centre Infrastructure Development Scheme (TCIDS). This scheme is based on Public-Private Partnership (PPP) and envisages engaging of a professional agency for project execution. The Ministry of Textiles (MOT) would implement the Scheme through Special Purpose Vehicles (SPVs).

Under the Scheme for Integrated Textiles Parks (SITP), 26 parks have been approved so far out of 30 sanctioned.

National Textile Corporation Ltd. (NTC)

4.13 National Textile Corporation Ltd. (NTC) is the single largest Textile Central Public Sector Enterprise under Ministry of Textiles managing 52 Textile Mills through its 9 Subsidiary Companies spread all over India. The headquarters of the Holding Company is at New Delhi. The strength of the group is around 22000 employees.

Cotton Corporation of India Ltd. (CCI)

4.14 The Cotton Corporation of India Ltd (CCI), Mumbai, is a profit-making Public Sector Undertaking under the Ministry of Textiles engaged in commercial trading of cotton. The CCI also undertakes Minimum Support Price Operation (MSP) on behalf of the Government of India.

Power Loom Development and Export Promotion Council

4.15 Power Loom Development and Export Promotion Council, set up by the Ministry of Textiles, Government of India. PDEXCIL provide some export assistance as follows:

- Exploration of overseas market.
- Identification of items with export potential.
- Market survey and up-to-date market intelligence.
- Contact with protective buyers to interest them in your products.
- Providing your company's profile to overseas buyers and vice-versa.
- Advice on international marketing.
- Display of selected product groups.

Cotton Textile Export Promotion Council (TEXPROCIL)

4.16 The Council looks after the export promotion of cotton fabrics, cotton yarn and cotton made-ups. It's activities include market studies for individual products, circulation of trade enquiries, participation in exhibitions, fairs and seminars at home and abroad in order to boost exports.

Hank Yarn Obligation

4.17 The Hank Yarn Obligation is a mechanism to ensure adequate availability of hank yarn to handloom weavers at reasonable prices. The existing Hank Yarn Packing Notification dated 17.04.2003 promulgated under Essential Commodities Act, 1955 prescribes that every producer of yarn, who packs yarn for civil consumption, shall pack at least 40% of yarn

packed for civil consumption in hank form on quarterly basis and not less than 80% of the hank yarn packed shall be of counts 80s and below. The Government of India is implementing the following schemes all over the country for overall development of handloom sector.

Integrated Handlooms Development Scheme (IHDS)

4.18 The Integrated Handlooms Development Scheme (IHDS) aims to focus on formation of Weavers Group as an entity, develop the Handlooms Weavers Groups to become self sustainable, inclusive approach to cover weavers both within and outside the cooperative fold, skill up gradation of handlooms weavers/workers to produce diversified product, etc.

Under the IHDS scheme, financial assistance is inter-alia provided for a group of weavers, who are in the clusters, having 300-500 handlooms per cluster and also, for a group of weavers who are outside the cluster under Group Approach Project having 10-100 weavers per group.

Under the cluster development programme, financial assistance is provided on need basis towards design development, formation of consortium, skill up gradation, basic inputs, construction of work sheds, corpus for yarn depot, setting up of Common Facility Centre/ Dye House, Publicity and Marketing etc.

Diversified Handloom Development Scheme

4.19 Under the scheme, Design Exhibition–cum Dyeing Workshops are being organized through existing 25 Weavers' Service Centres in the States concerned all over the country, including Karnataka to improve the productivity and earnings of the handloom weavers.

Quality Improvement

4.20 The Textile Commission, under the Ministry of Textiles, facilitates firms in the industry to improve their quality levels and also get recognized quality certifications. Out of 250 textile companies that have been taken up by the Commission, 136 are certified ISO 9001. The other two certifications that have been targeted by the Textile Commission are ISO 14000 Environmental Management Standards and SA 8000 Code of Conduct Management Standards.

Foreign Direct Investment (FDI) Policy

4.21 100% FDI is allowed in the textile sector under the automatic route. FDI in sectors to the extent permitted under automatic route does not require any prior approval either by the Government of India or Reserve Bank of India (RBI). The investors are only required to notify the Regional Office concerned of RBI within 30 days of receipt of in word remittance. Ministry of Textiles has set up FDI Cell to attract FDI in the textile sector in the country. The FDI cell will operate with the following objectives:

- To provide assistance and advisory support (including liaison with other organizations and State Governments)
- Assist foreign companies in finding out joint venture partners.
- To sort out operational problems
- Maintenance and monitoring of data pertaining to domestic textile production and foreign investment.

Other Legislations Regarding the Textile Sector

4.22 Ministry of Finance has added 165 new textile products under duty drawback schedule. The new products included wool tops, cotton yarn, acrylic yarn, viscose yarn, various blended yarn/ fabrics, fishing nets, etc. Further, the existing entries in the drawback schedule relating to garments have been expanded to create separate entries of garments made up of (1) cotton; (2) man made fibre blend and (3) MMF. Separate rates have been prescribed for these categories of garments on the basis of composition of textiles.

A five-pronged strategy aiming to attract FDI by making reforms in local market, replacement of existing indirect taxes with a single nationwide VAT, liberalization of contract norms for textile and garments units, elimination of restrictions that cause poor operational and organizational performance of manufacturers, was suggested.

4.23 Proposals for modernization of NTC mills have been made to the consultative committee members, including formation of a committee of experts to improve management of these mills. Even the present status of jute industry was under the scanner of the consultative committee.

The Government had announced change from the value-based drawback rate hitherto followed to a weight-based structure for textile exports that will

Technical Guide on Internal Audit of Textile Industry

discourage raw material exports and also curtail the scope for misusing the drawback claims by boosting invoice value of exports.

NCDEX has launched its silk contract (raw silk and cocoon). With this launch, the total number of products offered by NCDEX goes up to 27. The launch of the silk contract will offer the entire suite of fibres to the entire value chain ranging from farmers to textile mills.

With the objective of protecting the interests of those affected by the WTO agreements and globalisation process, Government of India jointly with NCDEX has adopted a policy of encouraging future contracts of silk.

4.24 Some of the major acts relating to textile industry includes:

- Central Silk Board Act, 1948
- The Textiles Committee Act, 1963
- The Handlooms Act, 1985
- Cotton Control Order, 1986
- The Textile Undertakings Act, 1995

Government of India is earnestly trying to provide all the relevant facilities for the textile industry to utilize its full potential and achieve the target. The textile industry is presently experiencing an average annual growth rate of 9-10% and is expected to grow at a rate of 16% in value, which will eventually reach the target of US \$ 115 billion by 2012.

Chapter 5

SWOT Analysis of Indian Textile Industry

5.1 **SWOT** is an acronym for Strengths, Weaknesses, Opportunities and Threats. By definition, Strengths (S) and Weaknesses (W) are considered to be internal factors over which you have some measure of control. Also, by definition, Opportunities (O) and Threats (T) are considered to be external factors over which you have essentially no control.

5.2 SWOT Analysis is the most renowned tool for audit and analysis of the overall strategic position of the business and its environment. Its key purpose is to identify the strategies that will create a firm specific business model that will best align an organization's resources and capabilities to the requirements of the environment in which the firm operates. In other words, it is the foundation for evaluating the internal potential and limitations and the probable/ likely opportunities and threats from the external environment. It views all positive and negative factors inside and outside the firm that affect the success. A consistent study of the environment in which the firm operates helps in forecasting/ predicting the changing trends and also helps in including them in the decision-making process of the organization.

SWOT analysis of Textile Industry in India

5.3 The following is a brief SWOT analysis of Textile Industry in India:

(i) Strengths

- (a) India has rich resources of raw materials of textile industry. It is one of the largest producers of cotton in the world and is also rich in resources of fibres like, polyester, silk, viscose, etc.
- (b) India is rich in highly trained manpower. The country has a huge advantage due to lower wage rates. Because of low labour rates the manufacturing cost in textile automatically comes down to very reasonable rates.
- (c) India is highly competitive in spinning sector and has presence in almost all processes of the value chain.

Technical Guide on Internal Audit of Textile Industry

- (d) Indian garment industry is very diverse in size, manufacturing facility, type of apparel produced, quantity and quality of output, cost, and requirement for fabric, etc. It comprises suppliers of ready-made garments for both, domestic or exports markets.
- (e) Manufacturing capacity present across the entire product range, enabling textile companies and garmenters to source their material locally and reduce lead-time.

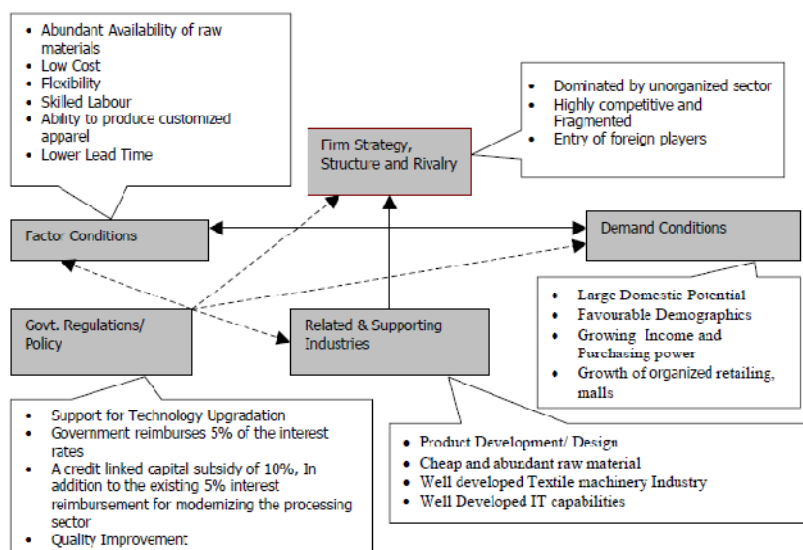
(ii) Weaknesses

- (a) **Fragmented industry:** Fragmented industry leading to lower ability to expand and emerge as world-class players. Huge unorganized and decentralized sector.
- (b) **Effect of Historical Government Policies:** Historical regulations thought relaxed continue to be an impediment to global competitiveness.
- (c) **Lower Productivity and Cost Competitiveness:**
 - (i) Labour force in India has a much lower productivity as compared to competing countries like china, Sri-lanka etc.
 - (ii) The Indian industry lacks adequate economies of scale and is therefore unable to compete with china, and other countries etc.
 - (iii) Cost like indirect taxes, power and interest are relatively high.
- (d) **Technological Obsolescence**
 - (i) Large portion of the processing capacity is obsolete
 - (ii) While state of the art integrated textile mills exists majority of the capacity lies currently with the power loom sector.
 - (iii) This has also resulted in low value addition in the industry.
- (e) Increased global competition in the post 2005 trade regime under WTO
- (f) Inadequate capacity of the domestic textile machinery manufacturing sector.
- (g) Big demand and supply gap in the training facilities in textile sector.

(iii) Opportunities

India's strong performance and growth in the textile sector is aided by several key advantages that the country enjoys, in terms of easy availability of labour and material, buoyant and large market demand, presence of supporting industries and supporting policy initiatives from the government. These advantages can be exhibited within the framework given in the figure below, and are further discussed in the subsequent sections.

Indian Textile Industry — Porter's Diamond Analysis



- (a) **Post 2011 challenges:** After the year 2011 is a huge opportunity that needs to be capitalized.
- (b) **Research and Development and Product Development**
 - (i) Indian companies needs to increase focus on product development.
 - (ii) Newer specialized fabric- smart Fabrics, specialized treatment, etc.
 - (iii) Faster turnaround times for design samples.
 - (iv) Investing in design centers and sampling labs.
 - (v) Increased use of CAD to develop designing capability in the Organization and developing greater options.

- (vi) Investing in trend forecasting to enable growth of the industry in India.

(iv) Threats

- (a) Possibility of a global recession triggered by a weakening dollar.
- (b) Non-availability of indigenous textile machinery.
- (c) Lack of domestic capital and absence of appetite of domestic industries to invest in the quantities envisaged for 12 percent growth target.
- (d) Higher competition specially after 2008 when China cannot be restrained under WTO.
- (e) Sickness is widespread in the cotton textile industry. After the engineering industry, the cotton textile industry has the highest incidence of sickness. As many as 125 sick units have been taken over by the Central Government.

Miscellaneous

5.4 The industry faces a number of other problems like, power cuts, infrastructural problems, lack of finance, exorbitant rise in raw material prices and production costs, etc.

The Indian textile industry is currently one of the largest and most important sector in the economy in terms of output foreign exchange earnings and employment in India. The textile industry has the potential to scale new height in the globalized economy. The textile industry in India has gone through significant changes in anticipation of increased international competition. The industry is facing numerous problems and among them the most important ones are those of liquidity for many organized sector units, demand recession and insufficient price realization. The long range problems include the need for sufficient modernization and restructuring of the entire industry to cater more effectively to the demands of the domestic and foreign markets for textile as per the needs of today and tomorrow.

Chapter 6

Spinning

Spinning

6.1 **Spinning** is the process of creating yarn (or thread, rope, cable) from various raw fiber materials. Several fibers are twisted together to bind them into a strong, long yarn. Characteristics of the yarn vary based on the material used, fiber length and alignment, quantity of fiber used and degree of twist.

6.2 The process of spinning yarn falls into two distinct parts- Spinning Preparatory and Spinning Finishing. Preparatory processes involve mixing of raw material, cleaning and removal of waste, parallelization of sliver whereas finishing involves uniformation of yarn and insertion of twist.

Technical information and guidelines are given below based on the learning from personal experience and discussions with Technologists. This could be used as a guideline and can be implemented based on the trials taken at site. Some of this information can be disproved in some other applications, because many of the parameters are affected by so many variables. A same machine or raw material cannot perform in the same way in two different factories. This is because of the fact that no two factories can be identical. The individual processes are explained below in detail:

Blow Room - Removal of impurities and mixing

6.3 Basic operations in the Blow-room are as follows:

- Opening
- Cleaning
- Mixing or blending
- Micro-dust removal
- Uniform feed to the carding machine
- Recycling the waste

Fibre are drawn from the godown and in the given proportion fed into the bale breaker alongwith usable wastes if applicable. The raw material mix is passed through the beating points of the bale breaker which thrashes the

cotton and waste and removes impurities such as, sand leaves and seeds to be collected through a duct. The mixing then is taken to a separate room and fed into scutchers. The deliveries obtained from the scutcher are in the form of laps which look like, cotton sheets where these are weighed and dispatched to the card room.

Carding - Sliver formation in Rope Form

6.4 **Card** is the heart of the spinning mill" and "Well carded is half spun" are two proverbs of the experts. These proverbs inform the immense significance of carding in the spinning process. **High production** in carding to economise the process leads to reduction in yarn quality. Higher the **production**, the more sensitive becomes the **carding** operation and the greater danger of a negative influence on quality.

The following are purpose of carding:

- to open the flocks into individual fibres
- cleaning or elimination of impurities
- reduction of neps
- elimination of dust
- elimination of short fibres
- fibre blending
- fibre orientation or alignment
- sliver formation

In this process the laps are opened up to a stage where every fibre becomes individualized and the cotton is no more in an entangled state. The laps are processed by the card engines and the output obtained is in the form of a silver which is like a cotton rope. At this stage, three types of wastes known as (i) flat strips, (ii) cylinder and doffer strips and (iii) card fly are produced.

Draw Frame -Uniformalion of Yarn

6.5 In this process, the fibres are straightened out and parallelized. A group of slivers are fed into draw frames twice and the delivery obtained at the second operation is ready to go to simplex frames. If combed yarn is to be spun, the carded silvers goes to combers and the output of the combers is fed into the draw frames twice.

6.6 Combing is an extra process introduced after carding and designed to parallelize the fibres and to remove the short fibres that are present in cotton so as to produce yarn which is more even, smoother, and freer from imperfection than carded yarn. Fine varieties are subjected to combing. The drawing operation is performed after this.

6.7 Drawframe is a very critical machine in the spinning process. Its influence on quality, especially on evenness is very big. If drawframe is not set properly, it will also result in drop in *yarn strength* and yarn elongation at break. The faults in the sliver that come out of drawframe *cannot* be corrected. It will pass into the yarn.

The factors that affect the **yarn quality** are as follows:

- the total draft
- number of drawframe passages
- break draft
- number of doublings
- grams/meter of sliver fed to the drawframe
- fibre length
- fibre fineness
- delivery speed
- type of drafting
- type of auto leveller
- auto leveller settings

The total draft depends upon following:

- material processed
- short fibre content
- fibre length.

6.8 Some facts derived from trials are as follows:

- Wider back roller setting will result in lower yarn strength.
- Wider back roller setting will affect yarn evenness.
- Wider back roller setting will increase imperfections.
- Higher back top roller loading will reduce yarn strength.

Technical Guide on Internal Audit of Textile Industry

- Higher back top roller loading will reduce end breakage rate.
- Wider front roller setting will improve yarn strength.

6.9 **Drafting wave** is caused primarily not by mechanical defects as such but by the uncontrolled fibre movement of a periodic type resulting from the defects. As the fibre-accelerating point moves towards the front rollers, the draft increases (and vice versa), so that a periodic variation in linear density inevitably results. With variable fibre-length distribution (with more short fibre content), the drafting irregularity be high.

More the number of doublings, lower the irregularity caused due to random variations. Doublings does not normally eliminate periodic faults. But it reduces the effects of random pulses. Doubling does not have any effect on index of irregularity also, since both the irregularities are reduced by square root of the number of doublings.

Fibre hooks influences the effective fibre length or fibre extent. This will affect the drafting performance. For carded material normally a draft 7.5 in both breaker and finisher drawframe is recommended. Seven of a draft can be tried in breaker, since it is a carded material. For combed material, if single passage is used, it is better to employ draft of 7.5 to 8. If combers with four doublings are used, it is better to use two drawframe passages after combing. This will reduce long thick places in the yarn.

In case of two drawframe passage, first drawframe passage will reduce the periodic variation due to piecing. Therefore, the life of servomotor and servo amplifier will be more, if two drawframe passage is used. Quality of sliver will also be good, because of less and stable feed variation.

Speed Frame

6.10 This forms the final stage in the spinning preparatory sequence of operations. The main object of this process is to reduce the silver bulkiness i.e. to attenuate it so as to be suitable for the yarn in the form of an attenuated strand of cotton with a little twist known as 'roving and is wound one bobbins'.

Roving machine is complicated, liable to faults, causes defects, adds to production costs and delivers a product that is sensitive in both winding and unwinding. The following parameters are very important in **SPEED FRAME**. They are as follows:

- Feed hank
- Delivery hank

- Roving tension
- Break draft
- Drafting system
- Bottom roller setting
- Top roller setting
- Condensers and spacers
- Twist in the roving
- Bobbin content
- flyer speed
- Creel and creel draft
- Drawframe sliver and cane
- Bobbin height
- Breakage rate
- Piecings.

Since modern Ringframes are capable of handling higher drafts in ringframe without quality deterioration, it is better to have coarser hanks in the speed frame. This helps to increase the production in speed frame.

Ring Frame - Ultimate Production

6.11 Spinning is the process of (i) continuing the drawings out of the roving so as to attain the desired degree of fitness; (ii) imparting sufficient twist to the emerging strands of fibres and forming continuous yarn; (iii) winding up the spun yarn into some convenient package form, usually on bobbins. The machine used for spinning yarn is known as ring frames. When the yarn has to be doubled either for weaving purpose or for sale, the requisite number of ply is first wound parallel and thereafter twisted on the doubling frame. The double yarn is obtained on bobbins and it is wound on cones.

6.12 Ringframe Technology is a simple and old technology, but the production and quality requirements at the present scenario puts in a lot of pressure on the Technologist to select the optimum process parameters and machine parameters, so that a good quality yarn can be produced at a lower manufacturing cost.

Technical Guide on Internal Audit of Textile Industry

Following are the points to be considered in a ringframe:

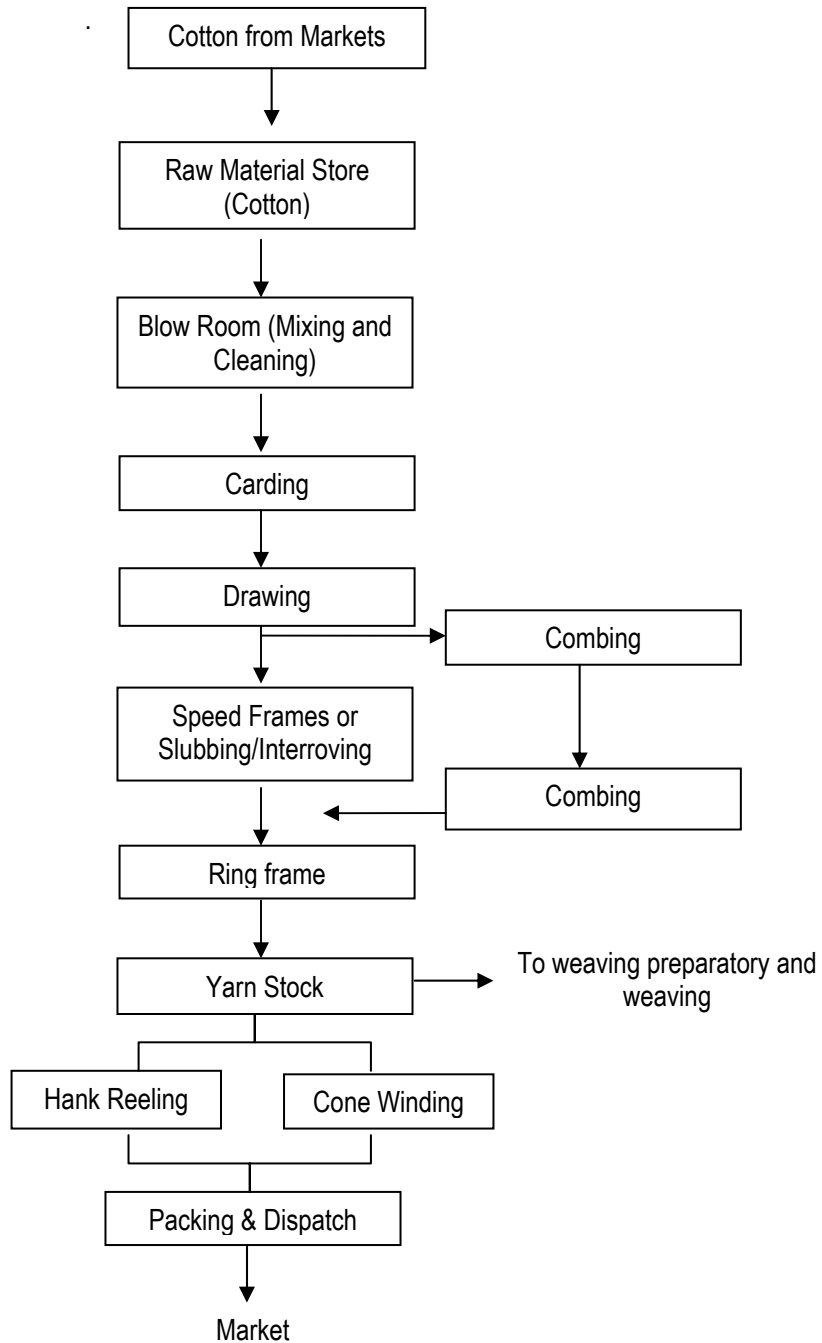
- Draft distribution and settings
- Ring and travellers
- spindle speed
- Twist
- lift of the machine
- creel type
- feed material
- length of the machine
- type of drive, above all.

Cone Winding

6.13 The single or double yarn, as the case may be, intended for sale in hanks is reeled, bundled and baled. The yarn to be sold on cones is packed in bags or boxes after being wound on cones. The hard waste resulting from winding, doubling and reeling processes is collected and sent to the waste stores.

The yarn is measured in kilograms. The fitness of the yarn is determined on the basis of the counts, i.e., if 840 yards of the yards of yarn weigh 1lb it is 1s (s=count), if 2 x 840 yards weigh 1 lb, it is 2s and so on. Thus, under the count system, higher the number, finer is the yarn.

6.14 A flow chart showing the aforesaid processes is given in the following pages:



Chapter 7

Weaving

Weaving

7.1 Weaving is an ancient textile art and craft that involves placing two threads or yarn made of fibre onto a warp and weft of a loom and turning them into cloth. The yarn for weaving is of two kinds namely, warp yarn and weft yarn. Warp yarn means the yarn running length-wise in the cloth, and the transverse threads in the cloth are called weft. The warp yarn should be stronger than weft yarn so as to withstand the stress and strain of shuttle movement at the time of weaving. This cloth can be plain (in one color or a simple pattern), or it can be woven in decorative or artistic designs, including tapestries.

Wrapping

7.2 The yarn is taken from number of cones, which are placed in a rack known as creel, and is drawn out in parallel on beams. This operation is called wrapping.

Sizing

7.3 In this process, sizing solution consisting of materials like, starch, maize, tallow, gum etc. is applied to give strength to the yarn and a bigger beam of more number of ends (threads) is made.

Drawing

7.4 The ends of the sized wrap have to be drawn. The process of drawing-in-divides the wrap into two sets of threads which are alternately moved up and down on the loom with each passage of the shuttle so as to result in the inter-lacing of the weft thread with the warp.

Loom

7.5 The section where the fabrics are woven is termed as 'loomshed'. Weaving is the process of interlacing of warp and weft threads on a loom. The weaving process consists of impelling a pirn of weft thread contained in a shuttle across the warp yarns from one side of the loom to another. The weft yarn laid down after each passage of the shuttle is beaten up against those previously laid down to form the fabric.

Looms may be either automatic or non-automatic. Plain cloth is woven on plain looms whereas drop-box looms are used for check weave, dobby looms for fancy cloth of limited choice and jacquard looms for patterns as in the case of furnishing fabrics.

In addition to wrap and weft the construction of the cloth can also be expressed by specifying 'picks' and 'piece length'. 'Picks' refers to number of thread per inch in the weft yarn. 'Piece length' is the standard measure of cloth in metres.

Finishing/ Processing

7.6 Fabrics coming from the weaving department are seldom in a condition to be offered directly to the consumers. They may contain imperfections which give them a harsh lusterless and dis-coloured character; they may also be soiled and may have strains. The grey fabrics are subjected to wet processing in order to make it acceptable to the consumers. The successive stages in wet processing are briefly described below:

(i) Batching

The fabrics are first sewn so that continuous processing of large quantity of cloth can be carried out.

(ii) Cropping and Shearing

This process is employed to remove lint, dust, loose yarn, loops, hanging ends, etc.

(iii) Singeing

The fabric is passed through a singeing machine with the object of burning off the fuzz or hairiness on the fabric to obtain a smooth surface. After singeing, the fabric is led through a water trough to quench sparks which may have fallen on it.

(iv) De-sizing/ Sourcing/ Bleaching

The impurities in the fabric such as, the sizing materials, fatty and oily substances, gums and mineral impurities are removed by employing the desizing process. Mineral impurities which are inherent in fibre are removed by sourcing. Bleaching helps to impart a white colour to the fabric. The bleached cloth may be sold as it is or after one or more of the following processes.

Technical Guide on Internal Audit of Textile Industry

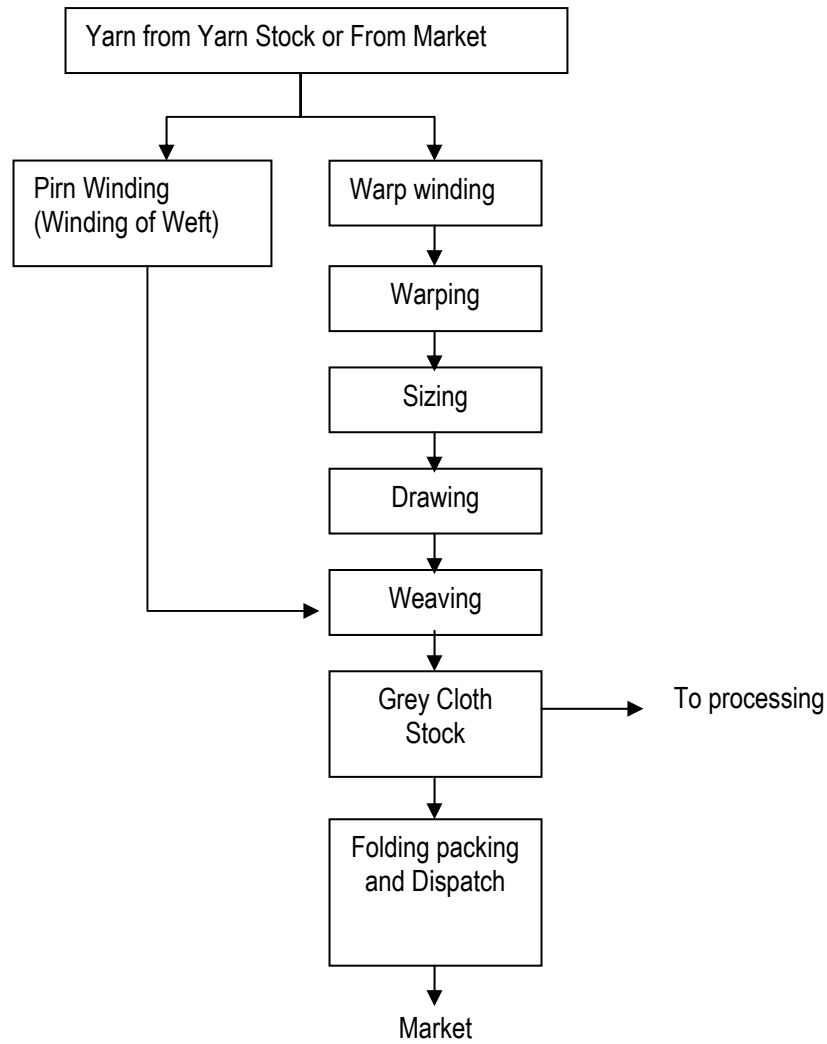
- (v) Mercerizing
This process gives fabrics a high lustre more or less of permanent nature. The fabric is treated in a caustic soda solution of specific strength and temperature.
 - (vi) Dyeing
The dyeing process imparts colour to the whole of the fabric. Detailed process of textile dyeing is given in this chapter.
 - (vii) Printing
There are two methods of obtaining a coloured design or pattern on a piece of cloth, either by weaving coloured yarns or by printing. The latter method is more economical, faster and more versatile. Commonly employed methods for printings are roller printing and screen printings. In roller printing, the design is engraved on copper rollers. More than one colour printing is possible at a time by using as many as six copper rollers. The copper rollers are capable of being re-engraved a number of times. When the re-engraving becomes impossible, copper rollers are usually sold. Under the screen printings, screen or frames containing the design are manually pressed over the fabric repeatedly.
 - (viii) Finishing
After the process fabrics become distorted as they are stretched either in length or width, their surface may be rough and unattractive to the customers. Further, it may be necessary or desirable to give the fabrics some special characteristics such as, added resistance to shrinkage, high luster, etc., which they normally do not possess. Such treatments are carried out in the finishing department.
 - (ix) Folding, Packing and Bailing
The finished cloth is sent to the folding department where it is thoroughly inspected. It is then folded by a folding machine and stamped with specifications as required by the stamping regulations issued by the textile controller, and with brand name, trademark, etc. Finally, the cloth is packed in bales or cases which are then ready for dispatch to buyers.
- 7.7 In the course of packing grey or processed cloth cut piece of small length arise and these are grouped as under:
- (i) Fents: measuring a length of more than about 65 cm. but less than about 135 cm.

- (ii) Rags: measuring a length of more than about 23 cm and less than about 65 cm.
- (iii) Chindies: small cut pieces measuring less than 23 cm in length.

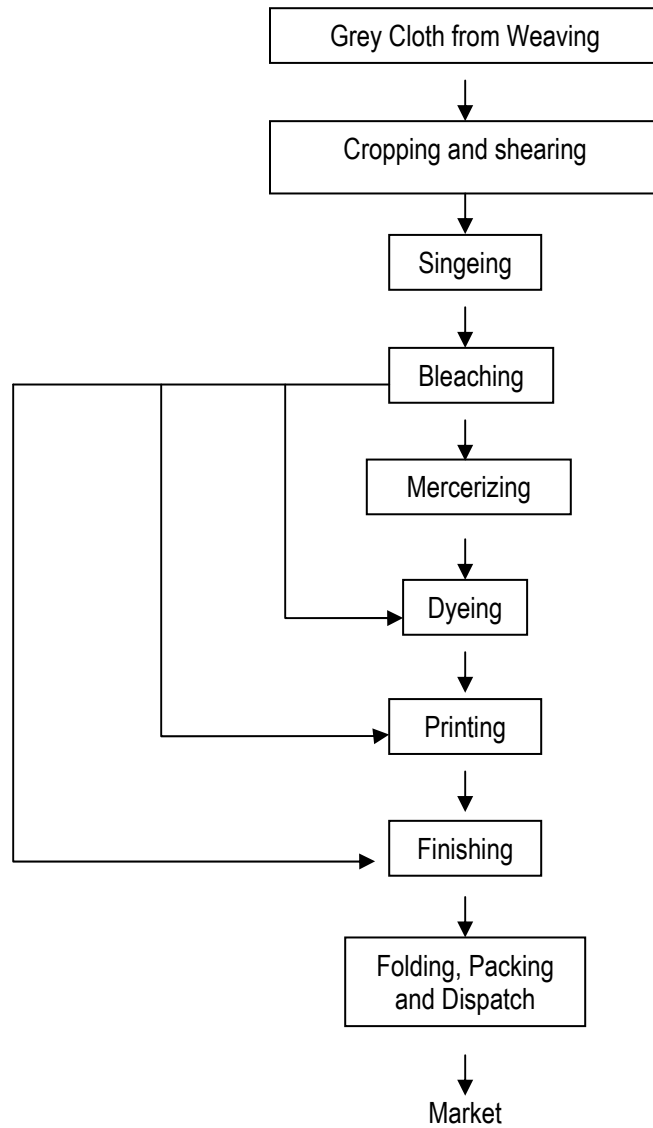
This classification, however, may vary according to the width of the cloth, and these materials are sold by weight.

Weaving Process

7.8 The following figure shows the steps in weaving process:



Processing



Textile Dyeing

Methods of Dyeing

7.9 In selecting the method of textile dyeing, the type of process used depends on several factors that include type of material like, fiber, yarn, fabric, fabric construction, garment, generic type of fibers, quality standards used in the dyed fabric, sizes of the dye lots, etc.

7.10 Batch Dyeing Process is the most popular and common method used for dyeing of textile materials. Batch dyeing is also sometimes referred to as *Exhaust dyeing*. This is because in this process, the dye gets slowly transferred from a comparatively large volume dye bath to the substrate or material that is to be dyed. The time taken is also longer. The dye is meant to 'exhaust' from dye bath to the substrate. In batch processes, textile substrates can be easily dyed at any stage of their assembly into the desired textile product. This includes fiber, yarn, fabric or garment. Some type of batch dyeing machines can function at temperatures only up to 1000°C. For example cotton, rayon, nylon, wool, etc. can be dyed at 1000°C or lower temperatures. While polyester and some other synthetic fibers are dyed at 1000 Centigrade or even higher temperatures.

7.11 There are three general types of batch dyeing machines which are:

- where there is circulation of fabric,
- where the dye bath gets circulated while the material that is being dyed remains stationary,
- where both the bath and material to be dyed gets circulated. Examples of dyeing machines that utilizes batch dyeing process are Beck, Jet, Jigs, Beam Package dyeing machines, etc.

Materials used in the Textile Dyeing Process

7.12 The materials that are used as inputs in textile dyeing and finishing process may include water, fibre, yarn or cloth. Examples are of wool, cotton, polyester, and a host of process chemicals that includes:

- Acids, e.g., acetic, formic.
- Alkalis- NaOH, potassium hydroxide, sodium carbonate.
- Bleaches- hydrogen peroxide, sodium hypochlorite, sodium chloride etc.
- Dyes, for example direct, disperse, pigment, vat.

- Salts, e.g. NaCl.
- Size, e.g. PVA, starch.
- Stabilisers from sodium silicate, sodium nitrate also organic stabilizers.
- Surfactants
- Auxiliary finishes, like fire retardant, softeners.

Dyeing Process

7.13 Dyeing is the process in which a dye molecule gets thoroughly dissolved and dispersed in the carrier. It can be in water or some other carrier also, but it must be able to penetrate and colour the textile materials in the process. In the textile dyeing process, the dyeing is carried out at different stages like, polymer, yarn, fabric and garment or even at the product stage.

Optimizing the Batch Dyeing Process

7.14 For any dyers the ultimate dream is to get the maximum out of the process of dyeing, at minimal cost. For a batch dyeing process the following techniques can prove to be effective for optimum utilization:

- Use machinery that are fitted with latest state-of-the-art automatic controllers of fill volume, temperature and other dyeing cycle parameters, indirect system of cooling and heating, innovative hoods and doors that lessens vapor losses.
- Choosing the machinery that is exactly sized for the batch that needs to be processed. It should also be confirmed that it is operated exactly within the specified range of nominal liquor ratios for which it is designed. It has been seen that machines that are operated with a consistent liquor ratio while being loaded at 60% level of their nominal capacity gives optimum results. With yarn dyeing machines, this level can stretch to even 30% of the nominal capacity.
- Opting new machineries that adheres to the following requirements:
 - Liquor ratio that is low-or-ultra-low.
 - Complete in process separation of bath from substrate.
 - Mechanism that involves smooth internal separation of process liquor from the washing liquor.

Weaving

- Mechanical liquor extraction that brings the carry-over to minimum and improves washing efficiency.
- Reduced cycle duration.
- Replacement of conventional overflow-flood rinsing method with methods like drain and fill or other methods (for example, smart rinsing for fabric).
- Proper re-use of rinsed water for the next dyeing session.
- Re-use of the dye bath, if technical considerations allows.

Chapter 8 Apparels

Garment Manufacturing

8.1 Garment manufacturers are primarily engaged in the design, cutting and sewing of garments from fabric. Some manufacturers are contractors or sub-contractors, which generally manufacture apparel from materials owned by other firms. Some manufacturers are vertically integrated, producing the textiles from which they make garments, or even operating retail outlets too.

History of Garment Industry

8.2 First sewing machine was invented in the Victorian era, after the development of machine elite class use to have a seamstress who stitched the clothes for them on sewing machine. Before sewing machines everything was done by hand. The seamstresses went to the home of the woman who wanted to stitch the clothes. As industrial revolution started in the 19th century, garment too began to evolve but it was in its infancy and had no developed system for garment manufacturing. Seamstresses observed that they can develop standard patterns which can fit more than one woman. They developed a mathematical sizing system to accommodate most women with very few patterns. As businessmen, interested in lowering costs, they continued developing these patterns to become paper “information systems” engineered to control quantities of exact reproductions in cutting and stitching clothing in mass production systems.

8.3 The apparel industry grew from these tailors/ businessmen, as they built manufacturing factories for production, which pattern engineering accommodated. Pattern engineering grew a great industry in the early and mid-20th century. Pattern making was first taught to “apprentices” who were called “designers”. Creative designers of styles didn’t exist in the early 20th century. Paris was center of the developments in style and creation in garments at that time and many other countries copied from there. Later designers created booklets for teaching the pattern making systems mathematically – that came to be called “pattern drafting”. One disadvantage of mass production was that designers put little effort in bringing new designs and patterns but they either copied or else made very little changes. Even today the readymade garment industry does not brings too

many new ideas in the products rather it is creating mass garments to reduce cost. Garment industry has developed many new and time saving techniques, processes and machinery for the effective production today. The most important is the CAD/CAM which enables the designer, pattern maker, marker and grader to do their jobs precisely and effectively.

Organizational Areas in Garment Manufacturing

8.4 On industrial basis there are certain areas or sequence through which garments are manufactured. These are have been explained in detail is the following paragraphs.

Design/ Sketch

8.5 In the garment manufacturing the first step is designing the sketch for the dresses that have to be prepared. For this purpose, the designer first draw several rough sketches in the sketch book. The designer does not go for details at this moment but he rather lets his creativity flow on the paper and he draws many sketches. Later, these sketches are analyzed by a panel of designers. They finally select few out of them. These few sketches are rendered in detail separately or in the form of a single collection. The designer also draws working drawings along with the sketch. Working drawings are flat drawing of the sketch and it helps maker in understanding the patterns involved in the construction.

Pattern Design

8.6 The pattern maker now develop first pattern for the designs in any one standard size. This is made by pattern drafting method and the purpose of making this pattern is to create the sample garment for test fit.

Sample Making

8.7 The first patterns are sent to the sewing unit for assembling them into garment. This is usually stitched on calico or muslin which is an inferior quality of fabric and it reduces cost. This sample is constructed to analyze the pattern fit and design too. After the sample garment is stitched it is reviewed by a panel of designers, pattern makers and sewing specialists. If any changes have to be made they are made at this time.

Production Pattern

8.8 The pattern design is now taken for creating the production patterns. The production pattern is one which will be used for huge production of

garments. The pattern maker makes the patterns on standard pattern making paper. These papers are made-up of various grades. The most important component, the tissue paper pattern, is made from the lightest and thinnest paper commercially available (it is not made at the pattern companies). It is called 7.5 lb (3.4 kg) basis paper, meaning that a ream of it (500 sheets) only weighs 7.5 lb (3.4 kg).

8.9 Garment patterns can be constructed by two means— manual method, or CAD/CAM method. Today many companies have developed CAD/CAM because of the ease of designing patterns, fluency and precision involved which cannot be guaranteed with the manual method. Investing once into the CAD/CAM unit is worth in itself. Many buyers around the world prefer manufacturers who are using CAD/CAM methods. The production patterns created in CAD/CAM can be stored easily and they can be modified at any point of time.

8.10 A garment sewing pattern or garment fabric and patterns draft is developed by calculating, taking account of the following measurements: -

- (i) Direct Sample.
- (ii) Specification Sheet/ Measurement Chart.
- (iii) Actual body size measurements
- (iv) Ease Allowances
- (v) Sewing Allowance.

These allowances are different for different type of fabrics and patterns.

Grading

8.11 The purpose of grading is to create patterns in different standard sizes. Grading a pattern is really scaling a pattern up or down in order to adjust it for multiple sizes. Pattern sizes can be large, medium and small or else there are standard patterns of size like, 10, 12, 14, 16 and so on for different figure and statures sizes. This is generally how we get S, M, L, XL and XXL sizing. Pattern grading by manual method is a cumbersome task because the grader has to alter the pattern on each and every point from armhole, to neckline, sleeve cap and wrist, etc. by using CAD it is much easier and faster.

Marker Making

8.12 The measuring department determines the fabric yardage needed for each style and size of garment. Computer software helps the technicians

to create the optimum fabric layout to suggest so that fabric can be used efficiently. Markers, made in accordance to the patterns are attached to the fabric with the help of adhesive stripping or staples. Markers are laid in such a way so that minimum possible fabric gets wasted during cutting operation. After marking the garment manufacturer will get the idea of how much fabric he has to order in advance for the construction of garments. Therefore, careful execution is important in this step.

Computer marking is done on specialized software. In computerized marking there is no need of large paper sheets for calculating the yardage, in fact, mathematical calculations are made instead to know how much fabric is required.

Spreading

8.13 With the help of spreading machines, fabric is stacked on one another in reaches or lays that may go over 100 ft (30.5 m) long and hundreds of plies (fabric pieces) thick.

Cutting

8.14 The fabric is then cut with the help of cloth cutting machines suitable for the type of the cloth. These can be band cutters having similar work method like, that of band saws; cutters having rotary blades; machines having reciprocal blades which saw up and down; die clickers similar to die or punch press; or computerized machines that use either blades or laser beams to cut the fabric in desired shapes.

Sorting/ Bundling

8.15 The sorter sorts the patterns according to size and design and makes bundles of them. This step requires much precision because making bundles of mismatched patterns can create severe problems. On each bundle there are specifications of the style size and the marker too is attached with it.

Sewing/ Assembling

8.16 The sorted bundles of fabrics are now ready to be stitched. Large garment manufacturers have their own sewing units and use it give the fabrics on contract to other contractors. Stitching in-house is preferable because one can maintain quality control during the processing. On the other hand, if contractors are hired then keeping eye on quality is difficult unless the contractor is one who precisely controls the process.

8.17 There are what is called sewing stations for sewing different parts of the cut pieces. In this workplace, there are many operators who perform a single operation. One operator may make only straight seams, while another may make sleeve insets. Yet another two operators can sew the waist seams, and make buttonholes. Various industrial sewing machines too have different types of stitches that they can make. These machines also have different configuration of the frame. Some machines work sequentially and feed their finished step directly into the next machine, while the gang machines have multiple machines performing the same operation supervised by a single operator. All these factors decide what parts of a garment can be sewn at that station. Finally, the sewn parts of the garment, such as sleeves or pant legs, are assembled together to give the final form to the clothing.

Inspection

8.18 Open seams, wrong stitching techniques, non- matching threads, and missing stitches, improper creasing of the garment, erroneous thread tension and raw edges are some of the sewing defects which can affect the garment quality adversely. During processing the quality control section needs to check each prepared article against these defects.

Pressing/ Finishing

The next operations are those of finishing and/ or decorating. Molding may be done to change the finished surface of the garment by applying pressure, heat, moisture, or certain other combination. Pressing, pleating and creasing are the basic molding processes. Creasing is mostly done before other finishing processes like, that of stitching a cuff. Creasing is also done before decorating the garment with something like, a pocket, appliqués, embroidered emblems. etc.

Vertical and form presses is automated machines. Perform simple pressing operations, such as touching up wrinkles in knit shirts, around embroidery and snaps, and at difficult-to-reach places on garments.

Final Inspection

8.20 For the textile and apparel industry, product quality is calculated in terms of quality and standard of fibers, yarns, fabric construction, color fastness, designs and the final finished garments. Quality control in terms of garment manufacturing, pre-sales and posts sales service, delivery, pricing, etc are essential for any garment manufacturer, trader or exporter. Certain

quality related problems, often seen in garment manufacturing like, sewing, color, sizing, or garment defects should never be over looked.

(i) Sewing defects

Open seams, wrong stitching techniques, non-matching threads, missing stitches, improper creasing of the garment, erroneous thread tension and raw edges are some of the sewing defects which can affect the garment quality adversely.

(ii) Color defects

Variation of color between the sample and the final garment, wrong color combinations and mismatching dyes should always be avoided.

(iii) Sizing defects

Wrong gradation of sizes, difference in measurement of various parts of a garment like, sleeves of XL size for body of L size garment can deteriorate the garments beyond repair.

(iv) Garment defects

Broken or defective buttons, snaps, stitches, different shades within the same garment, dropped stitches, exposed notches and raw edges, fabric defects, holes, faulty zippers, loose or hanging sewing threads, misaligned buttons and holes, missing buttons, needle cuts or chews, pulled or loose yarn, stains, unfinished buttonhole, short zippers, inappropriate trimmings, etc., all can lead to the end of a brand name even before its establishment.

Packing

8.21 The finished garments are finally sorted on the basis of design and size and packed to send for distribution to the retail outlets.

Recent Developments in Garment Manufacturing

8.22 CAD and CAM are two technologies that have made prominent changes in the way garment manufacturing was done in previous eras. Today all large garment manufacturing companies have developed CAD/CAM system to do the process of garment manufacturing. CAD is an abbreviation for computer-aided design and CAM for computer-aided machine. CAD/CAM is computer software that controls the production of garments. In CAD the designer designs the garments by using any suitable software like, Adobe Photoshop, Adobe Illustrator, Corel Draw, etc and in

Technical Guide on Internal Audit of Textile Industry

CAM the cutters, sewers, graders and markers control the process of development.

The designer creates 2-D or 3-D model of design in CAD and CAM as a software numerically controls the machines that generates the production. There are several advantages of CAD/CAM over manual method of designing and production of garments which are as follows:

- The expense and time is reduced in a considerable manner when compared to the laborious manual work of designing.
- Designing can be done from anywhere as the designers are able to control the process from remote locations as well.
- The data can be easily stored, transmitted, and transported through computer files.
- Digital swatches can be saved on floppy disks, zip disks, CD-ROM or hard drive thus saving space. Moreover, they can be easily organized for fast and easy retrieval.
- The designs can be easily customized and personalized as corrections and editing can be done at any time without significant delays or cost increases.
- The designers don't need to produce swatches all the time as they can now see how a particular fabric or garment looks in different colors and shapes on computer screen itself.

Part III
Practice Guide for Internal Audit

Chapter 9

Internal Audit Processes

9.1 Standard on Internal Audit (SIA) 1, “Planning an Internal Audit” requires that the internal audit plan should be based on the knowledge of the entity’s business. While developing the internal audit plan, the internal auditor should have regard to the objectives of the internal audit engagement as well as the time and resources required for conducting the engagement.

Further, the internal audit plan should be comprehensive enough to ensure that it helps in achieving of overall objectives of an internal audit. SIA 1, “Planning an Internal Audit” specifies that the internal audit plan should cover areas such as:

- Obtaining the knowledge of the legal and regulatory framework within which the entity operates.
- Obtaining the knowledge of the entity’s accounting and internal control systems and policies.
- Determining the effectiveness of the internal control procedures adopted by the entity.
- Determining the nature, timing and extent of procedures to be performed.
- Identifying the activities warranting special focus based on the materiality and criticality of such activities, and their overall effect on operations of the entity.
- Identifying and allocating staff to different activities to be undertaken.
- Setting the time budget for each of the activities.
- Identifying the reporting responsibilities.

9.2 In case of textile industry, specific care should be taken to design the internal audit plan. Audit planning should be divided into annual audit planning and individual audit planning.

Annual Audit Programme

9.3 As it would not be possible for internal auditor to audit all departments of the organization within one audit cycle, it should develop a framework for identification of departments and functional areas that would be taken up for audit of 4 to 5 department in a quarter of the year so that one department could be covered at least once in a year. Such prioritization can be done based on risk analysis and materiality of the potential risk.

Important objectives of the annual audit plan are to:

- Ensure coverage of all key departments each year;
- Review periodicity of coverage at regular intervals;
- Resource planning; and
- Control redundancy in audits.

Internal auditor should prepare the annual audit programme sufficiently in advance, at least two to three months in advance, i.e., by January so that the auditee units can be informed accordingly. Also, the annual audit programme should be broken down into quarterly programmes and it should be so arranged that travel of audit teams should be optimized and there is a good mix of audits at state capital and districts in every quarter.

Planning Individual Audits

9.4 The internal auditor should plan the audit in a manner, which ensures that an audit of high quality is carried out in an economic, efficient and effective way and in a timely manner. While planning individual audits due considerations should be given to the information available in permanent audit files. In case of first audit, sufficient time should be given to the audit team to gain understanding of the departments. Plan shall consider availability of resources and skill levels and prior experience in conducting the audit of the said department. Preliminary planning involves the following:

- gathering basic understanding about the department, its operations and controls;
- identifying areas of internal audit focus through study of past audit reports, analytical review and assessing inherent risks;

- Identifying requirements of legal compliance required of the department.

Ideally, of the total available time, about 40 percent should be budgeted for planning.

Knowledge of the Entity and its Environment

9.5 Since internal audit is a key assurance function regarding organization's achievement of its objectives, internal auditor should have fairly good knowledge of the organization and its operations. This includes understanding the rationale of establishing the department, structure of the department, functions of the department, relation between secretariat office, head office and plant level offices.

9.6 Standard on Internal Audit (SIA) 15 "Knowledge of the Entity and Its Environment" lays down that in performing an internal audit engagement, the internal auditor should obtain knowledge of the economy, the entity's business and its operating environment, including its regulatory environment and the industry in which it operates, sufficient to be able to review the key risks and entity-wide processes, systems, procedures and controls. The internal auditor should identify sufficient, appropriate, reliable and useful information to achieve the objectives of the engagement. Such knowledge is used by the internal auditor in reviewing the key operational, strategic and control risks and in determining the nature, timing and extent of internal audit procedures.

Since internal audit is a continuing engagement, auditor should keep re-evaluating the knowledge gained in previous audits and keep updating the changes. Primary source of information about the department can be obtained through the following documents:

- Internal policies;
- Budget estimates, revised estimates and actual expenditure;
- Audited financial statements;
- Standard operating procedure manuals, departmental manuals, etc.;
- Organization charts and flow charts of processes;
- Annual reports,
- MIS reports.

9.7 Internal auditor should use flowcharts, questionnaire or interview methods to obtain necessary information. Audit manager should ensure that members of audit team inculcate habit of gaining functional knowledge of the department throughout the course of audit and share information among themselves. Knowledge so gained should be used to interpret and correlate the contents of various financial and MIS reports prepared by the department.

Gathering knowledge of the various department is a continuous process that would help internal auditor in:

- Identifying inherent risk
- Determining materiality
- Develop audit plan and program
- Evaluating audit evidence
- Identification of areas of special consideration
- Identification of unusual transactions and fraud indicators
- Appropriateness of accounting principles applied.

Understanding controls

9.8 The auditor, in determining the extent and scope of the internal audit, should study and evaluate the reliability of internal control. After gaining understanding of the organization, auditor identifies key controls in conducting operations. Internal auditor should examine and evaluate the compliance to the controls specified in the various codes, manuals to assure effectiveness of controls in fulfilling the objectives of the organization.

9.9 Standard on Internal Audit (SIA) 12, "Internal Control Evaluation" lays down that the internal auditor should examine the continued effectiveness of the internal control system through evaluation and make recommendations, if any, for improving its effectiveness. The internal auditor should focus towards improving the internal control structure and promoting better corporate governance. The role of the internal auditor encompasses:

- Evaluation of the efficiency and effectiveness of controls;
- Recommending new controls where needed; – or
- Discontinuing unnecessary controls;

- Using control frameworks;
- Developing control self-assessment.

While the primary responsibility of administering effective controls lies with management, internal auditor provides assurance of effectiveness of controls. Internal controls extend beyond financial controls and envelop all the functional areas needed to achieve the set objectives of the organization. Objective of codes, manuals and guidelines is to safeguard operations from frauds, errors, irregularities besides ensuring the sound accounting and financial reporting. Thus, understanding these controls is imperative on the part of auditor.

Identification of Inherent Risk

9.10 Risks associated in the nature of operations of an organization in absence of controls are known as 'Inherent Risk'. Auditor should also try to know the reasons for existence of adverse conditions or highly favorable conditions such as, sudden increase in the budget of department or acquisition of high value capital items. Assessment of inherent risk depends on auditor's professional judgment and may be judged at two levels, i.e., macro level (environmental factors) and micro (account balance) level.

9.11 Environmental factors that substantiate the inherent risk are as follows:

- Integrity of the management (lower the integrity levels, higher the risk);
- Management's experience and understanding of the operations (inexperience of the management can lead to potential misuse by the staff);
- Unusual pressures to perform (unrealistic deadlines may cause management to take short cuts, make false claims, etc.);
- Economic conditions (lower economic activity can have impact on functioning of some of the departments like commercial taxes);
- Accounting factors that underpin the inherent risk would involve quality of accounting system (poor quality accounting is prone to more misstatements);
- Complexity of the transactions (huge engineering project may have more complexity in accounting than simple accounting of petty cash expenses);

- Susceptibility of assets (assets like, cash are more susceptible to theft than say, building);
- Pressure to complete unusual and complex projects (routine transactions may be accounted with ease by the staff than unusual transactions).

Identify legal Compliances

9.12 *In conducting regularity (financial) audits, a test should be made of compliance with applicable laws and regulations. The internal auditor should design audit steps and procedures to provide reasonable assurance of detecting errors, irregularities, and illegal acts that could have a direct and material effect on the financial statement amounts or the results of regularity audits. The internal auditor also should be aware of the possibility of illegal acts that could have an indirect and material effect on the financial statements or results of regularity audits.*

9.13 Organisation should adhere to all legal requirements. For example, Income Tax Act requires an organization to deduct tax at source while paying salaries to employees, suppliers, etc. The details of such deductions need to be furnished to the tax authorities periodically. Similarly Provident Fund Act requires deduction of employee's contribution from salary and payment to PF authorities. In case of textile, permissions under Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act 1981, Explosives license for FO and Diesel, Boiler License, Factory License etc is important for which internal auditor should acquaint himself with the applicable legal provisions as one of the audit objectives is to assure adherence to legal provisions.

9.14 Standard on Internal Audit (SIA) 17, "Consideration of Laws and Regulations in an Internal Audit" deals with the internal auditor's responsibility to consider laws and regulations when performing an internal audit. For the purposes of this SIA, "Non-compliance" means acts of omission or commission by the entity, either intentional or unintentional, which are contrary to the prevailing laws or regulations. Such acts include transactions entered into by, or in the name of, the entity, or on its behalf, by those charged with governance, management or employees. Non-compliance does not include personal misconduct (unrelated to the business activities of the entity) by those charged with governance, management or employees of the entity.

Perform Analytical Procedures

9.15 Analytical procedures are tests like, trend analysis, ratio analysis, changes in account balances, etc. done to study plausible relationships between two sets of data to judge the reasonableness. For example, while auditing finance department, internal auditor may compute ratio of interest paid by company over total outstanding loans taken by the company. This relationship may show that average interest paid is around 8%. However, if it showed that interest amount was abnormally high as a proportion of total loans, the internal auditor would flag this for detailed check during the audit. Significant deviation from expected results may prompt auditor to enquire and plan audit procedures accordingly.

9.16 It should be remembered that analytical procedures can establish only reasonableness, and are not in themselves evidence of any misstatement or error. Hence, they are generally used in planning and review phases of audit. As per Para 7 of SIA 6 “Analytical Procedure”, in determining the extent to which the analytical procedures should be used, the internal auditor should consider the following factors, including:

- The significance of the area being examined.
- The adequacy of the system of internal control.
- The availability and reliability of financial and non-financial information.
- The precision with which the results of analytical procedures can be predicted.
- The availability and comparability of information regarding the industry in which the organization operates.
- The extent to which other auditing procedures provide support for audit results.

After evaluating the aforementioned factors, the internal auditor should consider and use additional auditing procedures, as necessary, to achieve the audit objective.

9.17 The following are the some of the established analytical procedures applied by the auditors while conducting audit in the textile company:

- Comparison of Target V/s actual production and sales
- Comparison of Power Consumption
- Comparison of Labour cost per Kg/per meter per month

Working Papers

9.8 Standards on Internal Audit (SIA) 3 “Documentation” states that 'Internal auditors should collect, analyze, interpret and document information to support audit results.' Working papers are the documents either created by the auditor or gathered by him during the course of audit. Their preparation and maintenance is one of the key processes of audit. It provides evidence on how the processes of audit have been carried out, and hence is the source of evaluation of the quality of audit.

Good practices suggest that auditor should document all important matters that provide evidence that audit has been carried out in accordance with the generally accepted auditing standards. The working papers aid internal auditors in planning, performing, and supervising and reviewing audit work. Working papers are also a good source of evaluation of the internal auditor's work by external auditors and for peer review.

9.19 As per Para 4 of Standard of Internal Audit (SIA) 3, “Documentation” internal audit documentation:

- Aid in planning and performing the internal audit.
- Aid in supervision and review of the internal audit work.
- Provide evidence of the internal audit work performed to support the internal auditor's findings and opinion.
- Aid in third party reviews, where so done.
- Provide evidence of the fact that the internal audit was performed in accordance with the scope of work as mentioned in the engagement letter, SIAs and other relevant pronouncements issued by the Institute of Chartered Accountants of India.

9.20 It is advisable to standardize audit working papers wherever possible. Correspondence with auditee, points/ records of entry and exit conferences, questionnaires, check lists, etc. are a few that can be standardized. Well designed working papers facilitates internal auditor to delegate work and review whether the work is performed in accordance with the plan or not. It also provides a means to achieve efficiency, consistency and quality of audit. However, standardization of working papers in all audit areas is not possible as the audit procedures keep varying depending on size and complexity of audit.

Permanent and Temporary Files

9.21 Internal auditor should divide files into permanent and temporary files for better management of working papers. Permanent audit file shall contain documents that hold good over several audit periods whereas temporary audit files shall have documents that are specific to a particular audit. Thus, permanent audit file would consist of:

- Audit charter;
- Basic information of the department like, organization structure, schemes under implementation and its geographical locations;
- Roles and responsibilities of the key posts in the department; and
- Laws, codes, rules, orders, etc., as applicable to the department in the discharge of its functions and source of evaluation for the auditor.

9.21 Internal auditor should maintain three temporary audit files for each audit:

(i) Section A: Final report

- Final and draft audit reports;
- Audit Plan (its various versions);
- Status of the follow-up of earlier observations;
- Audit Programme; and
- Reviews of the work done by assistants

(ii) Section B: Correspondence with Auditee

- Entry conference letter;
- Minutes of meetings of entry / exit conferences and other meetings; and
- communication with management and other external entities during the course of audit;

(iii) Section C: Preliminary Survey

- Rules, regulations, laws applicable to auditee;
- Financial and other information collected from/ about the department; and
- Organization charts, flow charts of processes, operating policies/ procedures.

Technical Guide on Internal Audit of Textile Industry

The internal auditor should develop a consistent and rational system of numbering permanent and temporary files. Temporary files should be maintained in ring folders with separator sheets that would set apart audit plan, sampling plan, each audit area (establishment, contingent charges, procurement, etc.), audit observations, replies from auditee, audit findings and finally the audit report. The internal audit paragraphs should be cross referenced to audit observations, and the audit evidence.

Chapter 10

Conducting Internal Audit

10.1 Internal audit commences with an **entry conference**, which is a meeting between the key personnel of the auditee unit (including the head of the office) and the internal auditors to create a constructive environment for the audit. The scope and flow of activities of the audit are communicated so that auditee department makes necessary arrangements for effective conduct of audit. The plan and the methodology of the audit may be discussed for better communication and support of the auditee. However, audits with an element of surprise do not have any entry conferences. During the opening conference, internal auditors should:

- Introduce the team members and explain the scope and methodology of the audit;
- Describe the process of raising the audit queries and their finalization including the time line for replies to be received from auditee;
- Request for the support (production of records, arrangements for seating the audit team, prompt response to audit queries, etc.) that is needed from the auditee;
- Identify the information/ records that would be needed and the contact points in the auditee's organization; and
- Elicit the concerns, questions and suggestions of the auditee (particularly, the head of office).

10.2 The entry conference sets the tone for effective audit by establishing effective communication lines with the auditee organization. It also helps the internal auditor to validate the information he had gathered during the planning stage and assess the attitude and perception of the key personnel towards controls.

Immediately after the entry conference, the internal auditor should submit a list of records that they would like the auditee to submit. Simultaneously, the internal auditor should collect additional information that would enhance their understanding of the organization.

Identification of Audit Areas

10.3 Internal auditor should develop individual worksheet for evaluation of control activities and procedures in internal controls. Internal auditor should list down all components of an audit area. For example, in audit of commercial taxes department, cash receipt could be on account of the following:

- Collection of taxes
- Collection of penalties
- Sale of an asset
- Recovery of advance given to an employee

Internal auditor should then identify assertions in each audit area. For example, in case of collection of tax, assertions include occurrence (no collection is accounted without actually being received), completeness (all tax collections have been accounted for and no transaction is left out unaccounted), and accuracy/valuation (amount is credited with actual value of money received – neither understated nor overstated and accounted under correct head of account) and compliance with law.

For each of the assertions, internal auditor should identify possible misstatement. These can be identified from the controls incorporated by the organization (through various codes and manuals). The internal auditor would then comment on the effectiveness of each of the controls.

10.4 Preparation of control evaluation sheet for individual area of audit may not be required in case of repetitive audit assignments. Standardized questionnaire may be used subject to periodical review of changes in the processes or legal requirements. However, disadvantage with questionnaire is loss of creativity. In questionnaire based audit, auditors tend to lose skills of identification of controls, constructing relation between assertions and audit objectives. In long run loss of importance of evidence, documentation etc. leads to fall in standards of audit. It is, thus, a good practice to identify assertions and controls, and also verify their effectiveness.

Review of Audit Plan

10.5 After entry conference, collection of additional information regarding the auditee and internal control evaluation, the internal auditors can review the audit plan and was prepared prior to commencement of the audit.

Monitoring Quality of Audit Work

10.6 The work of the audit staff at each level and audit phase should be properly supervised during the audit, and a senior member of the audit staff should review documented work. Monitoring quality of audit is an important task of team leader. On completing each task, audit staff shall submit individual work sheet for manager's review. Key responsibilities of audit manager include:

- Coordinating staff assignments – with specific reference to capabilities
- Monitoring progress
- Level of understanding of the audit staff
- Review of documentation
- Review of evidence gathered (i.e., sufficiency, objectivity, relevance and appropriateness)
- Resolving issues
- Review of preliminary risk assessment and change in audit program and procedures needed in light of audit finding.

10.7 In each audit area, the internal audit would first check compliance with the established internal control. If the compliance is poor, the auditor should conduct a larger substantive testing. To illustrate, it is expected that every item of store is issued against a valid indent (issue voucher). Compliance testing would involve checking a sample of issues to assess the extent of compliance with the above requirement, whereas substantive testing goes beyond compliance and sees whether the outcomes are as they should be i.e., whether actual physical balance tally with bin card or stores ledger in a sample of items. If the compliance is poor, the internal auditor would be required to conduct higher substantive testing to rule out errors or mischief.

10.8 Internal auditors would also decide at each stage how they would select the transactions for audit. As 100 percent of transactions cannot be verified, a sample of transactions needs to be selected. As far as possible, internal auditors should try to apply a scientific sampling technique. The internal audit should also include surprise check on some sections like, cash and stores.

Technical Guide on Internal Audit of Textile Industry

10.9 While the items that need to be reviewed during audit of a government department may vary slightly from organization to organization due to difference in the nature of activities and functioning, some items that are common to all departments are:

- Custody of cash
- Fixed assets and stores
- Cash Receipts
- Cash disbursements
- Establishment expenditure
- Pay and allowances
- Claims
- Pension
- Contingent bills
- Grants-in-aid
- Procurement and contracts
- Budgetary controls
- Assessment of computerized systems
- Assessment of risk of fraud.

Part IV
Risk Assessment and Internal Audit
Function in Textile Industry

Chapter 11

Enterprise Risk Management and Internal Audit

11.1 The business world is becoming increasingly complex due to new, evolving, and emerging risks. Organizations are giving risk management more consideration, but implementing an effective risk management program takes time and discipline. Internal auditors are finding they can play important roles in risk management. Specifically, Internal auditor have opportunities to:

- (i) Educate and train audit committees and management on risk and risk management concepts.
- (ii) Seek opportunities to perform more risk management consulting services in support of whoever is managing the risk management program, and formally communicate the results of those consulting services to the audit committee and management.
- (iii) Evaluate strategic risks; i.e., whether management has
 - Comprehensively identified key strategic risks,
 - Developed prudent risk management techniques to address those risks, and
 - Established sufficient monitoring of strategic risk “signposts” to identify risk occurrences in time to take the appropriate actions.
- (iv) Devote the time, resources, and leadership to developing internal audit teams so that they have the right level of skills and experience related to risk management.
- (v) Use third-party and other internal resources to supplement the risk management skills of the internal audit activity.

What is ERM

11.2 Value is maximized when management sets strategy and objectives to strike an optimal balance between growth and return goals and related

Technical Guide on Internal Audit of Textile Industry

risks, and efficiently and effectively deploys resources in pursuit of the entity's objectives.

Enterprise risk management encompasses:

- (i) *Aligning risk appetite and strategy* – Management considers the entity's risk appetite in evaluating strategic alternatives, setting related objectives, and developing mechanisms to manage related risks.
- (ii) *Enhancing risk response decisions* – Enterprise risk management provides the rigor to identify and select among alternative risk responses – risk avoidance, reduction, sharing, and acceptance.
- (iii) *Reducing operational surprises and losses* – Entities gain enhanced capability to identify potential events and establish responses, reducing surprises and associated costs or losses.
- (iv) *Identifying and managing multiple and cross-enterprise risks* – Every enterprise faces a myriad of risks affecting different parts of the organization, and enterprise risk management facilitates effective response to the interrelated impacts, and integrated responses to multiple risks.
- (v) *Seizing opportunities* – By considering a full range of potential events, management is positioned to identify and proactively realize opportunities.
- (vi) *Improving deployment of capital* – Obtaining robust risk information allows management to effectively assess overall capital needs and enhance capital allocation.

These capabilities inherent in enterprise risk management help management achieve the entity's performance and profitability targets and prevent loss of resources. Enterprise risk management helps ensure effective reporting and compliance with laws and regulations, and helps avoid damage to the entity's reputation and associated consequences. In sum, enterprise risk management helps an entity get to where it wants to go and avoid pitfalls and surprises along the way.

Components of Enterprise Risk Management

11.3 Enterprise risk management consists of eight interrelated components. These are derived from the way management runs an

Enterprise Risk Management and Internal Audit

enterprise and are integrated with the management process. These components are:

- (i) *Internal Environment* – The internal environment encompasses the tone of an organization, and sets the basis for how risk is viewed and addressed by an entity’s people, including risk management philosophy and risk appetite, integrity and ethical values, and the environment in which they operate.
- (ii) *Objective Setting* – Objectives must exist before management can identify potential events affecting their achievement. Enterprise risk management ensures that management has in place a process to set objectives and that the chosen objectives support and align with the entity’s mission and are consistent with its risk appetite.
- (iii) *Event Identification* – Internal and external events affecting achievement of an entity’s objectives must be identified, distinguishing between risks and opportunities. Opportunities are channeled back to management’s strategy or objective-setting processes.
- (iv) *Risk Assessment* – Risks are analyzed, considering likelihood and impact, as a basis for determining how they should be managed. Risks are assessed on an inherent and a residual basis.
- (v) *Risk Response* – Management selects risk responses – avoiding, accepting, reducing, or sharing risk – developing a set of actions to align risks with the entity’s risk tolerances and risk appetite.
- (vi) *Control Activities* – Policies and procedures are established and implemented to help ensure the risk responses are effectively carried out.
- (vii) *Information and Communication* – Relevant information is identified, captured, and communicated in a form and timeframe that enable people to carry out their responsibilities. Effective communication also occurs in a broader sense, flowing down, across, and up the entity.
- (viii) *Monitoring* – The entirety of enterprise risk management is monitored and modifications made as necessary. Monitoring is accomplished through ongoing management activities, separate evaluations, or both.

11.4 Enterprise risk management is not strictly a serial process, where one component affects only the next. It is a multidirectional, iterative process in which almost any component can and does influence another.

Internal control is an integral part of enterprise risk management. This enterprise risk management framework encompasses internal control, forming a more robust conceptualization and tool for management.

Internal Auditing's Role With Strategic Risks

11.5 Standard on Internal Audit (SIA) 13, "*Enterprise Risk Management*" specifies that the role of the internal auditor in relation to enterprise risk management is to provide assurance to management on the effectiveness of risk management. Due consideration should be given to ensure that the internal auditor protects his independence and objectivity of the assurance provided. The role of the internal auditor is to ascertain that risks are appropriately defined and managed. The scope of the internal auditor's work in assessing the effectiveness of the enterprise risk management would, normally, include:

- assessing the risk maturity level both at the entity level as well as the auditable unit level;
- assessing the adequacy of and compliance with the risk management policy and framework and for the risks covered by the internal audit plan;
- Assessing the efficiency and effectiveness of the risk response; and
- Assessing whether the score of the residual risk is within the risk appetite.

11.6 An internal auditor can help the to organization to adopt a more strategic risk management focus. It includes:

- Ensuring that the risk assessment identifies those risks presenting the most significant risks to shareholder value.
- Facilitating risk management discussions across the organization.
- Viewing risk management as a core competency and ensuring that auditors receive appropriate training on risk and risk management practices.

Enterprise Risk Management and Internal Audit

- Reviewing business plans to determine whether they assess the risks embedded in their strategies and have risk monitoring and trigger points.
- Reviewing the annual report to determine whether risks are addressed appropriately.
- Continuously monitoring and assessing stakeholder expectations relative to risk and risk management, as well as assisting in the education of these stakeholders.
- Building a stronger relationship with other risk and control business functions to drive an enhanced process to identify emerging risks.
- Identifying and sharing best practices in risk management.

Chapter 12

Identification of Major Risks in Textile Industry

12.1 In the following chapter, a brief description of risks associated with textile industry are given for general guidance. It should be remembered that internal audit is always dynamic as there are new instructions, processes, procedures, and so on. Internal auditors should not take them as definitive and they should supplement them as required.

Global Risk

12.2 In India the Port infrastructure is at present highly insufficient. Also shipping a container of garments from India to the US is costlier in India compared to other Asian Countries. Non-availability of direct sailing vessels also increases transit time. Further, delays and inefficiencies in Indian Ports compared to other Asian Countries add huge disadvantage to Indian exports. China enjoys 13 % cost advantage in shipping garments from Shanghai to US East Coast and an overall advantage of 37 %. The export from aircrafts is still quite expensive but saves a lot of time.

Two critical factors that cause problems to Indian textile industry are

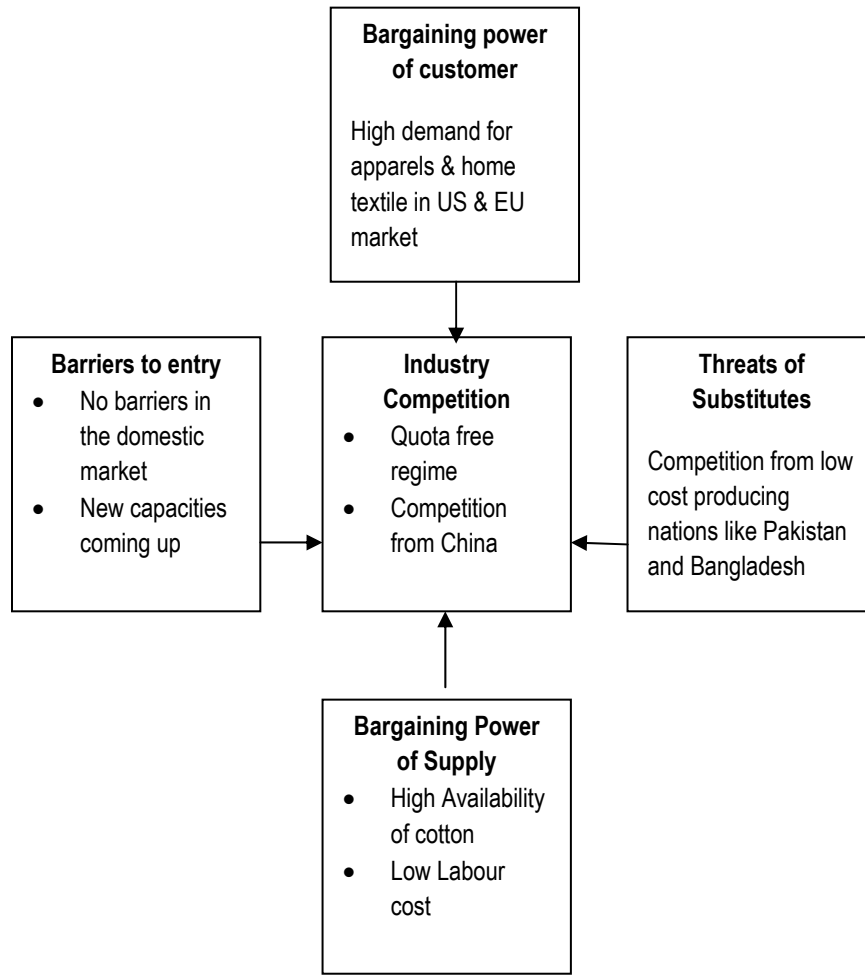
- India has a very old and fragmented textile industrial infrastructure.
- India a totally inadequate and small service infrastructure for textiles.

To overcome this infrastructure problem it is advisable to —

- Increase the size of the industrial infrastructure, to capture the efficiencies of the economies of scale, and it must cluster the textile production.
- Create the infrastructure to service the needs of European textile markets.

12.3 Let us analyze the Indian textile industry through the **Porter's five-factor model**.

Identification of Major Risks in Textile Industry



Bargaining Power of Customers (Demand Scenario)

12.4 With the dismantling of quotas, global textile trade is expected to grow. Although China is likely to become the 'supplier of choice', other low cost producers like, India would also benefit as the overseas importers would try to mitigate their risk of sourcing from only one country. The two-fold increase in global textile trade is also likely to drive India's exports growth. India, in particular, is likely to benefit from the rising demand in the home textiles and apparels segment, wherein it has competitive edge against its neighbor. Nonetheless, a rapid slowdown in the denim cycle poses risks to fabric players.

Bargaining Power of Suppliers (supply scenario)

12.5 India is the second largest producer of cotton in the world after China and has the largest area under cultivation. Cotton, a key raw material in the textile and garment industry, India has an abundant supply of locally grown long staple cotton, which lends it a cost advantage in the home textile and apparels segments. Other countries, like China and Pakistan, have relatively lower supply of locally grown long staple cotton. Low cotton prices due to a bumper cotton crop would enable India to lower its production cost and sustain pricing pressure.

Threat of New Entrants

12.6 In the quota free regime, capacity expansion is the name of the game in the textile sector. Resultantly, smaller players who cannot venture into the global markets are flooding the domestic markets with excess supply, thus weakening the pricing scenario.

Threat of Substitutes

12.7 Low cost producing countries like, Pakistan and Bangladesh (labour cost 50% cheaper) are also posing a threat to India's exports demand.

Competitive Rivalry

12.8 India's logistic disadvantage due to its geographical location can give it a major thumbs-down in global trade. The country is distant from major markets as compared to its global competitors like, Mexico, Turkey and China, which are located in relatively close vicinity to major global markets of US, Europe and Japan. As a result, high cost of shipments and longer lead-time coupled with lack of infrastructure facility may prove to be major hindrances.

Political Risk

12.9 Political risk may be defined as the probability that a political event will impact adversely on a firm's profit. The risk that a new law or a change in an existing law could have a significant impact on an investment. Whatever laws the government passes today may not be extinct tomorrow. Political risk represents the financial risk that a country's government will suddenly change its policies.

Identification of Major Risks in Textile Industry

12.10 Political risk covers:

- Restriction on remittances in the buyer's country or any government action which may block or delay payment in rupees to the exporter.
- War between the buyer's country and India.
- War, revolution or civil commotion in the buyer's country.
- Imposition or new import licensing restrictions in the buyer's country or cancellation of a valid import license.
- Additional handling, transport charges due to interruption or diversion of voyage, which cannot be recovered from the buyer.
- Any other kind of loss occurring outside India and not within the control of the export or the buyer.

12.11 It is important to note that political risk is always present since the firm exists only at the pleasure of the sovereign nation. Political structure and political events impact significantly on executive decisions. wars; riots, expropriation of property; assassinations and revolutions are obvious examples of events that can change the business environment radically. Expropriation probably is the extreme form of political risk, when a nation expropriation, it formally takes over the property of the firm, with or without payment. Less obvious, but very important are changes in government policy affecting the conditions of market entry and continued operations.

12.12 The export marketer needs to evaluate both the probability of a political event that may change the environment, and also the probability that the event will impact on the exporting firm. Following are some examples:

- The long-term capital gains tax has been changed 5 times in the last 20 years with the most recent cut at 20%.
- There is no insurance cover available for war risk in advance. It is therefore, necessary that government should take up such issues with the buyer country at the government level so that the supplier is not put to losses. Many cases have happened in case of war between Iran and Iraq.
- Anti-dumping duty in case of Peru.
- The supply chain in India is highly fragmented mainly due to government policies and lack of coordination between industry and trade bodies. Existence of large number of intermediaries adds to the

cost but also lengthen the lead times. The countries who have significantly consolidated their supply chain are globally competitive.

12.13 The main challenge is shorter lead-time, Several of our competing countries have substantially shorter transit times to Europe and USA, which are the main markets. Non-availability of direct sailing vessels and excessive government holidays (currently about 160 days a year including Saturday and Sunday's) also lead to a lot higher transit times from Indian ports. Most of Indian Garment exports being fashion garments, have very limited shelf life, hence it is important to device ways to deliver it to our customers in the quickest possible time.

So the garment export companies recommend that all apparel shipments be given the status of perishable items, so that it can be custom cleared on top priority, 24 hours a day and 365 days a year, this will put export shipments on sailing vessels or flying aircrafts, without any waste of time, to match or shorten the lead-times to various foreign destinations.

Operational Risk

12.14 Operational risk is defined as the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events. Although the risks apply to any organization in business, it is of particular relevance to the banking regime where regulators are responsible for establishing safeguards to protect against systemic failure of the banking system and the economy. It is associated with systems, processes, people and covers such as, succession planning, human resources, information technology, control systems and compliance with regulations.

12.15 In day to day business affairs, besides transaction related like credit risk & market risks, another important category are operational risk. This risk signifies that for an organization to continue its operations, some external events like natural disasters, political and military turmoil, not directly connected with the organization may affect its well being.

Operational risk may be defined into two angles as follows:

- “Operational risks are all those risks which cannot be classes as credit or market risks.”
- “Operational risk is an expression of the danger of unexpected direct or indirect losses resulting from inadequate or failed internal process, people and systems or from external events”.

Identification of Major Risks in Textile Industry

12.16 This risk covers:

- External fraud- theft of information, hacking damage, third-party theft and forgery Business disruption & systems failures- utility disruptions, software failures, hardware failures.
- Execution, delivery, & process management – data entry errors, accounting errors, failed mandatory reporting, and negligent loss of client assets.
- A 1999 survey of the fortune by Mercer management consulting in Boston reveals that operational risk accounted for a loss of 31% of the enterprises.

12.17 Some example of operational risks are as follows:

- The companies' cash transactions are directly feed in the system, if there is fault in feeding the information then the management is not able to calculate the cash in hand and other cash dealings so they are in critical situation to take decisions regarding cash flows.
- The companies are getting the conformation from the buyer regarding the design, colour are done through the electronic mail transfer if there is a network problem in net then the conformation will get delay so the production also get delayed.
- The money transfer from buyer are done through banks and all the banking system are now computerized so the network problem in banks or system failure will lead to delay in payment to the parties and purchase of raw materials which lead to production problem.

Employee/ Worker Health Risk

12.18 Health and safety issues are a constant problem in the textile industry. It is very necessary for the management to develop the Labour welfare condition, which will motivate the employees to do more and will help to achieve the satisfaction. This risk covers

- Illnesses
- Infections
- Injuries

12.19 The work environment in a majority of the units is unsafe and unhealthy. The people working in such poor or standard environmental prone to occupational diseases. These illnesses are due to– excessively high

Technical Guide on Internal Audit of Textile Industry

temperature or very low temperatures; dust; inadequate ventilation; inadequate lighting; excessive noise; lack of fire-fighting equipment; blocked exits; bad sanitation; unhygienic canteens; and lack of drinking water. The types of illnesses, which may affect the employees in company, are fevers, headaches, eyesight problems, skin allergies, kidney infections, backache, stomach cramps, breathing difficulties and constant exhaustion.

12.20 It is not just workers' physical health that is undermined by these conditions but also their mental and emotional health as a result of excessive hours, unsustainable work intensity due to high quotas as well as verbal and psychological harassment from management. Employees are the people who work in the established infrastructure. When they are comfortable with the furniture and machinery with which they are working, the result will be perfect. Uncomfortable furniture leads to trouble. The physical effects of the employee's conditions are worsened by sitting bent over a sewing machine on stools and broken chairs or using a heavy iron all day. If the employees are forced in their work place to complete their work, they might have to meet with accidents. Forced position is also a critical factor in the work environment.

12.21 Implicit overtime is when workers are not directly asked to perform overtime but know that they are not free to leave at the end of the day. This can be as a result of management's attitude or because quotas are so high that it is impossible to finish them during the working day, so workers are obliged to work overtime. Even though the labor laws are not strict the social welfare of the workers are being looked after by the companies. Also the buyers insist for social audits to be conducted by the third audit, if they found any default then the buyers company cancel the order which they gave.

12.22 Benefits of Employee risk management are as follows:

- Labour turnover and absenteeism are reduced to the minimum.
- Minimizing industrial disputes and peace.
- Creating permanent and settled labour force.
- Improvement in the efficiency of workers.
- Reducing damages to equipment, machinery and workers.
- Medical inspection is provided to the employees.

Worker's efficiency is considerably enhanced when they feel safety in work environment. Workers begin to feel interested in their work when they find

Identification of Major Risks in Textile Industry

that they are being well looked after by their employers. Thus, their morale is raised and industrial relations improve.

Purchasing Power Risk

12.23 The loss of purchasing power due to the effects of inflation. When inflation is present, the currency loses its value due to the rising price level in the economy. The higher the inflation rate, the faster the money loses its value. This risk is also known as inflation risk.

For example, the cotton textile industry is dependent in the vagaries of nature. Availability of the required quality and quantity of cotton is critical for business and any damage or fall in crop production can adversely impact the price of cotton, which can impact business performance and profitability. Last Year in June, 2011 cotton prices are suddenly downfall and companies who were stocking the cotton equal to six month consumption have significant financial impact in view of cost of finished product and sale price.

Technology Risk

12.24 Many institutions such as banks, investment management firms, insurance companies, brokerage firms, technology is a critical component of any risk management initiates for institutions which rely heavily on technology, there is always a risk technology becoming the focus on risk management. Technology can response corporate cultures and facilitates innovative procedures.

12.25 The Indian textile sector weakness is their industrial technologies and process because of this reason for the next five years china will be the strongest manufacturing center. China has built up a very efficient & scalable system for sourcing fabric and manufacturing garments using recent technology.

In order to survive in the highly-competitive market, India's cotton-centric textile manufacturers need to focus on upgrading their machinery besides creating new facilities and additional capacities. They require better machinery. Though domestic machines are competitive in terms of quality and price, the delivery schedule, which even extends to two to three years, is a matter of concern. Chinese machines require a delivery time of only four to six months; the Indian textile machinery manufacturers are not able to bridge the demand-supply gap.

Technical Guide on Internal Audit of Textile Industry

12.26 The government of India has to extend the technology up gradation fund scheme in order to support industry. The Indian textile industry has to invest heavily in systems and technology to reduce costs and lead times, also development of collaborative links between customers, vendors and partners to make the supply chain more efficient.

For example, the specialty work of companies garments are hand embroidery, sequence works, crochet works etc, now china is producing garments in different varieties using various technologies this lead to reduce the export of garments from India.

Counter Party Risk

12.27 The risk that the other party in an agreement will default is known as the counter party risk. In an option contract, the risk to the option buyer that the writer will not buy and sell the underlying as agreed. In general, country party risk can be reduced by having an organization with extremely good credit act as an intermediary between the two parties.

This risk covers following:

- Insolvency of the buyer.
- Buyer's protracted default to pay for goods accepted by him
- Buyer's failure to accept goods, subject to certain conditions.
- Buyer's failure to obtain necessary import or exchange authorization from authorities in his country.

For example, the companies are allowing 30 days credit to the buyers and because of delay in payment by buyer the Indian companies are not able to continue their further production for next order and not able to settle their credit.

Company Risk

12.28 Company risk is the risk that the individual company in which you invest will fail to perform as expected. This risk also includes the uncertainty associated with business firms operating environment and reflected in the variability of earnings before interest and taxes.

Due to the lack of planning, coordination and because of no systematic process many loss arise in the companies. The competition among the Indian companies are more and the new companies are not in a position to withstand these competitions. Some examples are as follows:

Identification of Major Risks in Textile Industry

- The growing companies are planned to open their branch in some other place if they didn't plan correctly and invest their money, loss will arise and they may fail in their business.
- Due to lack of systematic process of where to give for designing the garment i.e. finding the right person for the designing purpose they are delay in shipment.
- There are so many competitors for the company & so because of that there arise a problem for fixing the price for Yarn/ Fabric/ garments in order to capture the market.

Hazard Risk

It is related to natural hazards, accidents and fire that can be insured.

This risk covers

- Natural disaster
- Air pollution
- Water pollution
- Soil pollution
- Land pollution. etc.

Following are some examples of haryard risk:

- The shipments are done through the waterways or airways. So the natural disaster such as tsunami, cyclones may affect.
- The ship may starve, sunk or burnt.
- There are about 750 dyeing and bleaching units in Tirupur causing ground water pollution and effluents generated by these units are discharged into Noyyal River. The units have still not found suitable technology for treating effluents, including dissolving of salts. Discharging into oceans is not economically affordable.

12.30 The usual procedure, therefore, is to have an "all risk policy". It is not worthwhile for an exporter to try to save on premium payments and hence a less comprehensive policy because a few banks, negotiating letters of credit, accept such a policy. This risk is unavoidable and it cannot be transferred but this risk can be mitigated or accepted. Mitigation is a control approach that attempts to reduce the impact of an exploited vulnerability. Acceptance of

risk is the choice to do nothing to protect an information asset and to accept the outcome from any resulting exploitation.

Currency Risk

12.31 “Currency risk arises due to uncertainty in exchange rates”. Currency risk is a form of risk that arises from the change in price of one currency against another. Whenever investors or companies have assets or business operations across national borders, they face currency risk if their positions are not hedged. The risk that a business operations or an investments value will be affected by changes in exchange rates. These risks usually affect business, individual investors who make international investors. This is also called as exchange rate risks. The fluctuations in the exchange rate are caused basically by the supply of and the demand for the currencies being exchanged.

Effect of Exchange Fluctuations

12.32 When quoting prices in terms of the foreign currency, the exporter knows how many rupees are to be received at the current rate of exchange. However, when the customer pays in sterling pounds, pesos, US dollars, Japanese yen or some other acceptable currency, the amount received in terms of rupees will depend upon the rate of exchange when the currency is converted. When the price is quoted in the foreign currency, the exporter accepts the risk of exchange fluctuations. Unless steps are taken to protect expected profits, a decline in exchange rates may reduce profits or even convert them into a loss.

12.33 The most completed safeguard against unfavorable exchange fluctuations is when payment is to be made in their domestic currency, but even then they have an interest in exchange fluctuations. Fluctuations following the closing of the sales contract may be so unfavorable that the foreign customer may refuse to accept the delivery, or unwilling to meet the financial obligations. Thus the exchange rate obligations rate fluctuations may increase the exporter’s credit and commercial risks

Any government measures affecting the volume of exporters and importers influence exchange rates. A country may restrict the importation of certain goods in conformance with its economic development programmed in order to converse foreign exchange for projects with a higher priority, furthermore protective tariff rates, import quota, license requirements, export subsidies,

Identification of Major Risks in Textile Industry

governmental price control and trade agreements all imply a certain amount of exchange control.

12.34 The exchange risk associated with a foreign denominated instrument is a key element in foreign investment. This risk flows from differential monetary policy and growth in real productivity, which results in differential inflation rates. The hurdle in the path of growing textile exports from India is Artificial pricing of the Chinese Currency: which is giving undue advantage to the Chinese industry in the Global Market. Hardening of the Indian Rupee against US\$ has also seriously affected and eroded the bottom-lines of textile and garment exporting companies. If government offers income- tax exemption to the textile industry in particular for the next 5 years, so that, the export companies are more equipped to face undue competition from China and other competing nations.

Price Risk

12.35 Risk resulting from the possibility that the price of security or physical commodity may decline. Price risk is defined as “The risk that the value of a security or portfolio of securities will decline in the future”.

The Indian exporter faced competition internationally and also from within the country. This has lead to intense pressure on the profit margin for Indian exporters and buyers were squeezing the prices every year. A product pricing strategy by which a firm charges the highest initial price that customer will pay. As the demand of the first customers is satisfied, the firm lowers the price to attract another, more price-sensitive segment. Therefore, the skimming strategy gets its name from skimming successive layers of cream or customer segments, as prices are lowered over time. Government intervention to set an artificially high price through the use of a price floor designed to aid producers. It's the risk that you will lose money due to a fall in the market price of a security that the company own.

Financial Risk

12.36 It is the uncertainty associated with how firms finance its business. Finance for the exporters is needed at following four stages:

- 1st an exporter may need finance to develop an exportable product.
- 2nd finance is needed to upgrade export production through acquisition of new equipments, new technology.

Technical Guide on Internal Audit of Textile Industry

- 3rd pre-shipment is needed to acquire inputs that get converted into an export product.
- 4th finance is needed for systematic marketing activities.

This risk is divided into 3 types

- Credit risk
- Liquidity risk
- Settlement risk.

12.37 **Credit risk** refers to the company or governments inability to repay principal plus interest to the bondholder in a timely manner. This credit risk is also known as default risk. Credit risk is the risk that a company or individual will be unable to pay the contractual interest or principal on its debt obligations. In simple terms the credit risk is termed as the risk of non-payment. The main way to reducing credit risk is by monitoring the behavior of clients who wish apply for credit in the business. These clients may be businesses or individuals

12.38 Credit risk is the risk that a counterparty will not meet an obligation when due, and will never be able to meet that obligation for full value. The bankruptcy of counterparty is often associated with such difficulties, but there may be other causes as well. In a payment netting system, losses from defaults due to the bankruptcy of counterparties can be measured as the principal amount due less recovery from defaulting parties. Forgone interest can also be an important loss. In an obligations netting system, losses from the default of counterparty would typically be calculated from the replacement costs of one or more contracts that are not settled. If, however, one party to a contract defaults after having received settlement payments from another party, but before making required counter-payments (in the same or another currency), the loss would again be for a principle amount (less recoveries).

For example, the companies are now starting their units by applying loan in banks and other financial institutions but if there arise loss in company they are in a position of non-payment of interest.

Liquidity Risk

12.39 The risk that arises from the difficulty of selling assets an investment may sometimes need to be sold quickly. Unfortunately, an insufficient secondary market may prevent the liquidation or limit the funds that can be

Identification of Major Risks in Textile Industry

generated from the asset. Liquidity risk is the risk that clearing, or settlement, payments will not be made when due, even though one or more counterparties do have sufficient assets and net worth ultimately to make them.

This risk covers following:

- A temporary inability to convert assets to cash
- Operational difficulties of various kinds
- The inability of correspondents to perform settlement functions.

Settlement Risk

12.40 The risk that a party will default on clearing obligations to one or more counterparties is sometimes referred to as settlement risk. This risk may contain elements of either credit risk or liquidity risk, or both. The usage of the term "settlement risk" varies considerably, and may also depend on the situation being analyzed.

Climate Change Risk

12.41 One more big risk in the textile and apparel industry is the shipping dates and season change risk. The entire industry works on the basis of the season. For example, if there is a spring 2010 collection, the finished product would need to reach the store before spring, the entire show room space is defined in foreign countries and the calculation is done back-wards to reach at what dates the shipping would happen, how many days for logistics, how many days for manufacture, for Qc for sample etc and then the final date is frozen. Even if there is a small change in the schedule the entire thing goes into a rough space and finally air shipment would need to be done, while the buyer would never pay for air shipment. This risk has to be clearly mentioned and most manufacturers loose money because of this risk.

Chapter 13

Records Maintenance in Textile Industry

Introduction

13.1 Cost ascertainment involves collection, classification, and recording the costing data. This data is used for making plans, taking decisions and controlling costs. Cost records are statutorily required to be maintained in a cotton textile company as per the Cost Accounting Records (Cotton Textile) Rules, 1977. In this chapter some issues relating to cost ascertainment in a cotton textile mill have been discussed keeping in view the requirements of the Rules.

Direct Material Cost

13.2 Direct material are those materials which can be identified and charged directly to the cost of the final product. In textile industry, fibre is the basic raw material from which yarn and fabric are manufactured. For weaving mills, yarn is the direct material and grey cloth is the direct material for processors. About one half of the total cost in a cotton textile mill can be attributed to direct material.

13.3 In order to spin yarn of different counts, different qualities of cotton are mixed together. The mills usually maintain a book called “**Mixing Book**” in which all mixings issued every day are recorded. Mixing is a highly specialized job and needs considerable technical skill. The purpose is to have the mixing as cheap as possible for a given count of yarn without sacrificing the strength of yarn and its other properties. At times the mixings for coarser varieties of cloth include some soft wastes which may either be purchased or may arise out of the internal processes. The total cost of cotton depends on various factors *viz.*, proportions of different grades of cotton used in mixing prices of different grades of cotton and quantity and sale value of waste.

Requirements of Rules Regarding Direct Material

13.4 The Cost Accounting Records (Cotton Textiles) Rules, 1977, require that proper records showing all the receipts, issues and balances, both in quantities and cost, of cotton, manmade fibres and filament yarn from man made fibres used in the manufacture of cotton textiles should be maintained. The Rules also provide that where cotton and/or manmade fibres are

obtained from different sources including imports, separate records should be maintained for imported and indigenous supplies, variety wise. The names and specifications used for different varieties of cotton/manmade fibre/filament yarn from manmade fibre should conform to the nomenclature and specifications as prescribed by the Textile Commissioner. The records should indicate the actual quantity and value of each variety of cotton or other raw materials used in each mixing prepared for manufacturing different counts of yarn.

Waste

13.5 The processing of raw materials in a cotton textile mill results in the production of different types of wastes. Wastes arise from almost every process. Wastes can be broadly grouped into following two categories:

(i) Soft waste

Soft wastes are those which are in the form of cotton fibre and hard wastes are those which are in the form of spun yarn. Soft waste and hard waste can further be grouped under three heads *viz.*,

- usable in the same mixing
- usable in the lower grade mixing than that from which it emerges, and
- unusable waste which is usually sold through auction.

(ii) Hard waste

The sources of hard wastes are remnants in the bobbins, off cuts of sized or unsized yarn on beams, etc. It should be ensured that the percentage of wastes to input is reasonable keeping in view the various factors which affect such waste. The percentage of waste should not be materially different from the percentage in the past and percentage of cotton tested in the mills unless special circumstances can reasonably be attributed to such variance.

Requirements of the Rules Regarding Waste

13.6 The following are rules regarding waste:

- (i) **Soft Waste:** Proper records should be maintained to show the quantity and realizable value of usable soft waste collected from each mixing in each cost centre of the spinning department, quantities reused in each mixing used in the waste plant, if there be any, sold out with the sales realization thereof and the balance lying in stock.

The quantity of this waste collected at regular intervals, say quarterly, during the relevant period should be reconciled with such waste for which due credit is afforded to the respective production on technical basis/past performance/trial run during the said period.

- (ii) **Hard Waste:** Proper records should be maintained to show the quantity and realizable value of hard waste collected, typewise, such as, superfine, fine, medium coarse, etc. separately from spinning department and pre-weaving department, re-used in the waste plant, if any, sold out with the sales realization thereof and the balance lying in stock. The quantity of this waste collected to regular intervals, say quarterly, during the relevant period should be reconciled with such waste for which due credit is afforded to the respective production on technical basis/past performance/trial run during the said period. Any waste cotton purchased for use in the manufacture of yarn should also be recorded properly regarding receipts, issues and balances both in quantity and value.
- (iii) **Yarn:** In case the company is purchasing yarn from outside sources for use in the manufacture of cloth, proper records should be maintained showing all the receipts, issues and balances, both in quantity and value. This record should be kept count-wise, separately for carded and combed varieties.
- (iv) **Grey Cloth:** In case the company purchases cloth in grey stage for processing, proper records should be maintained showing the quantity and cost of such purchases, issues to processing and balance in stock, fabric-wise. Where the company receives cloth in grey stage for processing only, proper records should be maintained showing the quantity of such receipts, issues to processing and balance in stock.

Sizing Materials

13.7 The sizing process consists of strengthening the yarn with a mixture so that it can stand the rigours of weaving. Normally starch maize, tallow gum, etc are used in the sizing solution.

Other Direct Materials

13.8 In addition to cotton there are some other direct materials used by the cotton textile industry. These are: dyes and chemicals, bleaching, finishing, mercerizing, printing, etc. As some of the materials may be

consumed in more than one process, therefore, for accounting purposes as well as from cost control point of view, it may be necessary to departmentalize the costs of such materials. For each product/ class of products a formula (called 'Recipes') is worked out by the chemist. This formula shows the proportions of those materials to be used for each product/ class of products.

Requirements of Rules regarding other Direct Materials

13.9 The Cost Accounting Records (Cotton Textiles) Rules, 1977, require that proper records should be maintained for sizing materials, dyes, and chemicals and other process materials/ chemicals. These records should show the receipts, issues, and balances, both in quantities and costs of each item used. The cost should include all direct charges upto the mills, wherever specifically incurred. The issues should be properly identified with the cost centres, departments and products manufactured. In case the issues made against the receipts prepared in advance, a periodic reconciliation between the actual consumption as per the receipts should be made both in quantity and value.

13.10 Separate records should be maintained in such details as may enable the company to work out following:

- (a) The cost of sizing materials required per kg. of warp yarn seized;
- (b) The material cost of dyeing or printing each type of cloth processed;
- (c) The process material/ chemical cost in each of the processing cost centres/ departments;

Where any of the dyes and chemicals and processing chemicals are produced by the company; separate records, showing the cost of manufacture of such materials indicating the break-up of raw materials consumed for the production and conversion cost should be maintained in such details as may enable the company to determine the actual cost of such materials produced.

Recoveries of Process Materials and Chemicals

13.11 Certain materials and chemicals are recovered from different processes which may or may not be re-used. Those which cannot be re-used

Technical Guide on Internal Audit of Textile Industry

due to lower concentration are sold. Sometimes, these materials and chemicals can be re-used or sold only after further processing.

Requirements of the Rules Regarding Recoveries of Process Materials and Chemicals are as follows:

- The Rules require that proper records should be maintained indicating the quantity of materials or chemicals recovered from different processes.
- In case of certain materials or chemicals, thus, recovered which cannot be re-used in the process due to lower concentration and are sold, the realization from such sales should be recorded and adjusted against the cost of consumption of the respective materials or chemicals, if practicable, or otherwise adjusted against the processes concerned on reasonable basis.
- Where further processing is necessary to make these materials or chemicals useable or saleable, as the case may be adequate records of cost involved for such further processing should be maintained.
- If such further processing is done by any outside agency, records showing the quantity sent for processing, quantity processed and the cost involved thereon should be maintained in detail.

Wages and Salaries

13.12 Direct wages cost is the second largest element in the cost structure of the various products of the cotton textile industry. In Indian cotton textile industry, basic wages are usually based on time. However, in certain cases basic wages are also payable on the basis of machines attended to by the workers. For example, in ring spinning, basic wage is related to the number of spindles attended to by him. From time to time, the Wage Boards appointed by the Government, award certain payments to the workers employed in the industry. These payments are termed as 'Wage Board Awards'. As in other industries, workers in the cotton textile industries also receive fringe benefits e.g., provident fund, bonus, gratuity leave with pay, etc. These are usually related to the basic wage, dearness allowance and wage board award.

13.13 Accounting treatment of direct wages has following two aspects:

- Identification, classification and charging these costs to respective cost centres, and

Records Maintenance In Textile Industry

- Absorption of the total cost centre labour costs to products. In order to facilitate such an accounting treatment, it is imperative that the basic source documents *viz.*, clock cards, time cards, piece work cards, etc. are kept separately for each cost centre. After the direct labour costs have been allocated to the cost centres, the next step of absorption of the labour costs may be carried out as given below:
 - If the wages are payable on time basis or on the basis of machines attended to by workers and the wages cost does not vary with output, the direct labour cost should be treated in the same way as the indirect labour cost.
 - Where the wages payable vary with the output achieved (piece rate system) absorption of direct labour cost is straight forward because the per unit labour cost is known in advance.

Requirements of the Rules Regarding Wages

13.14 The Rules require that proper records should be maintained to show the attendance and earnings of all employees and the cost centres or departments and the work on which they are employed. The records should also indicate separately:

- (i) Overtime wages earned;
- (ii) Piece-rate wages earned;
- (iii) Incentive wages earned, either individually or collectively as production bonus or under any other scheme based on output;
- (iv) Earnings of casual labour engaged on casual work under classified headings.

13.15 Idle time should be separately recorded under classified headings indicating the reasons thereof. This data should be maintained, as far as possible, cost centre-wise, otherwise for principal cost centres like, ring frame, looms, bleaching, dyeing, printing, warehousing, etc. The method followed for accounting of idle time payments in determining the cost of the product should be disclosed in the cost records.

Any wages and salaries allocable to capital works such as, addition or heavy repaired works to plant and machinery, buildings, or other fixed assets should be accounted for under the relevant capital heads.

Direct Expenses

13.16 A few expenses, other than direct materials and direct labour, are directly identifiable to the final product. Such expenses are termed as direct expenses. In the cotton textile industry, examples of direct expenses are sanforizing royalty, processing charges for the jobs under taken outside the mill, etc. These can be charged to the final product directly.

Overheads

13.17 Overheads cannot be directly identified and charged to the final product. In other words, they are an aggregate of indirect materials, indirect labour and indirect expenses. Overheads can also be classified according to the functions viz:

- (i) Factory overheads,
- (ii) Administration, and
- (iii) Selling and Distribution overheads.

The following discussion pertains to the factory overheads. Since these costs cannot be directly charged to the final product a detailed procedure is required to charge them to the products.

Consumable Stores, Small Tools and Machinery Spares

13.18 In a textile mill a number of consumable stores, small tools, machinery spares, and items like, bobbins, pirns, shuttles, rollers, etc., are used in the process of production.

The Rules require that proper records should be maintained to show the receipts, issues and balances both in quantities and costs of each item. In the case of consumable stores and small tools, the cost of which is insignificant, the company may, if it so desires, maintain such records for the main group of such items. The cost of issues of consumable stores, small tools and machinery spares, should be charged to the relevant heads of account such as, production, repairs to plant and machinery and repairs to buildings. Materials consumed on capital works such as, additions to buildings, plant and machinery and other assets should be shown under the relevant capital heads.

13.19 Proper records should be maintained to show the quantity and cost of items which are not forming part of the machinery and replaced as and when necessary, such as bobbins of all sizes, pirns, winding cones, cheeses, reels, silver drums, rollers in frames, shuttles, etc., lying in the shop floor at the end of the relevant year in order to enable the company to arrive at the actual consumption of such items during the relevant year. The method followed for charging the cost of the products manufactured should be indicated in the records. Sales realization of old and discarded stores materials scrap, etc., should be identified wherever possible with respective cost centres and credit given accordingly. Otherwise it should be deducted from the common mill overheads.

Spoilages, Rejections, Losses and Wastages

13.20 As with most of the processing industries, in the cotton textile industry also, there is wastage of material as it passes from one process to another. This wastage is inherent in the different processes, therefore its cost should be charged to the good units produced. The calculation of the cost of the finished product per unit for each cost centre after taking account of the wastage multipliers for the respective cost centres. The waste multipliers are calculated to determine the quantity of raw materials required to produce one unit of the finished product. In the case of spinning activity, a waste multiplier is also known as the Yarn Equivalent Factor. The formula used for its calculation for a cost centre is as follows:

100 - Total waste% (Upto and including the waste% at that cost centre)

100 - Total waste% in all cost centres.

13.21 It may be noted that the total waste percentage in the above formula has to be based upon the input of the first cost centre. The calculation of the waste multiplier is illustrated below:

Mixing: 30s

<i>Cost Centres</i>	<i>Actual Waste %</i>
(i) Mixing and Blow Room	6.00
(ii) Carding	7.60
(iii) Pre-comb Drawing	0.80
(iv) Combing	10.10
(v) Post-comb Drawing	0 50

Technical Guide on Internal Audit of Textile Industry

(vi)	Inter-roving	0.50
(vii)	Ring-spinning	2.50
		28.00

Thus, for carding cost centre the waste multiplier is

$$=100-(6.00 + 7.60) = 1.2$$

$$100 - 28$$

If the per kg cost of yarn produced upto the 'carding' process is 'x' (before taking account of the wastages), the final per kg. cost of yarn produced upto the "carding" process can be determined by multiplying 'x' ¹ with the "waste-multiplier" for that process i. e. 1.2. This aspect has been amplified later in the section "Calculation of the Cost of Production and the Cost of Sales'.

Requirements of the Cost Accounting Records Rules Regarding Wastes

13.22 Proper records should be maintained showing the quantity and cost of wastages, spoilages, rejections and losses of raw materials, dyes and chemicals, process materials, consumable stores, small tools and machinery spares, whether in transit, storage, manufacture or for any other reason. The method followed for adjusting the above losses as well as the income derived from the disposal of rejected and waste materials including spoilage, if any in determining the cost of product should be indicated in the cost records

13.23 In the case of cotton and man-made fibre, records of wastage, spoilage and losses should be maintained in such a way as may enable the company to work out the waste multipliers for each mixing at periodic intervals. Necessary records should be maintained showing the quantity and realisable value of hard waste derived in different departments, re-used, sold out and balance in stock. The method followed for adjusting the above wastage as well as the income derived from the sale of such waste in determining the cost of product should be indicated in the cost records.

Separate records should be maintained for fents, rags, chindies, etc., arising out of finished fabrics, group-wise. Such grouping should be as per the one adopted by central excise authorities. Such records should enable the company in determining the incidence on this account in the cost of fabric. The quantity of fents, rags, etc., formed in the case of each fabric may be determined on technical basis if actuals are not available. In such cases reconciliation of such waste accounted for in the production on technical

basis and that actually formed, group-wise should be made at regular intervals, say quarterly, within the relevant period.

Service Department Expenses

13.24 The Rules require that detailed records should be maintained to indicate expenses incurred for each service cost centre or department. These expenses should be apportioned to other service and production departments on an equitable basis and applied consistently.

Utilities

13.25 In textile mill utilities like, water, steam, power and humidification are required. The provisions of the Rules regarding the various utilities are given below:-

- (i) Water: Where water is treated or purified, proper records showing the quantity and cost of water treated and consumed in different cost centres or departments for the manufacture of processed fabrics, etc. should be maintained in such detail as may enable the company to furnish the necessary particulars. The cost of treated water allocated to the departments concerned should be on a reasonable basis and applied consistently.
- (ii) Steam: Where steam is raised by the company, proper records showing the quantity and cost of steam raised and consumed in various cost centres or departments for the manufacture of cotton textile products should be maintained in such detail as may enable the company to furnish the necessary particulars. The cost of steam consumed by the cotton textile products and other products or other units of the company, if any, should be calculated on reasonable basis and applied consistently.

Where steam is raised and supplied by any other unit of the company to the textile unit, the cost of steam so supplied should be charged to the textile unit on a reasonable basis and applied consistently.

- (iii) Power: Adequate records should be maintained for the quantity and cost of power purchased. If expenses are incurred for distribution of the power thus purchased, proper records to show such expenses should be maintained.

Where power is generated by the company itself adequate records should be maintained to show the cost of power generated and

consumed by the different cost centres, departments, etc., of the textile unit of the company, in such detail as may enable the company to furnish the necessary particulars.

Where power is generated and supplied by any other unit of the company to the spinning/ weaving/ processing departments of the textile unit, adequate records should be maintained to assess the quantity and cost of power so supplied. The rate charged by the supplying unit should be on a reasonable basis. Necessary records should be maintained to show the consumption of power by various cost centres or departments. The cost of power allocated to products should be on a reasonable basis and applied consistently.

- (iv) Humidification: Proper records should be maintained to enable determination of the cost of humidification and its distribution to different cost centres and departments.

Workshop/ Repairs and Maintenance

13.26 The Rules require that proper records showing the expenditure incurred by the workshop under different heads and on repairs, and maintenance by the various cost centres and departments should be maintained. The records should also indicate the basis of charging the workshop expenses to different cost centres, departments and units. Wherever maintenance work is done by direct workers of any production cost centre, the wages and salaries of such men shall be treated as other direct expenses of the respective cost centre.

13.27 Expenditure on major repair works from which benefit is likely to accrue for more than one financial year should be shown separately in the cost records indicating the method of accounting in determining the cost of various products manufactured during the relevant period.

Expenditure incurred on works of capital nature should be capitalised. The cost of such jobs should include the expenditure on material, labour and due share of the overheads. The jobs carried out by the workshop attached to the spinning, weaving or processing departments, for other units of the company and vice-versa should be charged on a reasonable basis and applied consistently.

Design Studio

13.28 The Rules require that proper records showing the expenditure incurred by the design studio, if any, should be maintained. The records

should also indicate the basis of charging the studio expenses to the different cost centres and departments in the printing section.

Screen Making, Photo Engraving, Pentsgraph, Chromium Plating and Rotary Screen Making

13.29 The Rules require that proper records showing the expenditure incurred by these departments should be maintained. The records should also indicate the basis of charging the expenses of these departments, to the respective cost centres of the printing department and ultimately to the products. The basis so adopted should be reasonable and applied consistently.

Depreciation

13.30 Proper records should be maintained showing the cost and other particulars of fixed assets in respect of which depreciation is to be provided. These records should *inter alia* indicate the cost of each item of assets including installation charges, if any, the date of its acquisition, the date of its installation and rate of depreciation. In respect of those assets, the original cost of acquisition of which cannot be ascertained without an unreasonable expenditure or delay, the valuation shown in the books on the first day of the financial year beginning on or after commencement of these rules should be taken as the opening balance.

The basis on which depreciation is calculated and allocated to the various cost centres and departments and to the products should be clearly indicated in the records. Depreciation chargeable to the different cost centres and departments should not be less than the amount of depreciation chargeable in accordance with the provisions of sub-section (2) of Section 205 of the Companies Act, 1956 (1 of 1956), and should relate to plant, machinery and other fixed assets in such cost centres and departments.

13.31 In the case of assets or group of assets on which depreciation is written off at the rate of 100 per cent in the relevant year, such depreciation should be spread over the number of years during which benefit is derived from such assets or group of such assets. In case, the amount of depreciation charged in the cost accounts in any financial year is higher than the amount of depreciation chargeable under the aforesaid provisions of the Companies Act, the amount so charged in excess should be indicated clearly in the cost records. The cumulative depreciation charged in the cost records against any individual item of asset should not, however, exceed the original cost of the respective asset.

Other Overheads

13.32 The Rules require that proper records should be maintained showing the various items of expenses comprising the overheads. These expenses should be analysed, classified and grouped into mills or processing house (works), administration and selling and distribution overheads. The method followed for allocation of the above categories of overheads to the cost centres, departments and absorption by the products should be indicated in the cost records.

Where the company is engaged in the manufacture of any other products in addition to cotton textiles, the records should clearly indicate the basis followed for apportionment of the common overheads including head office expenses of the company to the cotton textile activity, other activities and capital work.

13.33 In case any expenses included in the above categories of overheads can be identified with a particular activity or product, such expense should be segregated and charged to the relevant activity or product in the first instance and thereafter the remaining common expenses under the above categories of overheads should be allocated on a reasonable and equitable basis and applied consistently.

The details of administrative, selling and distribution overheads and the amounts applicable to yarn, cloth and processed cloth should be maintained in such a manner as to enable the company to fill up the necessary particulars in the cost of production and cost of sale statements of each count of yarn/ type of cloth and processes cloth (fabric-wise).

Expenses on Export

13.34 Proper records showing the expenses incurred in the export item of cotton textiles, if any, should be separately maintained so that the cost of export sales can be correctly determined for each type of the product exported.

The expenses incurred on exports as well as any export incentives, such as, cash subsidy, drawback duty and benefit derived out of the import entitlement licence issued, etc., if any, should be reflected separately in the cost of sales statements relating to export sales.

Packing

13.35 Proper records should be maintained showing the quantity and the cost of various packing materials such as, hessian cloth, polythene paper, boards, packing boxes, mild steel wires, hoops and buckles used for different types of packing of yarn, cloth and processed cloth separately. In the absence of actual consumption of such material for each type of packing, apportionment of material cost should be made on the basis of quantity requirement as per standard specifications, in such cases, reconciliation of major material cost as per standards and that as per actual should be made periodically, say quarterly.

13.36 Records should also be maintained showing the other expenses incurred in-respect of packing. Where expenses are of a general nature and cannot be identified directly with the types of packing, apportionment of such expenses to the different types of packing should be on an equitable basis and the basis of such apportionment should be clearly indicated in the cost records and applied consistently. The records should be kept in such a manner as to enable the company to fill up the necessary particulars.

Separate records for expenses incurred on special packings made for exports of yarn/ cloth in grey stage, processed cloth should be maintained and exhibited in the relevant cost of sales statements for exports.

Research and Development Expenses

13.37 Proper records showing the details of expenses, if any, incurred by the company for research and development according to the nature of such research, namely, development of products, existing and new, processes of manufacture, existing and new, design and development of new plant facilities, market research for new products, etc., should be maintained separately.

The method of charging these expenses to the cost of products during any year should be indicated in the cost records. Wherever the utility of such research extends over more than one financial year such expenses should be treated as "deferred expenses" and charged to the cost of the products on some equitable basis which is to be followed consistently.

Yarn/ Cloth in Grey Stage for Self-consumption

13.38 Proper records should be maintained showing the quantity and cost of each item of yarn and cloth transferred to another department/unit of the

company for self-consumption. The rates at which transfers are effected should be at cost.

Work-in-Progress and Finished Goods Stock

13.39 Adequate records should be maintained showing the cost of work-in-progress in each productive cost centre of the spinning, weaving, and processing departments of the company. Proper records showing the opening stock, production, issues for further processing/sales and closing stock of all the finished products like yarn of various constructions and processed and finished cloth of the various constructions designs, etc should be maintained.

The method followed for determining the cost of work-in-progress and finished goods stocks should be indicated in the cost records so as to reveal the cost elements that have been taken into account in such computation. The method adopted should be followed consistently.

Calculation of the Cost of Production and the Cost of Sales

13.40 After identification and recording of various items of costs, the next step is the determination of the cost of production and the cost of sales of yarn, grey cloth and finished cloth. Following steps are involved in the determination of the cost of production and the cost of sales.

Spinning

13.41 The following steps may be taken for the determination of the cost of yarn spun and of the yarn sold:

- (i) Calculation of the quantity and value of total cotton issued for the manufacture of carded and combed yarn for both warp and weft. The computation should be mix-wise with corresponding reduction due to wastages to arrive at the output of warp and weft yarn.
- (ii) Preparation of an input-output analysis, showing input, wastages and output in each processing cost centre upto yarn stage. This data is in mix-wise quantities.
- (iii) Computation of total output of yarn for whole of the spinning department showing input, wastages and output taking the relevant data from (1) above.

Records Maintenance In Textile Industry

- (iv) Computation of net mix-wise cost as follows;
(Cost of input as per step (1) x cost per Kg. of the mix)—Credit for wastes collected as per steps (2) and (3).
- (v) Computation of waste multipliers for each cost centre mixing-wise. Data is taken from step (1)
- (vi) Computation of cost-centre-wise conversion cost upto and including spinning. The conversion cost includes direct wages and salaries; utilities like water, steam, power etc.; consumable stores; bobbins; pirns; repairs and maintenance; mill overheads; depreciation; share of administration overheads; research and development cost, etc. Conversion cost should be calculated per machine shift/spindle shift.
- (vii) Computation of conversion cost per Kg. for each mixing as follows:
Conversion cost per machine shift/spindle shift as per step (6) X
Production per machine shift/spindle shift in Kgs. as per step(1)
- (viii) Computation of conversion cost of yarn per Kg. count-wise for each cost centre which is to added to the total cost = conversion cost per Kg. as per step (7) X waste multiplier as per step (5).
- (ix) Computation of cost of production of yarn count-wise, separately for warp and weft by following calculations:
 - (a) Cost per Kg. of mixing used = Net Cost per Kg. of mixing as per step (4) X Waste multiplier as per step (5).
 - (b) Cost of production per Kg. of yarn = Cost per Kg. of mixing used as (i) above + Conversion cost per Kg. of mixing as per step (8).
 - (c) Total cost of production of yarn spun cost of production per Kg. of yarn as per (ii) above X Total Quantity of yarn spun as per step (1).
- (x) Computation of the cost of yarn sold. This involves the following steps:
 - (a) A stock statement showing the quantities and values of opening stock, production during the year, yarn issued for further processing, issued for sales and closing stock, is prepared. This information is also given mixing-wise and count-wise. Relevant cost data taken from step (9).

- (b) To the cost of yarn issued for sales as given in (i) above are added cost of reeling/winding, cost of packing, share of administrative expenses, selling and distribution expenses, bonus, interest, gratuity, etc. to determine the cost of sales. The difference between sales realization' and 'cost of sales' is the margin on the sale of the yarn.

Weaving

13.41 For calculating the cost of grey cloth manufactured and sold the following steps may be followed:

- (a) Computation of conversion cost from winding to weaving for each cost centre. The conversion cost includes direct wages and salaries; utilities like water, steam, power, etc; consumable stores; sizing materials; bobbins, pirns, shuttles etc. Conversion cost should be calculated per spindle shift/loom shift/machine shift and cost per kg/ metre.
- (b) Computation of sort-wise cost of production of cloth in grey stage. This includes following items of cost from step (1)
 - (i) Cost of yarn for warp and weft
 - (ii) Winding cost for warp and weft
 - (iii) Warping
 - (iv) Sizing cost—materials and others
 - (v) Drawing-in cost
 - (vi) Loom-shed cost.

From the above is deducted realization on account of wastes.

Cost of yarn can be taken from (A) above or if it is purchased from outside, the purchase cost plus other direct charges should be taken. Winding charges include cost of cone, pirn winding, etc. If the cloth is calendared or any other finishing is done the conversion cost of such process must also be included.

- (c) Computation of the cost of grey cloth sold. This involves the following steps:
 - (i) A stock statement is prepared. This includes sortwise information of quantities and values of production of grey cloth as per step (2), fents, rags, and chindies, good

Records Maintenance In Textile Industry

production, opening stock of good grey doth, issued for further processing, issued for sales (including consignment sales), and closing stock.

- (ii) To the cost of grey cloth issued for sales as given in (i) above are added share of administrative expenses, selling and distribution expenses, bonus, interest, gratuity, packing expenses, to determine the cost of sales. The difference between 'sales realisation' and 'cost of sales' is the 'margin' on the sale of the grey cloth.

Processing

13.42 Computation of the cost of finished cloth usually involves the following steps:

- (a) Calculation of the cost centre-wise conversion cost in the bleaching section. This includes expenses on account of process materials e.g., for desizing, scouring, bleaching, wetting agents, chemicals for mercerizing; utilities like water, steam, power, singeing, chemical mixing, rope washing, cooling plant, caustic recovery plant; process house/mill overheads, etc. Conversion cost should be calculated per Kg./Metre/Machine Shift/Hour.
- (b) Calculation of cost centre-wise cost of production in the dyeing section. This includes expenses on account of process materials like, chemicals; utilities like water, steam, power, pigment padding, developing, fast colouring, soaping, drying; mill, process house overheads.
- (c) Calculation of cost centre-wise cost in the printing section This includes cost of process materials; utilities like water, steam, power, soaping, drying, roller engraving, screen making, design department, chemicals mixing, etc.
- (d) Computation of cost in the Finishing section in respect of different departments like damping, calendaring, sanforizing, tabelizing, etc.
- (e) Computation of cost of different types of packing like, yarn packing (Full Bale; 3/4 Bale; 1/2 Bale, etc.), cloth packing (Rollers, Bales, etc.), and Export Packing. This includes packing material cost like hessian, cheese, card board, polythene; wages and salaries in respect of folding, reeling, inspection, stamping, cutting, baling and bundling etc.; consumable stores.

Technical Guide on Internal Audit of Textile Industry

- (f) Computation of the cost of processed and finished cloth (Proforma L of Schedule II of the Rules). This includes following expenses:
 - (i) Cost of cloth at grey stage (issued from weaving)
 - (ii) Bleaching cost as per step (1)
 - (iii) Dyeing cost as per step (2)
 - (iv) Printing cost as per step (3)
 - (v) Finishing cost as per step (4).
- (g) Computation of the cost of sales of processed cloth. This involves the following steps:
 - (i) A sortwise stock statement is prepared. This may include quantities and values of production of the processed cloth as determined in step (6), fents, rags and chindies, good production of the processed cloth, opening stock—pre-packed and packed, cloth packed during the year, packed cloth issued for sales, closing stock etc.
 - (ii) To the cost of processed packed cloth issued for sales as computed in (i) above are added share of administrative expenses, selling and distribution expenses, bonus, interest, gratuity. The difference between the 'sales realization' and the 'cost of sales' is the 'margin' on processed cloth sold during the year.

The following may be noted in this regard:

- (i) In the case of controlled cloth, the cost data required should be given for each sort in the said proforma.
- (ii) Export of yarn/cloth/in grey stage/processed cloth should be exhibited separately in the relevant cost statements and the same should be excluded from the cost statements of yarn/cloth meant for sale in the internal market. Value of export incentives, if any, should be shown in the respective cost of sales statements.
- (iii) The transfer of finished products which form the raw materials for subsequent products should be made at the cost of production of such finished products.

Miscellaneous Requirements of Cost Accounting Records (Cotton Textiles) Rules

13.43 In addition to the cost records required to be kept for the various elements of cost as detailed above, the Cost Accounting Records (Cotton Textiles) Rules, 1977 require the records explained in following paragraph to be maintained by a company manufacturing cotton textiles.

Production Records

13.44 Quantitative records of all finished and packed production, issues for further processing, department wise, issues for sales and balance in stock both packed and in pre-packed condition of:

- (i) different counts and types of yarn (both grey and . processed)
- (ii) all sorts of cloth in grey stage
- (iii) all sorts of processed and finished cloth produced should be maintained by the company.

In the process departments, the records of production of different machines, count group-wise and variety-wise only need be kept. The cost of all finished and packed production may be kept in detail. Details of the quantity of cotton blankets produced, if any, from waste cotton should also be kept in the cost records. Adequate records to show the production of yarn/ cloth in grey stage, processed cloth in various stages of production in the respective intermediary productive departments should also be maintained.

Reconciliation of Cost and Financial Accounts

13.45 The cost records should be reconciled preferably periodically with the financial books of account so as to ensure accuracy. Variation, if any, should be clearly indicated and explained. The period for which such reconciliation is effected should not exceed the period of the financial year of the company. The reconciliation should be done in such a manner that the profitability of the products under reference can be correctly adjudged and reconciled with the overall profits of the company.

A statement showing the total expenses incurred and income received by the company under different heads of account and the share applicable to cotton textile activity of the company should be made giving therein the basis of allocation of the total expenses and income duly reconciled with the financial accounts for the period.

Adjustment of Cost Variances

13.46 Where the company maintains cost records on any basis other than actual, such as standard costing, estimated cost, etc., the records should indicate the procedure followed by the company in working out the cost of products under such system. The method followed for adjusting the cost variances for determining the actual cost of the products should be clearly indicated in the cost records. The cost variances should be shown against the relevant heads. The reasons for the variances should be detailed in the cost records.

Records of Physical Verification

13.47 Records of physical verification should be maintained in respect of all items held in stock such as cotton, synthetic fibre, yarn, etc., dyes and chemicals, processing materials, machinery spares, fuels finished goods, copper cylinders, printing screens, yarn dyeing spools, etc., and fixed assets. Reasons for shortages/surpluses arising out of such verification and the method followed for adjusting the same in the cost of the products should be indicated in the records.

Inter-Company Transactions

13.48 In respect of supplies made or services rendered by the company to its holding company or to its subsidiary or to a company under the same management as defined in Section 370 (IB) of the Companies Act, 1956, or to a company in which a director of the company is also a director in such companies and vice versa, records should be maintained showing contracts entered into, agreements or understanding reached in respect of:

- (a) purchase and sale of raw materials, finished products (yarn/ cloth in grey stage, processed cloth etc.), process materials, chemicals, dyes and rejected goods including scrap, etc.
- (b) utilization of plant facilities.
- (c) supply of utilities.
- (d) administrative, technical, managerial and any other consultancy services

These records should also indicate the basis followed for arriving at the rates charged between them so as to enable determination of the reasonableness of the rates charged or paid for such services.

Statistical Records

13.49 Particulars of contracts entered into for purchase of cotton and sale of finished goods should be maintained in detail indicating separately the percentage of commission, carrying cost, etc. Data regarding available and actually utilized spindle shifts/loom shifts/ machine shifts in the spinning, weaving and processing departments respectively, as well as related data in sub-production centres of such departments should be maintained. The reasons for stoppages and under utilization under classified headings should be recorded. Records showing yield of yarn estimated and actually obtained from each type of mixing of cotton used for yarn production, production of yarn per spindle shift for each type of mixing for each type of frame used, production of different machines count group-wise and variety-wise in the processing departments, speed and efficiency of all the spindles/ looms/other machines where necessary for calculation of cloth cost in each production cost centre, etc., should also be kept. Records detailing the method of control exercised by the company in respect of efficiency in each productive department like spinning, weaving, processing, etc., losses, rejections, wastages in process should be maintained.

Such records, as will enable the company to identify, as far as possible, capital employed separately for yarn/cloth in grey stage/ processed cloth should be kept. Fresh investments on fixed assets that have not contributed to the production during the relevant period should be indicated in the records.

13.50 Detailed records showing the quantity and sale proceeds realized, for each variety of yarn/ cloth in grey/ processed cloth sold during the relevant period should be maintained, so as to enable the company to determine the actual sales realization per unit of the product sold.

13.51 Statistical and other records maintained in compliance with the provisions should be such as would enable the company to exercise, as far as possible, control over the various operations and costs with a view to achieve optimum economies in costs. The data maintained in the cost records should be reconciled with the various returns submitted to the Textile Commissioner and Central Excise authorities, under the various control orders and notifications issued from time to time in respect of cotton, yarn and processed cloth.

Chapter 14

Understanding of Audit Segment and Its Aspects in Textile Industry

14.1 An internal auditor normally reviews the operations of an enterprise to appraise their effectiveness and to ensure that control system in the organization function effectively for both internal and statutory audit, knowledge of the industry, details of the financial accounting system, and of the cost accounting system is necessary and which has been detailed in the earlier chapters.

Various Segments for Review

14.2 There are various segments in which an internal auditor has to review for the purpose of internal audit. These are as follows:

- Constitution/ Status of the entity
- Plant
 - Location of the plant
 - Segments (Yarn, Fabric, Garment etc)available
 - Types of machinery installed
 - Spare Parts and Tools
 - Types of Products manufactured
 - Versality in Product manufacturing
 - Quality control of Raw Materials
 - Process control
- Inventory
- Export documentation
- Routine Accounts checking
- Quality Control of Finished Product
- Design (in House)
- Energy Saving

Understanding of Audit Segment and Its Aspects in Textile Industry

- Compliance of Government Rules (State, Central)
- Commercial
 - Purchases
 - Sales
 - Allied Others

The present study deals with internal audit of various segments in textile industry. The effectiveness of internal audit is measured by the successful identification, monitoring and control of risk activities. The internal auditor should focus on the risk implications of the analysis and reporting of internal audit. The following are the broad areas where the internal control is required to make certain the business functioning of the organization.

Constitution/ Status of the Entity

14.3 Examine the constitution of the entity. (For e.g., MOA and AOA for Private Limited Company, Partnership Deed for Partnership Firm). Check whether the provisions of the governing Act have been complied with.

Procurement of Raw Material

14.4 In the textile industry, the following items are normally purchased for the purpose of consumption:

- (i) Cotton/yarn/grey cloth.
- (ii) Wastes scraps for lower grade mixings
- (iii) Sizing materials
- (iv) Other consumable stores.
- (v) Polyester Fibre
- (vi) Viscose.

Cotton

14.5 It is the most important aspect while taking into account. The cotton price varies significantly due to its seasonal nature. The history of Commodity Derivatives in India dates back to the 19th century when the Cotton Trade Association started futures trading in 1875, barely about a decade after the commodity derivatives started in Chicago. Over a period the derivatives market developed in several other commodities in India.

Following cotton derivatives trading started in oilseeds in Mumbai in the year 1900, raw jute and jute goods in Kolkata in 1912, wheat in Hapur in 1913 and Bullion in Mumbai in the year 1920.

Polyester

14.6 Polyester is a term often defined as “long-chain polymers chemically composed of at least 85% by weight of an ester and a dihydric alcohol and a terephthalic acid”. In other words, it means the linking of several esters within the fibers. Reaction of alcohol with carboxylic acid results in the formation of esters. Polyester also refers to the various polymers in which the backbones are formed by the “esterification condensation of polyfunctional alcohols and acids”. Polyester can also be classified as saturated and unsaturated polyesters.

14.7 Saturated polyesters refer to that family of polyesters in which the polyester backbones are saturated. They are thus not as reactive as unsaturated polyesters. They consist of low molecular weight liquids used as plasticizers and as reactants in forming urethane polymers, and linear, high molecular weight thermoplastics such as polyethylene terephthalate (Dacron and Mylar). Usual reactants for the saturated polyesters are a glycol and an acid or anhydride.

Unsaturated polyesters refer to that family of polyesters in which the backbone consists of alkyl thermosetting resins characterized by vinyl unsaturation. They are mostly used in reinforced plastics. These are the most widely used and economical family of resins.

14.8 The following are characteristics of polyester:

- Polyester fabrics and fibers are extremely strong.
- Polyester is very durable: resistant to most chemicals, stretching and shrinking, wrinkle resistant, mildew and abrasion resistant.
- Polyester is hydrophobic in nature and quick drying. It can be used for insulation by manufacturing hollow fibers.
- Polyester retains its shape and hence is good for making outdoor clothing for harsh climates.
- It is easily washed and dried.

Viscose

14.9 Viscose is a unique form of wood cellulose acetate that can be used for the manufacture of a number of different types of products that are used in the medical industry, when the cellulose is treated with caustic soda. Sometimes referred to as cellulose xanthe in this state, viscose is ideal for the creation of dialysis membrane and other medical tools that must be soft and supple to the touch.

Created from a combination of natural and man-made components, viscose can also be made into the more common form of rayon that is used for many types of textile products, including clothing. Viscose rayon has a silky appearance and feel, and also has the ability to breathe in a manner similar to cotton weaves. In addition to being an inexpensive material to use in lightweight clothing, viscose can also be used for such textiles as tablecloths, napkins, furniture slipcovers, and sheeting. One of the more popular properties of viscose rayon is that the fabric tends to drape very well, which makes it ideal for use in simple curtains, as well as the perfect fabric to line more formal draperies.

Purchase of Cotton

14.10 To make cotton fit for use in a textile mill, it is ginned to remove cotton seeds and other impurities. After ginning, cotton is pressed into bales of usually half a candy each (one candy =784 lbs.). Rates of cotton are usually quoted per candy. In India, the main varieties of cotton suitable for spinning yarn upto 80 counts are:

- 320F,
- Dig Vijay,
- Kafyan,
- Desi,
- Shankar ,
- J 34
- MCU 5,
- V797,
- Varalaxmi,
- Jaidhar,

Technical Guide on Internal Audit of Textile Industry

- Wagad etc.

14.11 Cotton being an agricultural produce, its price depends upon various factors. The size of the crop in a particular year plays an important part in the determination of the price of cotton. The efforts grower and to ensure at the same time that the final product is within reach of the common man. However, there have been wide fluctuations in prices of cotton during the past few years and the industry has passed through uncertain conditions, the price of cotton also depends upon its colour, staple length, presence of dirt, dust, other impurities etc.

14.12 The textile mills have a dual system of buying cotton. Depending upon the market conditions, expectation of fluctuations in prices, their own requirement and availability of the right type of cotton at the right time, the mills usually make contracts with middle men merchants for the purchase of cotton for immediate delivery or deferred delivery.

Sometimes cotton is also purchased by mills directly through their own staff or through agents appointed for the purchase of cotton from the ginning factories, In the latter case purchases are made on behalf of the textile mills and the purchase price plus all expenses incurred in that connection are recoverable from them. Such merchants are usually allowed some commission/ brokerage for rendering their services. All these expenses and commission/brokerage become a part of the cost of cotton and have to be accounted for accordingly by the mills.

14.13 The cotton trade has another peculiar feature. Many times, because of the shortage of funds or for other reasons, the cotton is purchased but it is required to be carried by the merchants on the account of the mills for such period as may be considered necessary by the mills. The mills in such cases have to pay interest charges, storage charges, insurance, etc. for the period the cotton is required to be carried. Such charges add to the cost of cotton. This system enables the mills to take advantage of price at a particular time and also ensures quality without having to invest ready money. The charges thus paid are usually termed as 'carrying charges'. The interest is the major portion of carrying charges. Carrying charges are usually included in the purchase cost of cotton.

Where contracts for direct purchases of cotton are made, the payment is usually made on the basis of the weighment at the time of the receipt of goods in the mills. When commission purchases are made, the weight usually acceptable to the mills is the spot weight of cotton. In any case, a bale-wise record is usually kept to record weighment at the time of the

Understanding of Audit Segment and Its Aspects in Textile Industry

receipt of cotton in the mill. This weight, particularly in the case of commission-purchases is usually compared with the spot weight for which payments have to be made, to determine the reasonableness of gain or loss in transit.

It may be emphasised that where the 'property' in cotton has passed to the mill, whether its delivery has been obtained or not it should be accounted for as cotton purchased. Where cotton has been weighed and set apart by the supplier for the mill pursuant to the contract, it should be accounted for as purchases.

Inventory

14.14 The textile mills usually maintain proper quantitative records for purchases, issues and stocks of all qualities of cotton and other inputs. The mills, which obtain bank finance on the pledge/ hypothecation of cotton are also expected to adhere to the norms of stocks fixed by the bank.

Normally, the stock in a cotton textile mill consists of the following:—

- (i) Raw Materials—cotton, purchased yarn, waste, etc.
- (ii) Dyes and chemicals
- (iii) Consumable stores and spare parts
- (iv) Stock-in-Process
- (v) Finished goods—cloth, yarn for sale, fents, garments etc. if any,
- (vi) Wastes—saleable and usable.

Physical verification of stocks is usually done by the management in the normal course and a list of discrepancies is prepared. Reasons for differences, if significant, are located. Sometimes, there is tendency to show shortage arising on such verification as consumption by obtaining consumption slips from the consuming departments and excesses are adjusted by showing them as returns from the departments. This practice should in all circumstances be discouraged. No shortage or excess should be adjusted without proper scrutiny and any adjustment in the books of accounts should be made only after obtaining approval of the appropriate authority in the mill.

14.15 The method of valuation of stocks should be one in accordance with the generally accepted accounting principles and should be followed consistently. Guidance on what constitute the generally accepted principles

of valuing stock is available from Accounting Standard 2 “Valuation of Inventories”, issued by the Accounting Standards Board of the Institute of Chartered Accountants of India. In case there is a change in the method of valuing stock, the effects of such change should be worked out and, if material should be disclosed in the accounts.

Sales

14.16 Sales in a textile mill can be broadly classified under the following:—

- (i) Sale of controlled cloth.
- (ii) Sale of other cloth—
 - (a) Export
 - (b) Government and Semi-Government departments
 - (c) Civil sales
 - (d) Sales through agents on consignment basis
 - (e) Sale of fents, rags and chindies
 - (f) Retail sales
- (iii) Sale of yarn
- (iv) Sale of wastes/scrap.

Export Sales

14.17 In respect of sales in export market, the proceeds of sale are recorded from the sales invoices. The price, terms of payment, adjustments for foreign currency fluctuations etc. are contained in such sale contracts. At times the services of middlemen may have been obtained in the procurement of such export orders. Contract/agreement with such agents contain terms regarding the commission or other payments. In case the agents belong to a foreign country, the RBI's permission is needed before remitting the amount of commission etc. In case revaluation of currency has taken place after the sale has been effected in law (the contract being in foreign currency) but before recovery of the sales proceeds contract is executed, proper adjustments for such currency fluctuations, if they are to the account of the seller will have to be made. Proper adjustment of expenses incurred to execute such contracts i.e., freight, insurance, transport etc. in the case of CIF contracts are made in respect of all exports made during the year. When goods have been sent out from the mill, but they are lying at the port pending shipment, at the closing date such goods

Understanding of Audit Segment and Its Aspects in Textile Industry

are not treated as sales if the property in the goods has not passed to the buyer but are included in stock.

14.18 The terms and conditions of the various export incentive schemes (e.g., cash incentives, or incentives in the form of import licenses or replenishment licenses) are not uniform, therefore, a set accounting treatment may not be equally appropriate in every case. Due care should be exercised by the management in ascertaining the correct and complete terms and conditions of the scheme applicable. The time honoured dictum (based on the generally accepted principle of conservatism) that anticipated profits should not be taken credit for in the accounts unless they have accrued, but expected losses should be provided for, would serve as a guiding rule in deciding the extent to which benefits not yet received under the export incentive schemes are taken credit for. However, an equally important guiding consideration should be that the accounts should show a true and fair view of the trend of the actual results over a number of years. Thus, that accounting treatment should be adopted in respect of such benefits which, in the facts and circumstances of the case, comes nearest to reconciling what may be the conflicting requirements of these two considerations.

Sale to Government Departments

14.19 Sale to Government and Semi-Government departments are generally finalised on the basis of tenders. At times, a price escalation clause is also found in such sale contracts. Proper adjustment in this regard is made in respect of all such sales irrespective of whether the claim by the company or the purchaser has been made or not unless there are special reasons for not doing so in which case a note in the accounts may have to be given to disclose the position. Sales to Government/ Semi-government departments are usually made without the aid of middlemen. But the mills may choose to utilise such services. The usual practice of billing in case of sales to Government departments is that the first bill is raised for 90% or 95% of the sales value and the balance amount is billed by a second bill. If the goods have been actually delivered 100% of the agreed price should be accounted for as sale.

Civilian Market

14.20 Bulk of the sales takes place in the civilian market. The selling organization depends upon the marketing policies of the company. Usually, sole selling agents' selling agents/ distributors/ authorized stockiest are

appointed by the company for sales in the civilian market. Agreements are entered into with such agents, specifying the services to be rendered by them and their remuneration. The prices in the civilian market are subject to wide fluctuations; these are fixed by the management from time to time.

Sale of Fents, Rags and Chindies

14.21 Sale of fents, rags and chindies has also to be properly accounted for in the books of accounts. Having recorded the production and stock of such goods, the rates at which such goods are sold should be properly recorded with reference to the management policy in this regard and/ or the rates fixed of the purpose from time to time.

Retail Sales

14.22 Many companies have their own retail outlets. Such retail outlets can be managed:

- (a) on the basis of contract to some outside party
- (b) company's own department or some other system. In the former case generally the responsibility for stock, insurance, etc. rests with the contractor. In any case, proper accounting of sales and expenses must be made. In case the retail outlet is the company's own department, then proper quantity and other records regarding receipts, sales and stocks must be kept.

14.23 Where the volume of business transacted at the retail outlets is large, it becomes difficult to maintain elaborate quantity of records for each variety and design without incurring large expense. In such cases it may be proper to carry out the stock taking at periodical intervals say six monthly or quarterly and reconcile the total retail account by taking into account the sale value of opening stock, of goods sent to retail outlet and of closing stock and reconcile the balance with the sale proceeds during the period. Difference, if reasonable, can be due to genuine cutting shortages or other minor clerical errors which may be ignored by the management on business considerations.

This system can work only if the selling prices are pre-determined and there are no changes during the period. Considerable difficulties have to be faced in cases where there are frequent changes in selling rates.

Sale of Yarn

14.24 Sale of yarn is generally made to power looms and hand looms in the civilian market if there are long term contracts with any purchaser there should be proper accounting of sales. Selling prices of usable or non-usable wastes sold is also decided by the management from time to time.

Sale of Scrap

14.25 Scraps are usually sold periodically by auction. A list giving quantity of goods put up for auction is prepared by the management. The auction is normally held through approved auctioneer. The auction bids are subject to management sanction.

Sale of Controlled Cloth

14.26 Controlled cloth scheme was introduced by the Government to ensure production of cheaper varieties of cloth for the poorer section of the society. Prior to the declaration of the 'Integrated Textile Policy' in August 1, 1978, all mills were obliged to produce a part of their total production to conform to the specified categories. Because, the production of such cloth entailed a loss to the mills and the sickness in the textile industry was feared to grow alarmingly, therefore, the Government decided in 1978 to withdraw this obligation. Presently, only the mills under the National Textile Corporation are required to produce the controlled cloth. The losses suffered on this account by the NTC mills are being reimbursed by the Government.

Consignments Sales

14.27 At times goods may be sent to some party on consignment basis. In such cases till the goods are sold by the consignee, they are the property of the consignor. Proper accounts of goods sent on consignment, goods sold and balance lying in stock with the consignee should be received from the consignee and sales account and sales tax, etc, adjusted properly. The consignee's remuneration should be appropriately accounted for with reference to the agreement with him and the amount of sales. If any expenses have also been allowed proper accounting thereof should be made.

Model Checklist of Generalized Areas

14.28 Model Checklist of generalized areas is being given below which may help to internal auditor to conduct the audit in these areas. The above list is not exhaustive and some points may be different from situation to situation or

Technical Guide on Internal Audit of Textile Industry

segment wise but have been provided considering the peculiarity of the financial transaction as well as operational activities taking place in this industry. The other usual modes of verification also need to be followed.

1) Administration

- Review of selection process of various Contractors i.e., Security, Canteen, Housekeeping, Routine maintenance (AMC), Doctor etc.
- Review of agreements and bill passing system.
- Comment on system of Authority Level Matrix being in place and report deviation.

2) Accounts and Finance

- Checking of Current Asset and Current Liability.
- Provisioning and cut off procedure / adherence to book closure process and timeliness.
- General expense system of sanction and deviations.
- Compliance with applicable accounting standards.
- Control over voucher preparation, modification and deletion.
- Check the calculation of commitment charges paid to financial institutions.
- Check the rebate received from financial institutions for prompt payment of interest.
- Check that the debt servicing is done properly and on due dates.
- Check that the terms of loan in respect of interest payment and loan repayment are followed correctly.

3) Cash Transaction

- Whether physical verification of Cash is carried out periodically?
- Whether adequate security arrangement for Custody of Cash exist?
- Whether proper cash retention limits prescribed have been and adhered objectively?
- Whether adequate insurance cover for protection of cash has been obtained?
- Whether all required cash transaction records are maintained?

Understanding of Audit Segment and Its Aspects in Textile Industry

- Verification Funds requirement and its efficient utilization as per HO directive with optimal balance.
- Verification auditing of cash book.
- Verification of accounting of cash receipts.
- Verification of authorization of Expenditure and Payment.
- Whether adequate Fidelity Insurance of cashier and related staff has been obtained?
- Verification of treatment given to excess and shortage found in cash; if frequency of discrepancy is more what steps are taken to strengthen control?
- Whether rotation of duties in Cash/Bank department is implemented.
- Keys management.

4) Bank Transaction

- Review of requirement of funds and whether proper groundwork is carried while planning periodic cash flow?
- Ensure proper review of receipts of funds from HO/CFD.
- Verify the Custody of Blank Cheque Books and the procedure of recording for the same.
- Whether blank signed cheques are properly recorded in register and its uses is monitored and accounted.
- Whether blank signed cheque are physically verified periodically and cancelled, after return of signing authority.
- Whether Internet transaction through CC limit is restricted and all govt. payment done through current accounts in all the units. Whether the required funds will be approved and transferred to this account by cheque?
- Verification of Bank Receipts with the pay-in-slips.
- Verification of booking of Bank Commission with bank advice.
- Verification of Funds Transfers electronically (RTGS/NEFT) whether any discrepancy noticed in approval's and transaction details? Whether authorized signatories only conduct such transactions?

Technical Guide on Internal Audit of Textile Industry

- Whether electronic fund transfer are recorded in separate register and physically signed by competent authority for authentication of transaction?
 - Verification of Bank Reconciliation of Operative and Non Operative Banks.
 - Whether bank reconciliation is prepared by person not involved in accounting of bank transaction and rotation of duty is implemented. Whether unit CFO has counter signed the BRS.
 - Whether interest charged by bank represent the transaction cost and is as per stipulated conditions of agreement.
 - Whether the entries shown in Bank Reconciliation have been followed up by the designated officer not being the preparer of reconciliation statement and or the accountant concerned?
 - Verification of Accounting of Stale Cheque.
 - Whether, cheques are printed through computer software and signed along with voucher approval ?
 - In case of yourself transfer, whether accompanied list is also signed by cheque signatory and such instruction is passed to bank ?
 - Whether the FDR's reported to be kept with authorities is verifiable or a certificate is obtained on periodical basis from the custodian?
 - Whether withdrawal of signing authority (for exiting employees) is informed to bank immediately?
 - Whether, in case of withdrawal of signing authority, for unrepresented cheques, payees are informed for replacement of cheques and bank for stop payment?
 - Whether post dated cheques are posted in the memorandum register and kept in adequate custody?
- 5) Imprest Transaction (Accounting and clearance)**
- Review the process/stipulation of granting Permanent Imprest and Temporary Imprest.
 - Review Closing of Imprest. Whether time limits for submission of Imprest is observed?
 - Review of expenditure through Imprest. Whether expenditure incurred is for the same purpose for which it is granted?

Understanding of Audit Segment and Its Aspects in Textile Industry

6) Booking of Expenditure

- Verification of Revenue Expenses incurred in the light of delegation of power and is within the permissible budget limits.
- Whether no personal expenses have been debited to company accounts?
- Verification of proper sanction for incurring of expenditure and verification of following proper procedure laid down by the company.
- Verification of power bills with respect to actual unit consumption, check if any penalties and extra payments are levied. Also indicate material nature of defaults leading to levies.
- Whether adequate documents are attached to the vouchers signifying the expenditures evidence and authority?
- Whether proper cut-off procedures have been followed for recognition of expenses/ incomes?
- Whether project/ estimates are prepared before incurring a works contract (revenue/capital) and variance with reason analyzed and corrective action taken?
- Verification of capital expenditure with respect to provisions of companies Act, 1956, and requirement of Accounting standard.

7) Payment Procedure

- Check the company's policy and procedure for making payment.
- Check whether all such payments have been made through e-payment or as per HO directives.
- Check that the bank details of the payee have been received correctly from the authorized representative.
- Check the e-payment details with the e-payment details provided by the payee.
- Verify whether the payments made through cheque can be made through e-payments with proper safeguard.
- Check the complaint of non-receipt of payment after e-payment.
- Check whether reasons were obtained from bank for non-payment and efforts taken to resolve the problem.

Technical Guide on Internal Audit of Textile Industry

- Whether all e-banking transactions are recorded in register and signed by competent authority for authentication of transaction.
- Whether passwords of handlers of e-payment are shared or are used by the owner of the password only.

8) Time-office and employees transactions

- Review of all other HR policies in place and their implementation.
- Whether recruitment of employees, contractors and consultants are done as per company policy?
- Whether photo ID cards have been issued to all employees and whether same are taken back at the time of separation?
- Review of attendance system and records of all employees (including contractor employees).
- Comment on adequacy and effectiveness of training programs and records maintained.
- Review of leave policy and maintenance of leave records.
- Review of system of preparation and payment of salary, wage bills, overtime bills, LTA, Medical reimbursement, loans, advances, leave encashment, etc. including deductions on account of PF, ESI, TDS etc.
- Comment on staff turnover and reasons for leaving. Whether leaving formalities are duly complied with?
- Comment on maintenance, updation and control over personnel files.
- Whether job rotation is done as per company policy?
- Whether employee complaints are properly addressed and resolved.
- Comment on actual manpower against budgeted.
- Verification of Salary Bills / Supplementary salary Bills/Wages sheets.
- Verification of Overtime Bills with the original attendance records and labour union agreements along with the good work payments and senior management approval.
- Verification of regular yearly increments granted to employees.
- Verification of leave encashment with respect to policy and entitlement (Regular & On Retirement).

Understanding of Audit Segment and Its Aspects in Textile Industry

- Verification of Medical Reimbursement/ Medical Claims/ Major Expenditure on medical treatment.
 - Review of Travelling Advance and Final Settlement of traveling expenses whether the frequency is high and outstanding is longer? If yes what steps are taken to control the same?
 - Review of Service Book and Leave Account.
 - Verification of Adhoc Gratuity payment and Final Gratuity Payment.
 - Review of Provisions for Gratuity/Leave Encashment/Medical Reimbursement).
 - Verification of Pay Fixation on increment and on Wage revision.
 - Verification of payment of Ex-gratia and Bonus, if any.
 - Verification of payment made under Workman Compensation, act if any.
 - Review and verification of Income Tax Calculation of staff, payment and deduction.
 - Verification of Reconciliation of deductions made on account of IT, PF, ESI, etc. and deposits on thereof.
 - Verification that all other major Recovery and Payment are being done properly or otherwise?
 - Review of Payment of Advances to Employee (Furniture, Computer, Festival, Car etc.).
 - Verification of assets given to employees under Schemes and accounting
- 9) Raw Material Purchase/Creditors (PSF/VSF/Cotton etc.)**
- a) Cotton purchase.**
- Review and verification of procedure of advance payment to cotton supplier (Ginner/ Broker etc) and its reconciliation.
 - Whether cotton procurement has been done as per cotton policy (for regular consumption and stock purpose)?
 - Whether cotton buyer intimate immediately on finalization of contract about quality, price, delivery and payment terms to respective units and purchase order is fed immediately in ERP on receipt of contract detail?

Technical Guide on Internal Audit of Textile Industry

- Whether superior quality is purchased and used where inferior quality/cheap cotton is sufficient to meet customer requirements?
- Whether QC test is conducted for each lot received as per sample size specified and deduction memo/ debit note is raised in case of deviation within permissible limit otherwise rejected and returned back (moisture, trash, elongation, Strength Average Staple length etc.)?
- In case of advance payment, whether value of money is received back for returned goods?
- Whether daily, monthly and yearly price chart is maintained for each quality of cotton to predict price trend?
- Whether purchases have been made in small quantities at higher rates where bulk purchases could have been made at cheaper rates?
- Whether records are kept to monitor the future price indexes in the global Market? Are these being used in buying decisions?

b) Purchase of PSF / VSF, etc.

- Review and verification of procedure of advance payment to fiber supplier companies and its reconciliation.
- Whether, it is ensured that total ordered quantity is dispatched by supplier, within the calendar month so that any upward price change is not affecting purchase cost as price as on date of dispatch will prevail.
- Whether, commitment quantity is lifted so that lifting/turnover discount is availed to the extent agreed?
- Whether, all available incentives/discount have been accounted for?
- Whether, credit-note on account of various incentive scheme available is adjusted timely in further payment/deliveries?
- Whether for all adjustments in prices, proper documentation is available from the suppliers?

10) Purchase Procedure and Various Purchases: Review of procedure for purchase

- Whether tender/RFQ procedures have been followed: inviting limited/open tender as per the delegation of powers, time given to

Understanding of Audit Segment and Its Aspects in Textile Industry

participate in the tender, formation of tender committee, opening of sealed tender by the tender committee, conducting negotiations, etc?

- Whether tender includes technical qualification parameters and whether any proven sources have been ignored for participation in tender for no valid reason
- Whether the rates at which orders have been placed appear to be competitive and reasonable compared to the previous purchases rates?
- Whether the Company policy (Through CCD/ Direct, emergency/Regular, Revenue/capex, authority level etc) of purchases is followed by all the units uniformly?
- Whether the Repeat Orders placed are based on orders placed earlier with proper tendering; whether other conditions governing the placement of Repeat Orders are have been followed?
- Whether any attempt has been made to split the tenders to keep the value of the contract within the delegated powers of the approving authority?
- In case of cancellation of tenders, whether approval of competent authority has been obtained stating the reason for cancellation?
- Whether the same items have been re-tendered; if so, whether the rates at which order has been placed are higher than the rates received for the tender cancelled?
- Whether indents of same items from different units are clubbed at the office of Material Resource Section or CCD before tendering?
- Whether unusual time taken to place orders (from the date of indent)?
- Whether material have been supplied within the stipulated time; if not, whether liquidated damages have been imposed?
- Review time taken to inspect the store materials (after the supply), to prepare Store receipt, to send the bill to Accounts department for payment, to pass the bill for payment and make payment.
- Whether the payment made are as per the terms and conditions of the order, especially taxes and duties, whether tax concessions are availed?

Technical Guide on Internal Audit of Textile Industry

- In case of delay in supply whether the Purchase department takes follow up action. Some instances of abnormal delay in supply to be given.
- Maintenance of records such as, Tender Register, Supply orders, Bill Passing Register, etc.
- Whether purchases have been made in small quantities at higher rates where bulk purchases could have been made at cheaper rates?
- In case of local purchase, whether the materials purchased have been consumed immediately?
- Whether local purchases made are within the powers delegated to the approving authority?
- Whether any local purchases have been made when the materials were in stock or waiting for inspection?
- Whether advance payments made to suppliers are outstanding for a long time; list of such advances (separately for Capital and Spares) with age and reason for non adjustment?
- Total no. of contracts placed up to period of audit no. of contract/orders Value
 - i) Open tender
 - ii) Limited tender
 - iii) Repeat order
- Whether repetitive orders are given even when material are in inventory.

11) Imports

- Check Payments to Clearing House agents, Air freight, Demurrage.
- Check Utilization of benefits: EPCG, DEPB, Duty drawback, Advance licensing etc.

12) Creditors Management

- Enquire about advances unadjusted for more than reasonable time.
- Enquire about non-payment of credit balances.
- Check earnest money/security deposit and old outstanding balances.
- Check exceptional transactions.

Understanding of Audit Segment and Its Aspects in Textile Industry

- Check Supplier account reconciliation and balance confirmations.
- 13) Works Procedure and Various works**
- Check whether tender has been given or quotation were invited.
- Check whether detailed estimate is prepared and approved by the Competent Authority.
- Check the financial terms and conditions of the order.
- Check the clauses for applicable taxes and duties and other relevant expenses.
- Check the compliance to various applicable statutes on work order.
- Check the compliance for statutory dues like PF, ESIC etc on contractor's payments.
- Check the order execution schedule is given in the order.
- Check the qualifying criteria is meet out or otherwise.
- Check the price comparative statement of the work order.
- Check the price variation conditions in the order.
- Check the comprehensiveness of the terms and conditions of the order.
- Check the work is not split up in the small works so as to bypass the Delegation Of Power (DOP) requirement.
- Check the clauses relating to liability and losses of property/third party liability.
- Check the clause relating to measurement of work.
- Check the clause relating to the supply of material in terms of rate and value at which it will be given.
- Check all terms and conditions which are order specific and there is no scope for ambiguity.
- Check draft work order approving authority as per DOP.
- Check whether order is being issued is within the validity of the order.
- Check whether per day compensation or a piece work compensation is competitive as compared to similar works in the vicinity.

14) Passing of supplier's bills

- Check the invoice with all the terms and conditions of the order.
- Check the recovery for late delivery.
- Check for VAT credit is availed or not.
- Check for the advance adjustment if paid against the order.
- Check whether adequate recovery of security deposit has been done.
- Check whether bill is duly passed by competent authority.
- Check whether discount/rebate if any has been given.
- Check whether TDS if applicable has been deducted and deposited.
- Check whether correct account head have been debited or credited.
- Whether payment advice is supported by original invoice for making cheques and the same is duly endorsed?
- Whether due care is taken before making payment on duplicate invoice?
- Whether payments are made within due dates?

15) Passing of works bills

- Check the invoice with all the terms and conditions of the order.
- Check the measurement as recorded in the Measurement Book with Running Bills.
- Check whether the bill and measurement have been internally verified as prescribed.
- Check the recovery for delayed execution of work.
- Check whether proper VAT credit has been taken.
- Wherever applicable, whether WCT has been deducted and deposited/adjusted?
- Check for the advance adjustment if paid against the order?
- Check whether adequate recovery of security deposit/retention money is made.
- Check whether bill is duly passed by competent authority.
- Check whether discount/rebate if any has been given.
- Check whether TDS if applicable has been deducted.

Understanding of Audit Segment and Its Aspects in Textile Industry

- Check whether recovery for the material issued to the party has been affected.
- Check whether correct account head have been debited or credited.

16) Sales & Dispatch (Final product, Rejects, Scrap)

- Adherence of Sales Policy, credit period and credit limits-analysis of Sales in excess of credit limit.
- Process of creating and maintaining customer master.
- Variance of actual and booking rates.
- Contract booking system – Domestic / Export. Alterations with proper authorization. Compliance of terms of contract.
- Whether amendment made in customer order (sales order) are duly approved/authorized?
- Sales Return system including method of calculation of its ageing for valuation purpose.
- System audit of dispatch planning, Report on delay in deliveries with reasons.
- System of dispatch / invoicing including cash discount.
- Comment on OTP (On Time Performance)
- Bill passing and payment system of Logistic.
- Transit insurance coverage.
- To review the system of Waste sale.

17) Export Sales

- What is the process of appointment of agents / sub-agents, renewal of agreement?
- Check whether commission paid to agent is as per agreement.
- Check system of order booking and Contract with the customers.
- Whether export shipment is against schedule?
- Review system of document negotiation with banks
- Check export related expenses – Container detaining, demurrage etc.

18) Debtors Management

- Debtor's ledger scrutiny, critical and doubtful debtors to be specifically mentioned with the recovery progress and action plan.
- Recovery of interest on delayed receipts.
- Enquire about incentives, discounts and commission and its authenticity.
- Scrutiny of debit/credit notes.
- Samples and its proper accounting.
- PDC cheques management, follow-up and authorization in case of holding beyond due date/ cheque dates, cases of cheque returns and delay in taking legal action.
- Check Customer reconciliation and balance confirmations.
- Approval and accounting for bad/ doubtful debts.
- Whether credit limits fixed are frequently relaxed.
- Whether the debit/ credit notes have been issued after proper authorization and documentation?

19) Preventive Maintenance

- Whether schedule of preventive maintenance is adhered to regularly?
- Whether all the plant and machineries are covered under preventive maintenance schedules?
- Whether in case of deferment of parts replacement/ overhauling, a comprehensive note is prepared and approved by competent authority?
- Whether all such case of deferment are reviewed and documented periodically till the same is taken on scheduled maintenance/ replacement of parts?
- Check if abnormal stoppages have occurred and if they relate to non-adherence to schedules quantify the losses.
- Check planning for availability of spares and substitute for imported machine spares.

Understanding of Audit Segment and Its Aspects in Textile Industry

20) Investments

- Whether proper documentations are available for the investment showing intentions, repayment, return on investment details?
- Whether the investment made are duly authorized by the investment committee?
- Whether documents signifying the ownership are kept in authorized custody and have been periodically verified?
- Whether interest/ dividend receipts and repayments are as stipulated?
- In case of strategic investment, joint ventures, subsidiaries whether adequate due diligence has been done?
- Whether due diligence report is comprehensive and gives a clear opinion on the proposed investment?
- Whether the conditions precedents have been complied before the investment is made?
- Whether there are any overrun's or delays in the investment object? Whether there is any loss or continuation of a loss since long?

21) Price Variation and Penalty/ Liquidated Damages

- Check whether price variation clause is applied correctly as per formula given in the order.
- Check whether penalty and liquidated damages are recovered from the party as per terms and conditions of the contract.

22) Inventory Management (Stores)

- Maintenance of records such as, MRN, Issue slip, Requisition slip, Purchase Indent, Budget and special sanction etc.
- Whether inventory levels (minimum, maximum, re-order and economic order) are fixed and adhered to.
- Number of Instances of emergency/urgent purchase or issue without following prescribed procedures is recorded separately to review the planning system and inventory requirements.
- Whether emergency spare, regular and other (as and when required) are separately classified/categories in ERP system?

Technical Guide on Internal Audit of Textile Industry

- Whether discarded/obsolete and disposable items are identified time to time and disposed-off with approval of competent authority?
- Whether the records are computerized and detailed comments about the effectiveness of computerization?
- Whether the requirement projected in the budget is substantially higher than the previous period's consumption; if so, whether justification has been given?
- Whether any item has been included in budget, the consumption of which was NIL in the previous year. If so, whether the quantity projected has been justified?
- Whether material are consumed before the preparation of Stores receipts?
- Physical verification of store materials at random periodically is conducted and adjustments in books are adequate.
- Whether issue of stores materials on loan are properly recorded?
- Review status of recovery of stores materials issued on loan
- Whether there are any cases of materials received short or in damaged condition and whether claim has been made with insurance company/ from supplier for replacement?
- Review details of avoidable, wasteful expenditure like wharfage, etc.
- Whether non-moving and slow-moving stores items have been identified, list prepared and circulated to other units and headquarters before disposal?
- Check whether the actual physical count sheets are preserved until the internal auditor verification is complete.
- Review maintenance of records for scraps along with their approximate value should be maintained.
- Comments about the scrap to dispose of major items, since when lying as scrap, their approximate value. etc. Check whether disposal procedure is adequate?
- Check whether the concept of ABC analysis is prevalent in the company and uses for operating.

Understanding of Audit Segment and Its Aspects in Textile Industry

- Maintenance of records in Major Stores, value of inventory, period the spares have been lying in Major stores including return of unused store material from sub Stores.
- Whether the number of items of store materials and their quantities issued by the Major Stores tally with those received by the sub stores?
- Whether the sub stores draws materials from main stores when it is already in its stock?
- Whether the materials issued by Stores are issued and received by authorized persons?
- Whether the materials are properly arranged and stacked to locate them easily?
- Whether physical control on FOC materials lying in the plant is adequate?
- Whether value of inventory in terms of number of months' consumption of stores and spares and comparison with previous year's figures should be made?
- Whether stores materials are lying in shop floor unconsumed for a considerable period of time; if so, reason therefore and determination of their NRV?
- Details of reconciliation between price stores ledger and financial ledger need to be furnished for taking action.
- Whether stores/surplus of charged off stores are approved by higher authority for taking action?
- Whether the consumption is booked as per consistent pre determined practice.

23) Physical Verification of the Inventory

- Check physical verification of inventory taking of all stores material completed at appropriate intervals and proper reconciliation has been carried out.
- Whether perpetual inventory system is adequate to cover entire inventory in one year and whether implementation is right?

Technical Guide on Internal Audit of Textile Industry

- Is the inventory verification conducted independent of stores and stores staff? Examine the responsibility of the person involved in inventory taking.
- Check whether there is proper authority in approving the adjustment of differences in the inventory findings. Is the approval and adjustment done promptly?
- Compare the shortages and excess of present inventory findings with those of previous 2/3 years and ascertain the reason difference in the same items. Examine the steps taken to stop the recurrences of such differences.
- Check whether slow and non moving items are regularly reviewed and appropriate action is taken.
- Check whether scrap salvage and unusable inventory are identified regularly and disposed off as per procedures laid down.
- Check whether the actual physical count sheets are present until the internal auditor's verification is completed.

24) Asset Management

- Comment on maintenance of Fixed Assets Register.
- Sale of any fixed asset/surplus asset with relevant approvals and as per disposal policy of the organisation
- Scrutiny of repair account to ensure that no items of capital nature are included therein.
- Scrutiny of additions to fixed assets so that no revenue expenditure has been capitalized.
- Interest and other expenses having direct nexus whether capitalized.
- Adherence to Preventive maintenance schedule and authorization on fixation/revision of maintenance schedule.
- Whether depreciation is being charged as per Accounting Policy of the Company.
- Check tagging and movement/ transfer of fixed assets.
- Custody and Control over Original Title Deeds.
- To report Idle and Under- utilized assets.
- Bill processing and payment system.

Understanding of Audit Segment and Its Aspects in Textile Industry

- To review the system of assets given to employees.
- 25) Capitalization of Fixed Assets**
- Examine the procedure of capital expenditure authorization. How such authorization is evidenced? Review and see compliance in case there is an authorization procedure in writing.
 - In case actual expenditure exceeds the sanctioned amount, is there subsequent authorization for the additional expenditure? Is the sanction obtained before or after the expenditure is incurred?
 - Is the amount of capital expenditure reflected in cash flow statement so that fund is available at the appropriate time? Examine whether actual expenditure is according to cash flow.
 - Examine the purchase order/ contract issued for acquiring capital asset.
 - Examine and review the technique applied for assessing the productivity and profitability of capital fixed asset.
 - Check whether transaction is capitalized to correct account head.
 - Check whether all the direct cost incurred is capitalized except taxes for which credit is available.
 - Review whether requirements of AS 10 are complied with.
 - Review depreciation charged on these assets for the construction period.
 - Review as to the compliance of Schedule VI to the Companies Act.
 - Check whether, separate capital cost is computed as per Companies Act and Income-tax Act.
 - Whether fixed assets registers have been kept and maintained and are updated on regular basis?
 - Check whether adequate depreciation is charged as per Schedule XIV of Companies Act.
 - Check if assets are revalued and whether the write off is adequate after revaluation.
 - Examine the assets write off policy and comment on the variance and adequacy.

26) Insurance

- Verify validity of Insurance coverage and adequacy of Insurance and Risk coverage including additions during the year.
- Review of / stipulate various risks covered in insurance.
- Checking of follow up on pending claims and refunds.

27) Physical Verification of Fixed Assets

- Check whether fixed asset register has been updated till the date of the physical verification.
- Check whether physical verification was conducted periodically as per policy approved by the Audit Committee.
- Check whether scrap salvage and unusable/ discarded/ disposable assets are identified regularly and disposed off as per procedures laid down.
- Check whether the fixed asset register mentions the location of the fixed asset.
- Verify whether the asset was found at the same location as mentioned in the fixed asset register.
- Check if the asset was transferred to any other location? if yes, whether proper documents are maintained for such transfers and the fixed asset register is duly updated.
- Check whether any material discrepancy was noticed during the physical verification of the asset. If yes, whether such discrepancy was duly reconciled or whether adjustment were made in the books of accounts and fixed asset register.

28) Accounting Standard Compliance

- Check whether the compliance of applicable accounting standard is communicated at the execution level and also ensure the implementation of the same.
- Check the inventory valuation with respect to AS 2.
- Check the accounting of prior period expenses in accordance with the AS 5.
- Check the depreciation in the light of AS 6.
- Check whether revenue is recognized in accordance with AS 9.

Understanding of Audit Segment and Its Aspects in Textile Industry

- Check the capitalization of Fixed Asset as per AS 10.
- Check the compliance of AS 11, i.e., accounting of foreign exchange transaction
- Check that the interest is accounted for as per Accounting Standard (AS 16) for borrowing cost.
- Check the compliance to all other accounting standards applicable to the company.

29) Financial charges

- Check the calculation of guarantee fee paid/payable.
- Check the calculation of commitment charges paid to financial institutions.
- Check the rebate received from financial institutions for prompt payment of interest.
- Check the interest subvention received/ receivable.
- Check the TUF subsidy receivable.
- Check that the debt servicing is done properly and on due dates.
- Check that the terms of loan in respect of interest payment and loan repayment are followed correctly.
- Check that security created in favour of lenders are registered with ROC are immediately discharged on repayment of debt/loan.
- Check any guarantees issued by the bank on behalf of company or guarantee given by company to others are immediately recorded in guarantee register maintained and are within the limit specified in Companies Act or share holders approval.

30) Information Technology Controls

- Review compliance of IT policy.
- Whether there is control over sharing of user ID and Password.
- Abuse / misuse of ERP/ SAP.
- Whether proper audit trail is available or not.

31) Reconciliations

- Check whether preparation of reconciliation and maintenance of books are done by separate employee.

Technical Guide on Internal Audit of Textile Industry

- Check Inter unit Reconciliation and Report on Deviations.
 - Check reconciliation of sub-ledger to main ledger.
- 32) Security and safety system:** Stipulate various safety and security measures already in place and comment on adequacy and improvement, if any, like:
- Safety measures and its effectiveness.
 - Security system (personal and assets).
 - Comment On the Existing Security Systems in the Plant.
 - Review of Adequacy of Records and Controls at the Main Gate.
- (a) Fire and Safety Equipment**
- Is the proper fire and safety equipment available?
 - Is the equipment accessible (i.e., is it unblocked)?
 - Are flammables stored in flammable storage cabinets?
- (b) Operation of Machinery or Complex Apparatus**
- Are the indicator lights on the apparatus in an O.K. or safe condition?
 - Is the apparatus producing normal sounds, odors, parts, or results?
 - Is the apparatus equipped with data recorders or monitors that track the condition of the apparatus?
 - If necessary, are there maintenance logs or other records that track the condition of the apparatus ?
 - Are proper lock/ tag techniques being practiced?
- (c) Common Tools and Equipment**
- Are the workers using the right tool for the job?
 - Are the workers using the tools correctly?
 - If necessary, have the workers been trained to use the tools?
 - Are the tools in good and safe working condition?
 - Have the tools been inspected recently?
 - Are the tools stored in appropriate locations?
- (d) Work Area and Housekeeping**
- Is the work area neat in appearance?

Understanding of Audit Segment and Its Aspects in Textile Industry

- Are all aisles and walk-ways sufficiently wide for personnel and moving equipment?
 - Do all aisles used by moving equipment have clear line-of-sights?
 - Do all walking/working surfaces have barricades or hand guards to protect personnel from hazards?
 - Are the chemicals properly inventoried and stored away?
 - Is the lighting adequate?
 - Are the exits clearly marked and easy to find?
 - Are all overhead items secured?
 - Are all stairs in good and safe condition?
 - Are all ladders properly secured or stored away?
 - Is the overall building in good working condition?
- (e) General Procedures**
- Do the personnel and building occupants know evacuation procedures for fire and weather alarms?
 - Do building occupants such as, lab visitors have point-of-contacts within the building?
 - Is the area manager sufficiently aware of work being done by lab visitors or employees from other area?
- (f) Personnel Ergonomics, Focus, Training and PPE**
- Are the personnel working in a manner that is free of unnecessary physical exertion?
 - Are the personnel practicing good ergonomics?
 - Do the personnel seem sufficiently focused on their job, especially jobs where hazards are present?
 - Are the personnel trained to do the job and are aware of the hazards and mitigations?
 - Does the job appear suited to the personnel?
 - If necessary, are the personnel using PPE?
 - For work near machinery, are the personnel wearing proper clothing?

Technical Guide on Internal Audit of Textile Industry

- If necessary, are the personnel wearing TLD badges in radiation areas?

33) Warehousing and Storage

(a) Control Features

- Ensure that sufficient storage space is available and the layout of storage facilities is suitable to meet the operational requirements of the organization.
- Ensure that goods are effectively stored in order to provide an efficient service to customers and internal users.
- Ensure that materials, goods and products are adequately and securely stored in order to facilitate their prompt identification and dispatch.
- Ensure that the optimum warehouse locations are utilised to maximise the efficiency of distribution to customers, etc.
- Ensure that all goods are adequately protected from damage, deterioration and loss, in order that they remain in optimum condition for use.
- Ensure that all stock movements are valid, authorised and properly executed.
- Ensure that goods are stored safely.
- Ensure that staff are appropriately trained in the handling of goods in order to avoid damage to goods and injury to staff.
- Ensure provision of adequate and serviceable materials handling devices as an aid to efficiency and cost effectiveness.
- Ensure that hazardous items are safely stored.
- Ensure that all relevant regulations and legislation are complied with.
- Ensure that stocks are used in rotation.
- Ensure that adequate and relevant insurance cover is provided for both the stocks and storage facilities.

(b) Risk Issues

- How are management aware of the current and future storage capacity requirements, and what is the evidence of effective planning to meet the identified demands?

Understanding of Audit Segment and Its Aspects in Textile Industry

- How does management decide where to locate warehouses, and is adequate account taken of the relevant logistical, transport and customer service considerations?
 - Are the storage locations (i.e., bins or bays) adequately identified to enable the prompt location of stock units?
 - Are storage facilities adequate to protect goods from damage or deterioration?
 - How can management be assured that all stocks are adequately protected from theft and pilferage?
 - What measures are in place to prevent unauthorised access to the storage areas?
 - How can management be certain that all movements of stock are valid, authorised and correctly executed?
 - Are goods (especially hazardous materials) stored safely and in accordance with established regulations and good practice, and how can management be assured that this is the case?
 - Are staff adequately trained in various material handling techniques, and how can management confirm this?
 - Is efficiency of the storage facility enhanced with the use of appropriate handling devices (trolleys, pallets, forklift trucks, cranes, etc.) and how can management be assured that all such devices are serviceable and contributing to the overall cost effectiveness of the operation?
 - How can management be sure that all the relevant regulations and legislation are being complied with?
 - What mechanisms ensure that adequate, up-to-date and relevant insurance cover is in place for both the stocks and the storage facilities?
- (c) Detailed Issues**
- Is space allocated in order to cope with peak loads rather than normal or minimum requirements?
 - Have management provided some spare storage capacity as a contingency to cater for expansion, etc. (and how was this accurately determined)?

Technical Guide on Internal Audit of Textile Industry

- Is space usage monitored and action taken to avoid wasted or excess space?
- Are raw materials, goods and finished goods appropriately segregated?
- How does management avoid excess storage space and aim to contain the costs of providing storage facilities?
- Are fast moving items accurately identified and conveniently located for efficient handling?
- Are items adequately trailed to all the relevant storage locations?
- Are stocks used in rotation (as appropriate) in order to avoid the build up of older or outdated items?
- Is there sufficient space between storage locations to enable effective and safe access, use of handling equipment, and safe evacuation of the building in case of emergency?
- How can management be assured that production and sales requirements are promptly and accurately advised to the warehouse?
- Have specific responsibilities for the warehouse operation been allocated (and does this include maintaining an awareness of current material handling trends and relevant regulations)?
- How can management be assured that packaging, storage and handling techniques are adequate to protect the goods from damage and deterioration?
- Are damaged items promptly identified and appropriate action taken (and how is this evidenced)?
- Are the appropriate environmental conditions (i.e., air conditioning, humidity, and temperature) provided and maintained at the required level?
- Are storage areas well lit for safety and security purposes?
- What physical and other security measures are in place to protect goods and personnel, and are they regularly tested for effectiveness?
- Are adequate and operational intruder alarms systems installed and regularly tested?

Understanding of Audit Segment and Its Aspects in Textile Industry

- Are adequate and operational fire prevention, protection, and containment facilities provided, and are they regularly tested and maintained?
- Would the fire containment systems (i.e., sprinklers, foam inlets, etc.) cause significant damage to stocks?
- What measures prevent staff pilferage of stock items?
- Are adequate staff provided to meet the operational demands of the organisation, and how does management determine and maintain the staffing requirements?
- Are staff aware of the required and safe handling techniques and how is this confirmed?
- Have management provided adequate and suitable protective equipment and clothing for staff, and how is its proper usage confirmed?
- How can management be sure that goods are stacked and stored safely?
- Are sufficient and adequate facilities provided for moving heavy items, and are staff aware of the correct use of such facilities?
- Are delicate items adequately protected during storage and when being moved?
- How is the accuracy of data input from other systems (i.e., stock control or Sales order processing) confirmed?
- How is data output to other systems (i.e., distribution) confirmed?

34) Foreign Exchange

- Review of foreign transactions for compliance with company policy / board mandates.
- Review of deal execution, confirmation and settlement.
- Review of deal capture in system and manual MIS.
- Review of settlements (cash/ hedge cancellation/ rollover cash flows/ delivery).
- Review of transaction documentation pertaining to foreign exchange.
- Checking of accounting for forex transactions.

35) Review Production Resources

- Review the system of monthly target setting process
 - a. Area wise (domestic and export)
 - b. Product mix wise
 - c. Sold / confirm order
 - d. Reliability of unsold program/ process of estimation/ achievement
 - e. Evaluation on market info as prices.
- Actual production laid and program change analysis
 - a. Change memo
 - b. Approval
 - c. Reason
 - d. Impact
- Analyze reason of efficiency losses
 - a. Utilisation%
 - b. Reason, corrective action
 - c. Review machine wise capacity utilization (under-load/idle run/idle lying)
 - d. Reason analysis of abnormality/ repetition.
- Review month wise usable and saleable waste (stage wise) and waste stock tally.
- Review month wise stage wise WIP stock movement.
- Standard lot size v/s actual lot size: Lot change / quality change / repeat lot / quality / frequency at each stage since mixing to spinning.

36) Packing cost analysis

- Compare Standard v/s actual packing cost per kg/meter
- Ensure that packing material quantity tally should be v/s actual.
 - on fresh packing
 - on re-packing (with reason)
- Wastage, sample packing, change in standard packing, etc.

Understanding of Audit Segment and Its Aspects in Textile Industry

- Free (sales promotion scheme): policy v/s actual.
- 37) Quality Issues- Complaint analysis**
- Customer complaints/claims management – process for recording customer complaints, classification, escalation mechanism, response time, follow up mechanism, pending customer complaints/ claims.
 - Analyse nature of Complaints, repetition of Complaints,
 - corrective Action taken on previous complaints.
 - Analyse cost of Complaint- (a) Claim Amount, (b) Settled Amount and (c) Loss of Customer.
- 38) Statutory Compliances**
- Verification of receipt/ acknowledgements for the payment of statutory dues like, Income tax, VAT, Central Sales Tax, WCT and Service Tax, etc.
 - Whether proper Cenvat/ Modvat credits are availed timely and there is adequate periodic inspection procedure for reviewing balances?
 - Whether statutory dues have been deposited in time and whether any penalty has been imposed on this account?
 - Verify reconciliation of recoveries and payment of statutory dues and other salary related deductions with financial Ledger.
 - Review of pending cases and show cause notice status, and whether timely submission/appeal have been made, wherever required.
 - In case of decision against the company, if company do not want to go into appeal against the order, appropriate note by competent authority supported by legal advice is recorded.
 - Whether in case of major appeals/ disputes with tax department. an approval of strategy is obtained from business heads?
 - Whether appropriate provision made, or shown as contingent liability
 - Whether checklist for statutory compliance in place and follow-up periodically (ideally monthly) by independent employees within the organization for verification of compliance.
 - Compliance to Companies Act and Other Applicable Laws (SEBI clause 49, RBI, Pollution control, Industrial Act, etc.) including the compliance of Standards on Internal Audit (SIA) 17 so far it relates to compliance of laws and regulations in internal audit.

- Does the legal counsel(s) periodically updates the management of implications and compliances requirements of laws and new legislations?

Conclusion

14.29 In this changing scenario, the role of internal auditor has become very crucial and important in discharging their duties properly and efficiently, particularly for timely detection of irregularities and lapse, which help in minimization of irregularities as well as prevention of frauds. For best results, internal auditors, who are given the task of substantive checking, must be fully abreast with the changes in functioning and operational activities of the entity at all levels and at all times.

The system of internal control is the plan of organization and all the methods and procedures adopted by the management of an entity to assist in achieving management's objectives of ensuring, as far as practicable, the orderly and efficient conduct of its business, including adherence to management policies, the safeguarding of assets, prevention and detection of fraud and error, the accuracy and completeness of the accounting records, and the timely preparation of the reliable financial information. The system of internal control extends beyond those matters which relate directly to the functions of the accounting systems.

The internal audit now-a-days is not limited to the audit of financial transaction but the audit of operational activity or operative audit. The review need to be made considering the operational procedure in the organization.

The internal auditor should apply analytical procedures as the risk assessment procedures at the planning and overall review stages of the internal audit.

14.30 An analytical approach need also to be made with respect to the following:

- Productivity
- Source and application of funds
- Cash generation
- Trends of profit and other financial growth
- Measurement of profitability
- Trend of cost structure

Understanding of Audit Segment and Its Aspects in Textile Industry

- Liquidity or working capital position
- Return on capital employed
- Whether there is over-trading
- Stock exchange quotation of shares for a number of years to examine the trends over a number of years so as to have a comparative study by teeing up with the facts and figures in Annual reports (stock Exchange Quotation are not presented in the Annual Reports in India)
- Dividend trends
- Return on investment
- Trends in the rate and quantum of dividends
- Yield potential
- Ploughing back of profits
- Inter-firm and intra-firm comparisons
- Management of corporate capital.

Part V
Concluding Internal Audit and
Reporting Audit Findings

Chapter 15

Concluding Internal Audit Procedures

15.1 The internal audit is concluded once all the internal audit procedures and checks are completed. The internal audit team leader should finally review the working papers to see that the internal audit has been conducted according to plan and it has achieved its objectives. He should make note of any audit procedures that could not be completed because records were not produced by the department or due to lack of time. It is time to decide finally whether all internal audit observations would find place in the report or some would be dropped in view of the department's reply. Team leader should check the supporting evidence for each observation that is proposed to be put in the report. He should satisfy himself about the sufficiency and relevance of the evidence. He should then prepare a draft report which will include his report on:

- Effectiveness of controls and any major/ minor weaknesses in them;
- Non-compliance with law, codes and government orders with assessment of possible loss; and
- Any matters relating to propriety of transactions.

The format of the draft report shall be same as final report and all the applicable quality checks equally hold good for draft report also except that the title of the report shall be "Draft Internal Audit Report".

Exit Conference

15.2 Internal auditor should seek appointment for an exit conference with preferably the head of the department once the final draft report is ready. A copy of the draft report should be given to the Read of the department at least a couple of days in advance so that he and his team have time to study it and prepare themselves for the meeting. The purpose of exit conference is to give the department an opportunity to place additional facts, its views, etc. on the internal audit findings.

Essentially, it is an opportunity for internal auditor to seek confirmation of facts given in the internal audit report and the department's views on the internal audit recommendations. If the exit conference takes place in right spirit, the internal audit report becomes an agreed document between the

department and the internal audit. Request for exit conference can be made through a formal letter to the management enclosing the draft audit report or by personally meeting the head of the department. The following should be the approach to the exit conference:

- Auditee department should be given opportunity to initiate the discussions and offer their views on the report;
- In case of disagreement, auditee department should be able to substantiate their views with supporting evidence; and
- Auditor may agree to reconsider his conclusions in the light of the information provided by the management.

A record of discussions of exit conference should be kept on file as a part of audit working papers. It is not necessary by for the department's representative to sign it. A copy of the record prepared internal auditor may be given to the department for their information. In case they disagree with any part of the record it is for the department to convey it to the internal auditor. The record helps document reasons for dropping any internal audit paragraph.

Reporting Audit Findings

15.3 Internal audit report is the final deliverable of audit process reflects the quality of audit. Hence, auditor should take utmost care in drafting the report. The internal auditor's report should contain a clear written expression of significant observations, suggestions/ recommendations based on the policies, processes, risks, controls and transaction processing taken as a whole and managements' responses. Standard on Internal Audit (SIA) 4 "Reporting" lays down the following basic elements of the Internal Audit Report:

- (i) **Title**– Report should have appropriate title. Titling the report as "Internal Audit Report" would be appropriate and helps in demarcating the report from other reports.
- (ii) **Addressee**– It should be addressed to the appropriate authority as mentioned in the charter. In case legal requirement arises to send internal audit report, it should be addressed to appropriate authority mentioned in the relevant law or regulation.
- (iii) **Executive Summary**– It should mention period covered under audit and mention that establishing appropriate internal controls and preparation

Concluding Internal Audit Procedures

of financial statement are the responsibilities of management and responsibility of internal auditor is to express opinion on efficiency of internal controls in achieving management objectives.

(iv) Scope paragraph– Nature of audit with reference to internal audit charter or engagement letter should be mentioned. Scope refers to terms of engagement, requirements under relevant legislation and applicable standards to be followed by the internal auditor. Internal auditor should mention scope with reference to control environment. The reader needs this as an assurance that the audit has been carried out in accordance with established standards.

(v) Audit Observations– A paragraph should give reference to the control environment and legal compliance required by the department in conducting its operations and should be supplemented by report of observations split into two sections along with auditor's opinion on effectiveness of controls. It should carry a statement that the opinions are based on audit work designed, performed to identify and check the material weaknesses in controls and observations are based on evidence collected.

15.4 Audit observations should be split into and separated for each section in the department, i.e., cash section, establishment section, engineering section etc. Within each section report should be split into

Part I A – Serious irregularities in which corrective action can be taken immediately e.g., minor changes in the current organization structure or introduction of a new MIS report for effective monitoring.

Part I B – Serious irregularities where corrective action need some time e.g., creation of a separate cell for monitoring quality/ appointment of a senior officer, etc.

(i) Follow-up Report: Status report of the follow-up actions taken by the department to the earlier report should be annexed.

(ii) Date of Report: Date of report is the date on which the report is signed. Significance of the date is that auditor has considered effect financial transactions on cut-off till the date of signing the report. This date in no case can be prior to the some important dates like of entry conference or date on which draft report is discussed with the management, etc.

(iii) Place of signature: Report should mention the location, which is city where audit report is signed.

(iv) Signature of the auditor: Report should be signed by appropriate

Technical Guide on Internal Audit of Textile Industry

authority in the audit department. Name of the officer and designation should be mentioned under the signature.

15.5 It is a good practice is to categorize audit findings by risk severity. A priority designation (High, Medium and Low) may be assigned to each of the key areas of focus detailed in the report based on auditors' assessment of the severity of the issue. The rating (High, Medium and Low) indicate the need for auditee to put priority focus which is as follows:

- **High** – Issue is high priority and should be given immediate attention and considered imperative to ensure that auditee is not exposed to high risks (i.e., failure to take action could result in major consequences and issues).
- **Medium** – Issue is medium priority and considered necessary to avoid exposure to significant risks (i.e., failure to take action could result in significant consequences).
- **Low** – Issue is not critical and considered desirable and should result in enhanced control or better value for money.

Another good practice is to classify possible causes of internal audit findings so that the auditee may address the causes of audit findings as follows:

Compliance	Failure to comply with prescribed regulations, rules and procedures.
Guidelines	Absence of written procedures to guide staff in the performance of their functions
Guidance	Inadequate or lack of supervision by supervisors.
Human error	Mistakes committed by staff entrusted to perform assigned functions.
Resources	Lack of or inadequate resources (funds, skills, staff, etc) to carry out an activity or function.

Following up Audit Report

15.6 Internal Audit Committee should set up a framework for effective follow-up.

Follow-up guidelines should be issued by them and checked independent of audit field work. The following are the indicative guidelines for effective monitoring:

Concluding Internal Audit Procedures

Action	Time frame
Issue of Draft Report to Head of the Department	Immediately on completion of field work
Exit conference	Within one week from issue of draft report
Issue of Final Audit Report	Within 10 days from exit conference
Action on I A irregularities	Within 20 days from the issue of final report
Action on I B irregularities	Within 6 months from the issue of final report
Action on other irregularities	Within 2 months from the issue of final report

Appendix

Abbreviation and Symbols
General Units

Amperes	A	Lu%	l%
Atmospheres	atm	Meters	m
Becquerels	Bq	Minutes	min
British Terminal Unit	Btu	Minutes of Arc	'
Calories	cal	Moles	mol
Candeles	cd	Newtons	N
Coulombs	C	Ohms	Ω
Degress Centrigate	°C	Ounces	oz
			oz/lin
Degrees Fahrenheit	°F	Ounces Per Linear Yarn	yd
Degress of Kelvin	K	Ounces Per Squard Yard	oz/yd ²
Degrees of Arc or Temperature	°	Parts Per Million	ppm
Denier	d	Pascals	Pa
Denier per Filament	d _{pf}	Pounds	lb
Farads	F	Pounds per Square Inch	psi
Feet	ft fl	Quarts	qt
Fluid Ounces	Oz	Radians	rad
Foot Pounds	ft-lb	Relative Humidity	RH
			rpm s
Gallons	gal	Revolutions per minute	or
Grains	gr	Seconds	sec
Grams	g	Simeans	S
Grams per Denier	g/d	Specific Gravity	sp gr
		Standards Cubic per Minute	scfm
Grams per Linear Meter	g/m	Steradians	sr
Grams per Liter	g/l		
	g/m ²	Teslas	T
Grams per Square Meter		Turns Per Inch	tpi
Grays	Gy	Turns per Meter	tpm
Henries	H	Variation	δ
Hertz	Hz	Wales % Courses	w % c
Horsepower		Warp % Filling	w % f
Hours		Watts	W
Inch-Pound		Webers	Wb
Inches		Yards	yd
Internsic Viscosity		Yards Per Minute	ypm
Joules			
Liters			
Lumens			

Abbreviation and Symbols (Continued)

Metric Prefixes

Mega-(10 ⁶)	M-
Kilo- (10 ³)	k-
Hecto -(10 ²)	h-
Deka-(10 ¹)	da-
Deci-(10 ⁻¹)	d-
Centi-(10 ⁻²)	c-
Milli-(10 ⁻³)	m-
Micro-(10 ⁻⁴)	μ-

Yarn Count

Cotton Count	c.c.
Jute Count	j.c.
Linen Lea	l.l.
Metric Count	m.c.
Te%	Te%
Wool Count	W
Woolen Count	w/c
Woolen Run	w.r.
Worsted Count	w.c.
Piled Yarn	= Single Denier/number of piles.,70/3 Single Denier/number of piles/number of cabled
Cable Yarn	= piles, e.g.,70/3/2
Filament Yarn	= Total denier/filament count, e.g., 70/36

Measures, Weights and Equivalents

Units	Multiply By:	To Get:	Multiply By:	To Get:
Linear Measures				
foot	x 0.3048	= meters	x 3.281	= foot
inches	x 2.54	= centimeters	x 0.3937	= inches
inches	x 25.4	= millimeters	x 0.03937	= inches
miles	x 1.6093	= kilometers	x 0.6214	= miles
mils	x 0.0254	= millimeters	x 39.37	= mils
yards	x 0.9144	= meters	x 1.0936	= yards
Area Measures				
foot ²	x 0.0929	= meters ²	x 10.764	= foot ²
foot ²	x 144	= inches ²	x 0.00695	= foot ²
inches ²	x 6.452	= centimeters ²	x 0.155	= inches ²
inches ²	x 645.16	= millimeters ²	x 0.00155	= inches ²
yards ²	x 0.8361	= meters ²	x 1.196	= yards ²
yards ²	x 9	= foot ²	x 0.111	= yards ²
yards ²	x 1296	= inches ²	x 0.00077	= yards ²
Volume				
foot ³	x 28.317	= liters	x 0.03531	= foot ³
foot ³	x 7.481	= gallons	x 0.1337	= foot ³
foot ³	x 29.92	= quarter (liquid)	x 0.0334	= foot ³
foot ³	x 0.02832	= meters	x 35.315	= foot ³
foot ³	x 1728	= inches ³	x 0.00058	= foot ³
fluid ounces	x 29.57	= millimetres	x 0.0338	= fluid ounces
fluid ounces	x 0.031	= quarter (liquid)	x 32	= fluid ounces
fluid ounces	x 29.57	= centimeters ³	x 0.0338	= fluid ounces
fluid ounces	x 1.805	= inches ³	x 0.554	= fluid ounces
gallons	x 3.7854	= liters	x 0.2642	= gallons
gallons	x 128	= fluid ounces	x 0.0078	= gallons
gallons	x 3785.4	= centimeters ³	x 0.00026	= gallons
gallons	x 231	= inches ³	x 0.00433	= gallons
inches ³	x 0.01639	= liters	x 61.024	= inches ³
inches ³	x 0.01732	= quarter	x 57.75	= inches ³

Technical Guide on Internal Audit of Textile Industry

			(liquid)			
inches ³	x 16.387	=	centimeters ³	x 0.06102	=	inches ³
inches ³	x 16387	=	millimeters ³	x 0.00006	=	inches ³
				1		
quarts (liquid)	x 0.94635	=	Liters	x 1.0567	=	quarts (liquid)
quarts (liquid)	x 946.4	=	centimeters ³	x 0.00106	=	quarts (liquid)
yards ³	x 764.5	=	Liters	x 0.0013	=	yards ³
yards ³	x 202	=	Gallons	x 0.00945	=	yards ³
yards ³	x 0.7646	=	meters ³	x 1.308	=	yards ³
yards ³	x 27	=	foot ³	x 0.037	=	yards ³

Mass

grains	x 0.0648	=	grams	x 15.43	=	grains
grains	x 0.00229	=	ounces	x 436.7	=	grains
ounces	x 28.35	=	grams	x 0.0353	=	ounces
pounds	x 0.4536	=	kilograms	x 2.2046	=	pounds
pounds	x 453.6	=	grams	x 0.0022	=	pounds

Force

kilograms (mass)	x 9.807	=	newtons	x 0.10197	=	kilograms (mass)
kilograms-force	x 2.2046	=	pounds-force	x 0.4536	=	kilograms-force
ounces-force	x 0.278	=	newtons	x 3.597	=	ounces-force
pounds-force	x 4.448	=	newtons	x 0.2248	=	pounds-force

Energy or Work

Btm	x 1055	=	joules	x 0.000948	=	Btm
Btm	x 778	=	foot-pounds	x 0.00129	=	Btm
calories	x 4.187	=	joules	x 0.2388	=	calories
foot-pounds	x 1.3558	=	joules	x 0.7376	=	foot-pounds
watt-hours	x 3600	=	joules	x 0.0002778	=	watt-hours
watt-hours	x 2655	=	foot-pounds	x 0.0003766	=	watt-hours

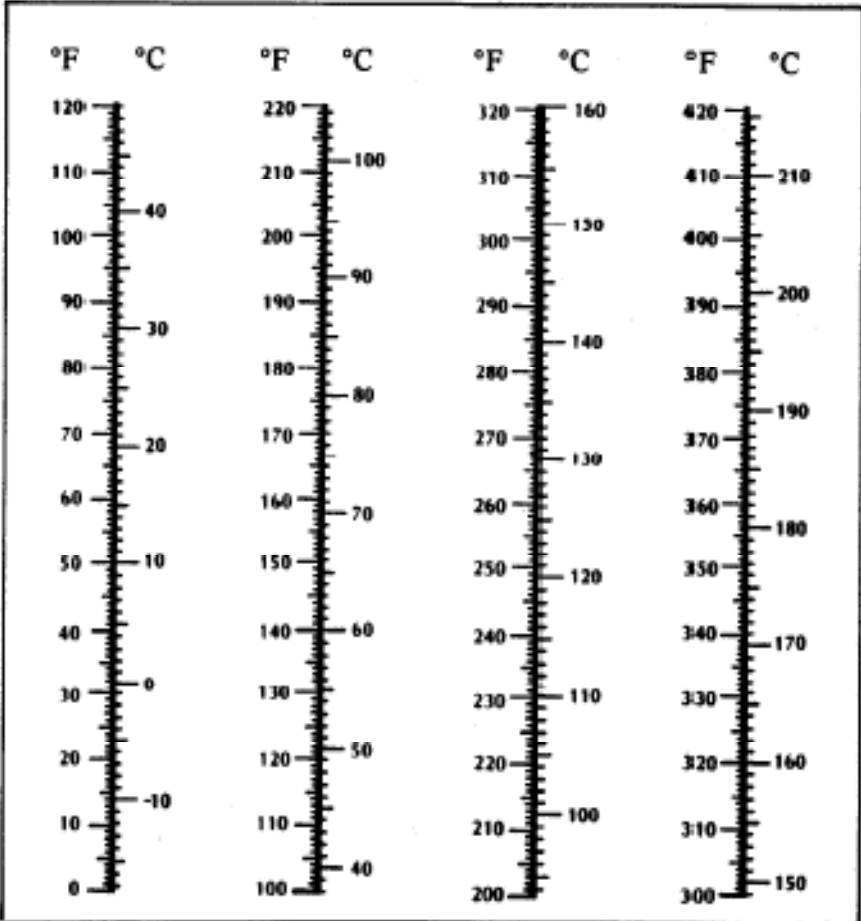
Pressure or Stress

atmospheres	x 101.3	=	kilopascals	x 0.00987	=	atmospheres
-------------	---------	---	-------------	-----------	---	-------------

Appendix

atmospheres	x	760	=	mm Hg (0 °C)	x	0.00132	=	atmospheres
atmospheres	x	29.92	=	inches Hg (0 °C)	x	0.0334	=	atmospheres
atmospheres	x	406.8	=	inches H ₂ O (4 °C)	x	0.00246	=	atmospheres
atmospheres	x	14.7	=	pounds per square inch	x	0.068	=	atmospheres
inches Hg (0 °C)	x	3.383	=	kilopascals	x	0.2956	=	inches Hg (0 °C)
inches Hg (0 °C)	x	0.491	=	pounds per square inch	x	2.037	=	inches Hg (0 °C)
inches H ₂ O (4 °C)	x	0.249	=	kilopascals	x	4.016	=	inches H ₂ O (4 °C)
inches H ₂ O (4 °C)	x	0.036	=	pounds per square inch	x	27.78	=	inches H ₂ O (4 °C)
mm Hg (0 °C)	x	0.134	=	kilopascals	x	7.46	=	mm Hg (0 °C)
mm Hg (0 °C)	x	0.019	=	pounds per square inch	x	52.6	=	mm Hg (0 °C)
mm Hg (0 °C)	x	13.596	=	kilogram per square meter	x	0.073551	=	mm Hg (0 °C)
mm Hg (0 °C)	x	1.3596	=	grams per square centimeter	x	0.73551	=	mm Hg (0 °C)
pounds per square inch	x	6.895	=	kilopascals	x	0.145	=	pounds per square inch
torrs	x	1.0	=	mm Hg (0 °C)	x	1.0	=	torrs
Powers								
horsepower	x	0.746	=	kilowatts	x	1.34	=	horsepower
horsepower	x	33000	=	ft-lbf/min	x	0.00003	=	horsepower
ft-lbf/min	x	0.0226	=	watts	x	44.25	=	ft-lbf/min

TEMPERATURE CONVERSION CHART
Fahrenheit ↔ Centigrate



**SPECIFIC GRAVITY AND MOISTURE CONTENT OF
COMMON NATURAL AND MANUFACTURED FIBERS
(70° F*, 65% Relative Humidity)**

Fiber	Specific Gravity	Moisture Content
Acrylict	1.15	1 -2
Cellulose Acetate	1.32	6
Cellulose Triacetatet	1.25	2.5 - 4.5
Cotton	1.54	7 (commercial = 8.5)
Glasst	2.54	0
Polyamidet (nylon 6 and nylon 66)	1.14	4.1 - 4.5
Polyestert	1.38	0.4 - 0.5
Polyethylenet	0.92	0
Polypropylenet	0.90	0
Polyurethanet	1.21	1.0 -1.5
Polyvinyl Chloridet	1.38	0 - 1
Polyvinylideme Chloridet	1.70	0
Proteint	1.25	10 - 18
Silk	1.37	9
Viscose Rayon	1.51	13
Wool	1.32	13-15

*21°C

* Average of commercial hands

Technical Guide on Internal Audit of Textile Industry

YARN NUMBER CONVERSION TABLE

Yarn Per Pound	Wool Runs (1600 yd per lb)	Cotton Count (840 yd per lb)	Worsted Count (840 yd per lb)	Metric Count (1000 m per kg)	Linen Count (300 yd per lb)	Grains per 100 Yards	Denier (g per 9000 m)	Tex (g per 1000 m)
300	0.188	0.357	0.536	0.605	1.000	2,333	14,882	1,654
372	0.233	0.443	0.664	0.750	1.240	1,882	12,000	1,333
447	0.279	0.532	0.798	0.901	1.390	1,566	10,000	1,111
560	0.350	0.667	1.000	1.129	1.867	1,250	7,972	885.2
600	0.375	0.714	1.071	1.210	2.000	1,167	7,441	826.7
840	0.525	1.000	1.500	1.694	2.800	833.3	5,315	590.5
1,120	0.700	1.333	2.000	2.258	3.733	625.0	3,986	442.9
1,600	1.000	1.905	2.857	3.226	5.333	437.5	2,790	310.0
1,680	1.050	2.000	3.000	3.388	5.600	416.7	2,658	295.3
2,030	1.269	2.417	3.625	4.093	6.767	344.9	2,200	244.4
2,232	1.395	2.657	3.986	4.500	7.440	313.6	2,000	222.2
2,240	1.400	2.667	4.000	4.516	7.467	312.5	1,994	221.6
2,520	1.575	3.000	4.500	5.081	8.400	277.8	1,771	96.8
2,800	1.750	3.333	5.000	5.645	9.333	250.0	1,595	77.2
3,200	2.000	3.810	5.714	6.452	10.67	218.8	1,395	155.0
3,360	2.100	4.000	6.000	6.774	11.20	208.3	1,328	147.6
4,060	2.538	4.833	7.250	8.183	13.53	172.4	1,100	22.2
4,200	2.625	5.000	7.500	8.468	14.00	166.7	1,063	118.1
4,211	2.632	5.013	7.520	8.490	14.04	166.2	1,060	117.8
4,464	2.790	5.315	7.971	9.000	14.88	156.8	1,000	111.1
4,480	2.800	5.333	8.000	9.032	14.93	156.3	996.5	110.7
4,699	2.937	5.594	8.391	9.474	15.67	149.0	950.1	105.6
4,800	3.000	5.714	8.571	9.677	16.00	145.8	930.1	103.3
4,960	3.100	5.905	8.857	10.00	16.53	141.1	900.1	100.0
5,040	3.150	6.000	9.000	10.16	16.80	138.9	885.8	98.4
5,252	3.282	6.253	9.378	10.59	17.51	133.3	850.0	94.4
5,581	3.488	6.644	9.966	11.25	18.60	125.4	800.0	88.9
5,600	3.500	6.667	10.00	11.29	18.67	125.0	797.2	88.6
5,880	3.675	7.000	10.50	11.86	19.60	119.0	759.3	84.3
5,953	3.721	7.087	10.63	12.00	19.84	117.6	750.0	83.3
6,160	3.850	7.333	11.00	12.42	20.53	113.6	724.8	80.6
6,378	3.986	7.593	11.39	12.86	21.26	109.8	700.0	77.8
6,400	4.000	7.619	11.43	12.90	21.33	109.4	697.6	77.6
6,720	4.200	8.000	12.00	13.55	22.40	104.2	664.4	73.9
6,869	4.293	8.177	12.27	13.85	22.90	101.9	650.0	72.2

Appendix

7,280	4.550	8.667	13.00	14.68	24.27	96.16	613.3	68.1
7,440	4.650	8.857	13.29	15.00	24.80	94.09	600.0	66.7
7,560	4.725	9.000	13.50	15.24	25.20	92.59	590.5	65.7
7,840	4.900	9.333	14.00	15.81	26.13	89.29	569.5	63.2
8,000	5.000	9.524	14.29	16.13	26.67	87.50	558.1	62.0
8,117	5.073	9.663	14.49	16.37	27.06	86.24	550.0	61.1
8,400	5.250	10.00	15.00	16.94	28.00	83.33	531.5	59.0
8,929	5.581	10.63	15.94	18.00	29.76	78.40	500.0	55.6
8,960	5.600	10.67	16.00	18.06	29.87	78.13	498.3	55.4
9,000	5.625	10.71	16.07	18.15	30.00	77.78	496.1	55.1
9,240	5.775	11.00	16.50	18.63	30.80	75.76	483.2	53.7
9,300	5.813	11.07	16.61	18.75	31.00	75.27	480.0	53.3
9,520	5.950	11.33	17.00	19.19	31.73	73.53	469.0	52.1
9,600	6.000	11.43	17.14	19.35	32.00	72.92	465.1	51.7
9,900	6.188	11.79	17.68	19.96	33.00	70.71	451.0	50.1
9,921	6.200	11.81	17.72	20.00	33.07	70.56	450.0	50.0
10,080	6.300	12.00	18.00	20.32	33.60	69.45	442.9	49.2
10,200	6.375	12.14	18.21	20.56	34.00	67.07	437.7	48.6
10,500	6.563	12.50	18.75	21.17	35.00	66.67	425.2	47.2
10,640	6.650	12.67	19.00	21.45	35.47	65.79	419.6	46.6
10,800	6.750	12.86	19.39	21.77	36.00	64.82	413.4	45.9
10,920	6.825	13.00	19.50	22.02	36.40	64.10	408.8	45.4
11,160	6.975	13.29	19.93	22.50	37.20	62.72	400.0	44.4
11,200	7.000	13.33	20.00	22.58	37.33	62.50	398.6	44.2
11,400	7.125	13.57	20.36	22.98	38.00	61.40	391.6	43.5
11,760	7.350	14.00	21.00	23.73	39.20	59.47	379.3	42.1
12,000	7.500	14.05	21.08	23.80	40.00	59.31	378.3	42.0
12,400	7.750	14.76	22.14	25.00	41.33	56.45	360.0	40.0
12,600	7.875	15.00	22.50	25.40	42.00	55.56	354.3	39.3
12,760	7.975	15.19	22.73	25.73	42.53	54.86	350.0	38.9
12,800	8.000	15.24	22.86	25.81	42.67	54.69	348.8	38.8
12,880	8.050	15.33	23.00	25.97	42.93	54.35	346.6	38.5
13,200	8.250	15.71	23.57	26.61	44.00	53.03	338.2	37.6
13,440	8.400	16.00	24.00	27.10	44.80	52.08	332.2	36.9
13,500	8.438	16.07	24.11	27.22	45.00	51.85	330.7	36.7
14,000	8.750	16.67	25.00	28.23	46.67	50.00	318.9	35.4
14,280	8.925	17.00	25.50	28.79	47.60	49.02	312.6	34.7
14,400	9.000	17.14	25.71	29.03	48.00	48.61	310.0	34.4
14,560	9.100	17.33	26.00	29.35	48.53	48.08	306.6	34.0
14,880	9.300	17.71	26.57	30.00	49.60	47.04	300.0	33.3
15,120	9.450	18.00	27.00	30.48	50.40	46.30	295.3	32.8
15,300	9.563	18.21	27.32	30.85	51.00	45.75	291.8	32.4

Technical Guide on Internal Audit of Textile Industry

15,680	9.800	18.67	28.00	31.61	52.27	44.64	284.7	31.6
15,960	9.975	19.00	28.50	32.18	53.20	43.86	279.7	31.0
16,000	10.00	19.05	28.57	32.26	53.33	43.75	279.0	31.0
16,240	10.15	19.33	29.00	32.74	54.13	43.10	274.9	30.5
16,500	10.31	19.64	29.46	33.27	55.00	42.43	270.6	30.0
16,800	10.50	20.00	30.00	33.87	56.00	41.67	265.7	29.5
17,100	10.69	20.36	30.54	34.48	57.00	40.94	261.1	29.0
17,360	10.85	20.67	31.00	35.00	57.87	40.32	257.2	28.6
17,600	11.00	20.95	31.43	35.48	58.67	39.77	253.7	28.1
17,860	11.16	21.26	31.89	36.00	59.53	39.19	250.0	27.8
17,920	11.20	21.33	32.00	36.13	59.73	39.06	249.1	27.7
18,480	11.55	22.00	33.00	37.26	61.60	37.88	241.6	26.8
18,600	11.63	22.14	33.21	37.50	62.00	37.64	240.0	26.7
19,040	11.90	22.67	34.00	38.39	63.47	36.76	234.5	26.0
19,200	12.00	22.86	34.29	38.71	64.00	36.46	232.5	25.8
19,500	12.19	23.21	34.82	39.32	65.00	35.90	228.9	25.4
19,600	12.25	23.33	35.00	39.52	65.33	35.71	227.8	25.3
20,160	12.60	24.00	36.00	40.65	67.20	34.72	221.5	24.6
20,400	12.75	24.29	36.43	41.13	68.00	34.31	218.8	24.3
20,800	13.00	24.76	37.14	41.94	69.33	33.65	214.6	23.8
21,000	13.13	25.00	37.50	42.34	70.00	33.33	212.6	23.6
21,280	13.30	25.33	38.00	42.90	70.93	32.90	209.8	23.3
21,840	13.65	26.00	39.00	44.03	72.80	32.05	204.4	22.7
22,320	13.95	26.57	39.86	45.00	74.40	31.36	200.0	22.2
22,400	14.00	26.67	40.00	45.16	74.67	31.25	199.3	22.1
23,520	14.70	28.00	42.00	47.42	78.40	29.76	189.8	21.0
24,640	15.40	29.33	44.00	49.68	82.13	28.41	181.2	20.1
24,800	15.50	29.53	44.29	50.00	82.67	28.23	180.0	20.0
25,200	15.75	30.00	45.00	50.81	84.00	27.78	177.2	19.7
25,760	16.10	30.67	46.00	51.94	85.87	27.17	173.3	19.2
26,260	16.41	31.27	46.90	52.94	87.53	26.66	170.0	18.9
26,880	16.80	32.00	48.00	54.19	89.60	26.04	166.1	18.4
27,200	17.00	32.38	48.57	54.84	90.67	25.74	164.1	18.2
27,720	17.33	33.00	49.50	55.89	92.40	25.25	161.1	17.9
28,000	17.50	33.33	50.00	56.45	93.33	25.00	159.4	17.7
28,560	17.85	34.00	51.00	57.58	95.20	24.51	156.3	17.3
28,800	18.00	34.29	51.43	58.06	96.00	24.31	155.0	17.2
29,760	18.60	35.43	53.14	60.00	99.20	23.52	150.0	16.7
30,000	18.75	35.71	53.57	60.48	100.0	23.33	148.8	16.5
30,400	19.00	36.19	54.29	61.29	101.3	23.03	146.9	16.3
32,000	20.00	38.10	57.14	64.52	106.7	21.88	139.5	15.5
32,480	20.30	38.67	58.00	65.49	108.3	21.55	137.5	15.2

Appendix

33,600	21.00	40.00	60.00	67.74	112.0	20.83	132.9	14.8
34,440	21.53	41.00	61.50	69.44	114.8	20.33	129.6	14.4
34,720	21.70	41.33	62.00	70.00	115.7	20.16	128.6	14.2
35,840	22.40	42.67	64.00	72.26	119.5	19.53	124.6	13.8
36,000	22.50	42.86	64.29	72.58	120.0	19.44	124.0	13.8
36,800	23.00	43.81	65.71	74.19	122.7	19.02	121.3	13.4
37,200	23.25	44.29	66.43	75.00	124.0	18.82	120.0	13.3
38,080	23.80	45.33	68.00	76.78	126.9	18.38	117.2	13.0
39,200	24.50	46.67	70.00	79.03	130.7	17.86	113.9	12.6
40,320	25.20	48.00	72.00	81.29	134.4	17.36	110.7	12.3
42,000	26.25	50.00	75.00	84.68	140.0	16.67	106.3	11.8
44,640	27.90	53.15	79.71	90.00	148.8	15.68	100.0	11.1
45,920	28.70	54.67	82.00	92.58	153.1	15.24	97.22	10.8
47,040	29.40	56.00	84.00	94.84	156.8	14.88	94.91	10.5
49,600	31.00	59.05	88.58	100.0	165.3	14.11	90.00	10.0
50,400	31.50	60.00	90.00	101.6	168.0	13.89	88.58	9.84
53,760	33.60	64.00	96.00	108.4	179.2	13.02	83.05	9.22
55,800	34.88	66.43	99.65	112.5	186.0	12.54	80.00	8.88
58,800	36.75	70.00	105.0	118.6	196.0	11.90	75.93	8.43
59,530	37.21	70.87	106.3	120.0	198.4	11.76	75.00	8.33
61,600	38.50	73.33	110.0	124.2	205.3	11.36	72.48	8.05
63,780	39.86	75.93	113.9	128.6	212.6	10.98	70.00	7.77
64,000	40.00	76.19	114.3	129.0	213.3	10.94	69.76	7.75
67,200	42.00	80.00	120.0	135.5	224.0	10.42	66.44	7.38
74,410	46.51	88.58	132.9	150.0	248.0	9.407	60.00	6.66
75,600	47.25	90.00	135.0	152.4	252.0	9.259	59.05	6.56
81,170	50.73	96.63	144.9	163.6	270.0	8.624	55.00	6.11
84,000	52.50	100.0	150.5	169.4	280.0	8.333	53.15	5.90
89,290	55.81	106.3	159.5	180.0	297.6	7.840	50.00	5.55
92,400	57.75	110.0	165.0	186.3	308.0	7.576	48.32	5.36
97,440	60.90	116.0	174.0	196.5	324.8	7.184	45.82	5.09
99,210	62.01	118.1	177.2	200.0	330.7	7.056	45.00	5.00
1,00,800	63.00	120.0	180.0	203.2	336.0	6.945	44.29	4.92
1,11,600	69.75	132.9	199.4	225.0	372.0	6.272	40.00	4.44
1,48,800	93.00	177.1	265.7	300.0	496.0	4.704	30.00	3.33
2,23,200	139.50	265.7	398.6	450.0	744.0	3.136	20.00	2.22
4,46,500	279.10	531.5	797.3	900.0	1,488.0	1.568	10.00	1.11

Technical Guide on Internal Audit of Textile Industry

Yarn Number Conversion Formulas

Yarn Number System	Cotton Count	Denier	Worsted Count	Wool Count	Linen Lea	Woolen Cut
Cotton Count	—	$\frac{5,315}{c.c.}$	$c.c. \times 1.50$	$c.c. \times 52.5$	$c.c. \times 2.80$	$c.c. \times 2.80$
Denier	$\frac{5,315}{d}$	—	$\frac{7,972}{d}$	$\frac{279,030}{d}$	$\frac{14,880}{d}$	$\frac{14,880}{d}$
Worsted Count	$\frac{w.c.}{1.50}$	$\frac{7,972}{w.c.}$	—	$w.c. \times 35.0$	$w.c. \times 1.867$	$w.c. \times 1.867$
Wool Count	$\frac{w}{52.50}$	$\frac{279,030}{w}$	$\frac{w}{35.0}$	—	$\frac{w}{18.75}$	$\frac{w}{18.75}$
Linen Lea	$\frac{ll}{2.80}$	$\frac{14,880}{ll}$	$\frac{ll}{1.867}$	$ll \times 18.75$	—	same
Woolen Cut	$\frac{w/c}{2.80}$	$\frac{14,880}{w/c}$	$\frac{w/c}{1.867}$	$w/c \times 18.75$	same	—
Woolen Run	$\frac{w.r.}{0.575}$	$\frac{2,800}{w.r.}$	$\frac{w.r.}{0.350}$	$w.r. \times 100$	$w.r. \times 5.33$	$w.r. \times 5.33$
Jute Count	$\frac{17.14}{j.c.}$	$j.c. \times 310$	$\frac{25.71}{j.c.}$	$\frac{900}{j.c.}$	$\frac{48.0}{j.c.}$	$\frac{48.0}{j.c.}$
Metric Count	$m.c. \times 0.5905$	$\frac{9,000}{m.c.}$	$\frac{m.c.}{1.129}$	$m.c. \times 31.00$	$\frac{m.c.}{0.605}$	$\frac{m.c.}{0.605}$
Grains/120 Yards	$\frac{1000}{gr/120 yd}$	$\frac{gr/120 yd}{0.1881}$	$\frac{1,500}{gr/120 yd}$	$\frac{52,500}{gr/120 yd}$	$\frac{2,800}{gr/120 yd}$	$\frac{2,800}{gr/120 yd}$
Tex	$\frac{590.5}{tex}$	$\frac{tex}{0.1111}$	$\frac{885.8}{tex}$	$\frac{31,000}{tex}$	$\frac{1,654}{tex}$	$\frac{1,654}{tex}$

Yarn Number Conversion Formulas (*continued*)

Yarn Number System	Woolen Run	Jute Count	Metric Count	Grains/120 Yards	Tex
Cotton Count	$c.c. \times 0.525$	$\frac{17.14}{c.c.}$	$cc \times 1.693$	$\frac{1,000}{c.c.}$	$\frac{590.5}{c.c.}$
Denier	$\frac{2,800}{d}$	$d \times 0.003225$	$\frac{9,000}{d}$	$d \times 0.1881$	$d \times 0.1111$
Worsted Count	$w.c. \times 0.350$	$\frac{25.71}{w.c.}$	$w.c. \times 1.129$	$\frac{1,500}{w.c.}$	$\frac{885.6}{w.c.}$
Wool Count	$\frac{w}{100}$	$\frac{900}{w}$	$\frac{w}{31.0}$	$\frac{52,500}{w}$	$\frac{30,975}{w}$
Linen Lea	$\frac{l.l.}{5.33}$	$\frac{48.0}{l.l.}$	$l.l. \times 0.605$	$\frac{2,800}{l.l.}$	$\frac{1,654}{l.l.}$
Woolen Cut	$\frac{w/c}{5.33}$	$\frac{48.0}{w/c}$	$w/c \times 0.605$	$\frac{2,800}{w/c}$	$\frac{1,654}{w/c}$
Woolen Run	—	$\frac{9.0}{w.r.}$	$\frac{w.r.}{0.31}$	$\frac{525.0}{w.r.}$	$\frac{310.0}{w.r.}$
Jute Count	$\frac{9.0}{j.c.}$	—	$\frac{29.03}{j.c.}$	$j.c. \times 38.33$	$j.c. \times 34.45$
Metric Count	$m.c. \times 0.310$	$\frac{29.03}{m.c.}$	—	$\frac{1,693}{m.c.}$	$\frac{1,000}{m.c.}$
Grains/120 Yards	$\frac{525.0}{gr/120\ yd}$	$\frac{gr/120\ yd}{38.33}$	$\frac{1,693}{gr/120\ yd}$	—	$gr/120\ yd \times 0.5905$
Tex	$\frac{310.0}{tex}$	$\frac{tex}{34.45}$	$\frac{1,000}{tex}$	$\frac{tex}{0.5905}$	—

Technical Guide on Internal Audit of Textile Industry

Calculations for Fabric Weight

For Yards per Pound*:

- a)
$$\frac{\text{Total yards}}{\text{Net weight in pounds}}$$
- b)
$$\frac{16}{\text{Ounces per linear yard}}$$
- c)
$$\frac{\text{Total Yards}}{\text{Ounces}} \times 16$$
- d)
$$\frac{\text{Square inch weighted}}{\text{Weight in grams (width)}} \times 12.60$$
- e)
$$\frac{\text{Square inch weighted}}{\text{Weight in grams (width)}} \times 194.4$$
- f) 12-inch square sample weighted in grains =
$$\frac{27,993.6}{\text{Grains x width}}$$
- g) 8-inch square sample weighted in grains =
$$\frac{12,441.6}{\text{Grains x width}}$$
- h)
$$\frac{576}{\text{Width (Ounces per square yard)}}$$

*yd/lb x 2.016 = m/kg

For Ounces per Square yard:

- a)
$$\frac{\text{Weight in pounds(16) (36)}}{\text{Yards (width)}}$$
- b)
$$\frac{\text{Weight in ounces (36)}}{\text{Yards (width)}} = \text{Ounces per linear yard} * (36/\text{width})$$
- c)
$$\frac{576}{\text{Width (yard per pound)}}$$
- d)
$$\frac{\text{Grams weight in sample}}{\text{Square inch weighed}} \times 45.72$$

- e) $\frac{\text{Grains weight of sample}}{\text{Square inch weighed}} \times 2.9622$
 - f) 8-inch square used: Grain weight x 0.04628
 - g) 12-inch square used: Grain weight x 0.02057
 - h) 8-inch square used: Gram weight x 0.7144
 - i) 12-inch square used: Gram weight x 0.3175
- *oz/yd² x 0.03391 = kg/m²

For Ounces per Linear Yard:

- a) $\frac{\text{Weight in Ounces}}{\text{Yards weighed}}$
- b) $\frac{16}{\text{Yards per pound}}$
- c) Ounces per square yard (Width/36)
- d) $\frac{\text{Weight in grams (width)}}{\text{Square inch weighed}} \times 1.270$
- e) $\frac{\text{Weight in grains (width)}}{\text{Square inch weighed}} \times 0.0823$

Stress-Strain Calculations

For tenacity at break:

$$\frac{\text{Gram load at break}}{\text{Denier}} = \text{tenacity (g/d)}$$

For tenacity at elongation:

$$\frac{\text{Gram load at given elongation}}{\text{Denier}} = \text{tenacity (g/d)}$$

For elongation at break:

$$\frac{\text{Length at break} - \text{original length}}{\text{Original length}} \times 100 = \% \text{ elongation}$$

For elongation at any load:

$$\frac{\text{Length at given load} - \text{original length}}{\text{Original length}} \times 100 = \% \text{ elongation}$$

For elastic limit:

$$\frac{\text{Gram load at yield point}}{\text{Denier}} = \text{yield stress (g/d)}$$

$$\frac{\text{Elongation at yield point}}{\text{Original length}} \times 100 = \% \text{ yield strain}$$

For average stiffness per unit elongation (resistance to deformation):

$$\frac{\text{Gram load at break} \times 100}{\text{Denier} \times \% \text{ elongation}} = \text{average stiffness (g/d)}$$

For toughness index (work to break):

$$\frac{\text{Gram load at break} \times \% \text{ elongation at break}}{2(\text{Denier}) \times 100} = \text{toughness index (g. cm/ d. cm)}$$

For energy to break:

$$\text{Breaking strength (lb)} \times \text{elongation (in.)} = \text{energy to break (lb . in)}$$

Textile Moisture Calculations

For moisture content:

$$\frac{\text{Original wt.} - \text{Dry wt.} \times 100}{\text{Original wt.}} = \% \text{moisture content}$$

For moisture regain:

$$\frac{\text{Original wt.} - \text{Dry wt.} \times 100}{\text{Dry wt.}} = \% \text{moisture regain}$$

To determine moisture regain of blends:

$$\frac{\% \text{ Fiber A} \times \text{Ra} + (\% \text{ Fiber B} \times \text{Rb}) + \dots}{\% \text{ Fiber A} + \% \text{ Fiber B} + \dots} = \% \text{ regain of blend}$$

Where: Ra= Commercial regain of Fiber A
Rb= Commercial regain of Fiber B

Wet Processing Calculations

To convert from grams per liter to percent on weight of fiber:

$$\frac{\text{Liquor ratio}}{10} \times \text{g/l} = \% \text{owf}$$

To convert percent on weight of fiber to grams per liter:

$$\frac{\% \text{ owf} \times 10}{\text{Liquor ratio}} = \text{g/l}$$

For percent wet weight of Fabric:

$$\frac{\text{Wet wt.} - \text{Dry wt.} \times 100}{\text{Dry wt.}} = \% \text{ wet wt.}$$

For percent wet pickup of Fabric:

$$\% \text{ Wet wt.} - \% \text{ Dry wt.} = \% \text{ wet pickup}$$

For percent dry solids add-on on fabric weight:

$$\% \text{ Solids content of liquid} \times \% \text{ wet pickup} = \% \text{ Solids add-on}$$

Weaving Guides

Diameters of Spun Yarns of Different Cotton Counts

Cotton Count	Diameter(in.)	Diameter(mm.)
80	0.00427	0.108
75	0.00433	0.110
70	0.00456	0.116
65	0.00474	0.120
60	0.00495	0.126
55	0.00521	0.132
50	0.00540	0.137
48	0.00554	0.141
46	0.00565	0.144
44	0.00577	0.146
42	0.00588	0.149
40	0.00606	0.154
38	0.00616	0.156
36	0.00636	0.162
34	0.00657	0.167
32	0.00675	0.171
30	0.00700	0.178
28	0.00724	0.184
26	0.00751	0.190
24	0.00781	0.198
22	0.00813	0.206
20	0.00841	0.215
19	0.00876	0.222
18	0.00900	0.229
17	0.00926	0.235
16	0.00957	0.243
15	0.00990	0.251
14	0.0102	0.259
13	0.0106	0.269
12	0.0110	0.279
11	0.0115	0.292

Appendix

Cotton Count	Diameter(in.)	Diameter(mm.)
10	0.0120	0.305
9	0.0126	0.320
8	0.0135	0.343
7	0.0145	0.368
6	0.0156	0.396
5	0.0171	0.434
4	0.0191	0.485
3	0.0221	0.561
2	0.0274	0.696
1	0.0382	0.970

Technical Guide on Internal Audit of Textile Industry

Weaving Guides (*continued*)
Loom Reed Air Space

Reed Dent	50% Air Space		55% Air Space		60% Air Space	
	In.	mm.	In.	mm.	In.	mm.
10	0.0500	1.270	0.0550	1.397	0.0600	1.524
13	0.0385	0.978	0.0423	1.074	0.0462	1.173
15	0.0334	0.848	0.0367	0.932	0.0400	1.016
17	0.0294	0.747	0.0324	0.823	0.0353	0.897
20	0.0250	0.635	0.0275	0.698	0.0300	0.762
21	0.0238	0.604	0.0262	0.665	0.0286	0.726
23	0.0218	0.554	0.0239	0.607	0.0261	0.663
25	0.0200	0.508	0.0220	0.559	0.0240	0.610
26	0.0192	0.488	0.0211	0.536	0.0231	0.587
28	0.0179	0.455	0.0197	0.500	0.0214	0.544
30	0.0166	0.422	0.0183	0.465	0.0200	0.508
31	0.0161	0.409	0.0177	0.450	0.0193	0.490
34	0.0147	0.373	0.0162	0.411	0.0177	0.450
35	0.0143	0.363	0.0157	0.399	0.0171	0.434
36	0.0139	0.353	0.0153	0.389	0.0167	0.424
38	0.0132	0.335	0.0145	0.368	0.0158	0.401
40	0.0125	0.318	0.0137	0.348	0.0150	0.381
42	0.0119	0.302	0.0131	0.333	0.0143	0.363
44	0.0114	0.290	0.0128	0.325	0.0136	0.345
45	0.0111	0.282	0.0122	0.310	0.0133	0.338
47	0.0106	0.269	0.0117	0.297	0.0128	0.325
50	0.0100	0.254	0.0110	0.279	0.0120	0.305
53	0.0094	0.239	0.0104	0.264	0.0113	0.287
55	0.0091	0.231	0.0100	0.254	0.0109	0.277
57	0.0088	0.224	0.0096	0.244	0.0105	0.267
60	0.0084	0.213	0.0092	0.234	0.0100	0.254
61	0.0082	0.208	0.0090	0.229	0.0098	0.249
62	0.0081	0.206	0.0089	0.226	0.0097	0.246
65	0.0077	0.196	0.0085	0.216	0.0092	0.234

Unit of Measures & Section wise formulas- Spinning
Conversion of Weight units

➤ 1kg = 2.2046 lbs
➤ 1kg = 1000 grams
➤ 1gm = 15.432 grains
➤ 1lbs = 453.6 grams
➤ 1lbs = 16 oz
➤ 1lbs = 7000 grains
➤ 1grain = 0.0029 oz
➤ 1oz = 437.50 grains
➤ 1penny = 24 grains
➤ 1ton = 2204.6 lbs
➤ 1bundle = 10 lbs
➤ 1bag = 100 lbs
➤ 1mund = 40 kg
➤ 1mund = 88.18 lbs

Conversion of length units

➤ 1m = 1.0936 yards
➤ 1m = 39.37 inches
➤ 1m = 100 cm
➤ 1m = 1000 mm
➤ 1cm = 10 mm
➤ 1yard = 36 inches
➤ 1yard = 0.9144 meter
➤ 1yard = 91.44 cm
➤ 1ft = 12 cm
➤ 1ft = 30.48 mm
➤ 1hank = 840 yards

Technical Guide on Internal Audit of Textile Industry

Moisture Relation for Textile Materials

➤	M.R = $w/D*100$
➤	M.C = $w/w+D*100 = w/W*100$
➤	M = $R/(1+R/100)$
➤	C.C.W = $D * (100+R/100)$
➤	D = $C.C.W *(100/100+R\%)$
➤	C.C.W = $D+R\%$
➤	C.C.W = $D+(D*R/100)$
➤	Dm = $(\sqrt{D1 + D2 + D3})^2$
➤	Volume of air = area (feet sq) * liner speed (ft/min)
➤	Pm = $CA + CB/WA + WB = PAWA + PAWB/WA + WB$

Blow Room & Carding Section

➤	Cleaning Efficiency = trash removed/total trash fed *100
➤	Efficiency = $tr/tf * 100 = tf-tr/tf * 100$
➤	Waste = trash + lint
➤	Waste Extracted = weight fed * waste%
➤	Waste Extracted = weight fed – weight delivered
➤	Weight Delivered = weight fed - waste extracted
➤	Weight Delivered = weight fed * (100 – w/100)
➤	Weight Fed = weight delivered * (100/100 – w)
➤	Lap length (directly proportional) lap change wheel
➤	Lap length = lap length constant * lap length constant wheel
➤	Beats/min = rpm of beater * number of strikers
➤	Beats/inch = beats per minute/feeding rate (inches/min)
➤	Beats Constant = beats/inch * rpm of paddle roller
➤	Beats Constant = beat per minute/feeding rate
➤	Efficiency = actual production/calculated production * 100
➤	Actual production = calculated production * efficiency
➤	Actual production = weight of lap(lbs) * number of lap/hr
➤	M.D = s.s of shell roller/s.s of paddle roller

Appendix

➤	Production of B/R (lbs/hr) = production constant * N(shell roller rpm) * W(oz/yd)
➤	Production of card (lbs/hr) = $\frac{\pi DN * 36 * 60 * 1 * \eta}{36 * 840 * \text{count}}$
➤	Production of card (lbs/hr) = $\pi DN * 36 * 60 * (\text{weight in ozs}) * \eta / 36 * 16$
➤	No of scutchers required = feeding rate of cards/production of one scutchers
➤	No of card required = production of blow room/feeding rate of card deptt
➤	Production of card (lbs/hr) = $\frac{\text{delivery rate(m/min)} * \text{grain/yds} * 1.0936 * 60 * \eta}{7000}$
➤	Time to complete full card can = sliver length(yds)/delivery rate(yds/min)
➤	No. of scutchers required = production of blow room/production of one scutchers
➤	No. of card required = production of card section/production of one card
➤	Tension Draft = s.speed of C.C.R/s.speed of Doffer
➤	Total Lap weight = lap length * weight/yd
➤	D(Trumpet guide) = $0.015625 * \text{count} * \sqrt{W}$
➤	Waste% age = $\frac{\text{input} - \text{output}}{\text{Input}} * 100$

Draw frame Section

➤	Actual Draft = $\frac{\text{weight/yd fed}}{\text{weight/yd delivered}} * \text{No. of doublings}$
➤	Production(lbs/hr) = delivery rate(m/min) * 1.0936 * 60 * No. of deliveries/7000
➤	Production(lbs/hr)(only for two deliveries) = delivery rate(m/min) * 0.45 * grains/yd * η
➤	Production(lbs/hr) = $\frac{\pi DN}{36 * 840 * \text{hank sliver}} * 60 * \text{tension draft} * \eta$
➤	No. of Deliveries Required = feeding rate of simplex/production of finisher draw frame

Technical Guide on Internal Audit of Textile Industry

Unilap Section

- **Production(lbs/hr)**

$$= \text{delivery rate(yd/min)} * \frac{\text{lap weight(grains/yd)} * 60 * 1.0936 * \eta}{7000}$$
- **Note = 1 penny = 24 grains/yd**

Comber Section

- **Production(lbs/hr) =**
$$\frac{L * F * N * H * (100 - W) * 60 * \eta}{7000 * 36 * 100}$$
- **Note**
- **L = lap weight in grain/yd**
- **F = feed rate in inches/min**
- **N = nips/min**
- **W = noil %age extracted**
- **H = no of comber heads**

Simplex Section

- **Feeding Rate = $\pi * D(\text{dia of back roller}) * \text{Rpm}(\text{back roller})$**
- **Delivery Rate = $\pi * D(\text{dia of front roller}) * \text{Rpm}(\text{front roller})$**
- **TPI = $\text{TM} \sqrt{\text{count delivered}}$**
- **TPI = $\frac{\text{spindle speed}}{\text{Delivery rate or F.R delivery in inches/min}}$**
- **Production(lbs/hr) = $\frac{\text{front roll delivery} * 60 * 1 * \eta}{36 * 840 * \text{count}}$**
- **Production(lbs/hr) = $\frac{\text{flyer rpm} * 60 * \text{No. of spindles} * \eta}{\text{TPI} * \text{Hank roving} * 36 * 840}$**

- **Production(lbs/hr) = $5.7 * \frac{\text{flyer rpm} * \eta}{\text{TPI} * \text{Hank roving}}$ (for 120 spindles m/c)**
- **TPI = $\frac{\text{flyer speed}}{\text{Delivery rate or F.R delivery in inches/min}}$**
- **CPM = front roll delivery(inches/min)**
- **Bobbin circumference**
- **CPI = $\frac{\text{CPM}}{\text{Liner speed of bobbin rail(m/min)}}$**
- **CPI = $\text{CPM} \sqrt{\text{count delivered}}$**

Appendix

➤	TCP(NEW) = TCP(old) * $\sqrt{\text{count(old)}/\text{count(new)}}$
➤	L.W = L.W(old) * $\sqrt{\text{count(old)}/\text{count(new)}}$
➤	B.W = B.W(old) * $\sqrt{\text{count(old)}/\text{count(new)}}$
➤	Roving Tension = winding rate/delivery rate = (b – f)πD/l
➤	Roving Tension = (b – f)πD/front roll delivery(inches per min)
➤	Lifter Constant = CPI * lifter wheel
➤	Turns per meter(TPM) = flyer rpm/delivery speed(meter per min)
➤	Draft = count deliver/count fed
➤	New DCP = old DCP * old draft/new draft
➤	New DCP = old DCP * old count/new count
➤	No. of Simplex required = production of finisher draw frame/feeding rate of one simplex
➤	No. of Simplex required = total feeding rate of ring section/production of one simplex m/c

Ring Frame Section

➤	Production(OPS) = $\frac{\text{spindle speed} * 1 * 1 * 60 * 8 * 16 * \eta}{\text{TPI} * 36 * 840 * \text{count}}$
➤	Production(OPS) = $\frac{\pi \text{DN} * 60 * 8 * 16 * \eta}{36 * 840 * \text{count}}$
➤	OPS from bags/day = total bags/total frame * No. of spindle per frame
➤	No. of ring frame required = total production of simplex section/feeding rate of one ring frame
➤	Traveler speed = spindle speed – winding speed
➤	Winding speed = front roll delivery(inches per min)/bobbin circumference
➤	Traveler angle = bare bobbin dia/full bobbin dia
➤	Linear speed of traveler(m/sec) = $\pi \text{DN}/1000 * 60$ (where D is ring dia & N is spindle speed)

Technical Guide on Internal Audit of Textile Industry

Auto Cone Section

➤	Cone Length(meters) = count * cone weight(lbs) * 840/1.0936
➤	Production(lbs/hr) = delivery rate(m per min) * No. of spindles * 60 * 1.0936 * η /840
➤	Production per spindle(lbs/hr) = $\frac{\pi * \text{Dia of Drum} * \text{Drum RPM} * 60 * \eta}{36 * 840 * \text{count}}$

Open End

➤	Production/Rotor(gm/hr) = 0.0006 * N * tex ^{1/2} * η/T.F (where N is Rotor Speed)
➤	Production/Rotor(lbs/hr) = 0.0019 * N * η/T.M * (count) ^{1/2}
➤	T.F = T.M * 9.61

Some Other Relations

➤	A.D = M.D * 100/(100 – W%)
➤	A.D = count delivered/ count fed
➤	A.D = weight fed/weight delivered
➤	Waste% = (A.D – M.D) * 100/A.D
➤	M.D = A.D * (100 – W%)/100
➤	M.D = $\frac{\text{s.s of delivery roll} * \text{Driver gear}}{\text{s.s of feed roll} * \text{Driven gear}}$
➤	M.D = $\frac{\text{s.s of delivery roll}}{\text{s.s of feed roll}}$
➤	Condensation Factor = $\frac{\text{s.s of cylinder}}{\text{s.s of doffer}}$
➤	Density = mass/volume
➤	590.5 = tex * count
➤	Yarn Diameter = k/√count (Where k is Constant)

List of Related Websites

www.aepcindia.com

www.textileworld.com

www.texprocil.com

www.ncto.org

www.textileindustrydirectory.comwww.citiindia.com

www.handlooms.com

www.itcti.com

Research Associations

1. Ahmedabad Textile Industry Research Association (ATIRA)
2. Bombay Textile Research Association (BTRA)
3. Northern India Textile Research Association (NITRA)
4. Indian Jute Industry's Research Association (IJIRA)
5. Man-made Textile Research Association (MANTRA)
6. The Jute Corporation of India Limited
7. The Synthetic & Art Silk Mills Research Association (SASMIRA)
8. Wool Research Association (WRA)

Ministry of Textiles, Government of India

1. Ministry of Textiles, Government of India
2. Textile Commissioner
3. Technical Textiles
4. Development Commissioner for Handlooms