Indian textile industry—Environmental issues

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Indian textile industry occupies a unique position in the Indian economy. Over the period, it has gone through several changes. In the present paper, an attempt has been made to present an overview of Indian textile industry in terms of its structure, associated problems, its impact on environment, pollution control strategies, German ban on azo dyes, response of textile ministry to cope with the implementation of German ban, and other environmental issues.

Keywords: Azo dyes, Eco label, Eco norm, German ban, Pollution control strategies

1 Introduction
The textile industry is a significant contributor to many national economies. The Indian textile industry is no exception to this. It occupies an unique position in the Indian economy in terms of its contribution to industrial production, employment and exports. It is one of the largest segments of Indian economy accounting for 14% of industrial production and one-third of total exports with only 1-1.5% of import bills. It is closely linked with agriculture and rural economy and is the single largest employer in the industrial sector, employing about 35 million people. If the employment in the allied sectors like agriculture, ginning, pressing, cotton trade, jute, etc. is added then the total employment is estimated at 93 million people. In the present paper, an attempt has been made to present an overview of Indian textile industry in terms of its structure, problems associated with it, its impact on environment, pollution control strategies, German ban on azo dyes and response of textile ministry to cope with the implementation of German ban.

2 Structure of Textile Industry
The structure of Indian textile industry is quite complex. Fig. 1 shows the arbitrary classification of textile industry in India. The Indian textile industry ranges from hand-spun khadi and traditional textiles woven on handlooms at cottage industry to the highly capital intensive modern and sophisticated mill sector and synthetic fibre manufacturing units. In between these two extremes lies decentralized powerloom, knitting and garment sectors. The Indian textile industry has diversified from the manufacture of traditional items to the manufacture of fashion items for international markets.

Based on the fibres processed, the textile sector can be divided, for convenience, into two groups:

- Natural fibres such as cotton, wool, silk, jute, etc.
- Man-made fibres, like rayon and synthetics, and their blends.

Out of the total textile production, cotton alone accounts for > 70% followed by man-made (20%) and the rest (10%) which include silk, wool, jute, coir etc.

2.1 Natural Fibres

2.1.1 Cotton
Indian textile industry is predominantly cotton based. Cotton textiles are produced in organized mills and decentralized sector. The mills are of two kinds (i) spinning mills which produce only yarn, and (ii) composite mills which produce yarn, and grey and finished fabrics. The decentralized sector consists of khadi, handloom, powerloom and hosiery.

2.1.1.1 Organized Mill Sector
The organized mill sector in India comprises about 1400 spinning mills and 280 composite mills. The spindle capacity has increased from 11 million spindles in 1951 to over 33 million spindles (19% of world's spindles) in 1997. However, the weaving capacity has declined continuously from a level of 2.1 lakh looms in 1951 to 1.24 lakh looms in 1997. This is mainly because of the re-structuring due to severe competition from the powerloom sector. The weaving

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capacity is expected to fall down further till this sector becomes completely export oriented. At present, the share of mill sector in the total cloth production in the country is about 6%.

2.1.1.2 Decentralized Sectors

2.1.1.2.1 Handloom Sector

The handloom sector is engaged in the production of natural fibre fabrics, like cotton, silk and wool, and man-made fibre fabrics. There are about 3.9 million handlooms spread throughout the country which provide about 20% of the total cloth production. The Government of India, through various schemes and financial assistance, has attempted to protect this sector so as to enable it to withstand the competition from the powerloom and mill sector. In addition, the handloom sector is labour intensive and also works as a supplementary wage mechanism for the agro-rural strata of the society. The handloom sector is enjoying the benefits of reservation of certain fabric varieties, subsidies on raw material and rebates on the price of fabric sold.

2.1.1.2.2 Powerloom Sector

The powerloom sector consists of about 13 lakh powerlooms and provides about 70% of the total cloth production. The powerloom sector has been playing a pivotal role, mainly on account of its lower cost of production, flexibility in changing the production pattern to suit the market demand, favourable excise duty structure and its proximity to fabric wholesale markets.

2.1.1.2.3 Hosiery Sector

The knitting industry is basically a small-scale industry and is labour intensive. The industry mainly concentrates on production of T-shirts, cardigans, jersey, pullovers, polo shirts, and inner garments for men and women.

2.1.1.2.4 Wet Processing Sector

The fabric wet processing sector consists of process houses spread throughout the country, most of these being in and around the powerloom centers. The sector essentially carries out post weaving/ knitting operations such as bleaching, dyeing, printing and finishing of fabrics.

2.1.1.2.5 Garment Manufacturing Sector

This sector is of recent origin and has grown predominantly on the basis of export demands and is concentrated mainly in the small-scale sector.
2.1.2 Silk

India is second largest producer of silk in the world. It produces all the four varieties of silk, viz. mulberry, eri, tassar and moga. An annual export of silk products from India at present is around 300 million US dollar. Among the four varieties, mulberry silk constitutes 90% of India’s silk exports.

2.1.3 Jute

India ranks number one in raw jute and jute goods production in the world. Jute has the potential to be used for several textile and industrial applications. In addition to packaging material, jute is now being increasingly used in apparels, floor coverings, home furnishing, fibre composites as a substitutes to wood, paper industry, automotive industry, soft luggage, geotextiles, etc.

2.2 Man-made Fibre Fabrics

Man-made textile industry in India produces fibres and yarns for various end uses. These include rayon, nylon, polyester, acrylic, polypropylene, etc and blended (polyester/cotton, polyester/viscose, etc) fabrics.

3 Indian Textile Exports

Textile export is one of India’s top foreign exchange earners and it is targeted to reach 20 billion US dollar by 2002.

The leading overseas markets for Indian mill-made/powerloom textiles are the European Union, USA, Middle East and Asean countries. As regards handloom textiles, the USA, EU, Japan and Hong Kong are the India’s major markets. Over 80% of the synthetic and rayon fabrics are directed to the UAE, UK, Russia, Singapore, Saudi Arabia, Netherlands, South Africa, Italy, Belgium and USA. Indian textile industry is undergoing radical changes. Huge investments in the core sector and ongoing modernization process have helped the industry to become competitive in the international market. An increasing number of units are entering into value addition fields to meet the needs of the global market. Endowed with inherent advantage of an assured supply of good quality raw materials and human skills, the industry is poised to be a leading player in the international textile market.

4 Indian Textile Industry and its Problems

Indian textile industry is one of the oldest and single largest industrial sectors, which has had its shares of ups and downs. In the 50’s, the organized mill sector produced > 75% of the share of Indian market and decentralized powerloom sector around 25%. Presently, organized mill sector is producing only 6% and the remaining production is through powerloom, hosiery and handloom.

In 60’s and 70’s, industry has passed through difficult times due to the old and obsolete machinery, lack of adequate maintenance and modernization, low productivity, low capacity utilization due to inadequate availability of raw cotton and yarn, stagnating domestic demands, and sagging exports. All these factors resulted in wide spread sickness of textile industry. However, the important changes like the emergence of synthetic and blended fabrics, phenomenal expansion of spinning and rapid expansion of decentralized sector, especially powerloom, have occurred in the structure of textile industry. These changes, particularly the emergence of powerlooms in the decentralized sector, have brought the problem of sickness of organized sector. In fact, a large number of mills went bankrupt and two-thirds of them were composite mills. The Government had stepped in and many mills were nationalized in 1967. A public sector corporation called National Textile Corporation (NTC) was set up to run these mills and nurse them back to health. The Government objective to take over was obviously to provide immediate employment relief to thousands of workers whose jobs were threatened. Subsequently, other policy objectives seem to have crept in and the responsibility of producing bulk of controlled cloth fell on NTC mills. However, this experiment has also miserably failed and the majority of NTC mills have been closed down.

In the beginning of 80’s, new textile policy was announced for the development of textile industry. The objective of the policy was to develop harmoniously all the three sectors, i.e. mill, powerloom and handloom. The textile policy has recognized the lack of modernization as the main factor for the sickness of the industry. In 1986, the Government set up the textile industry modernization fund of Rs.750 crores. It was operated by the Industrial Development Bank of India (IDBI). This had facilitated investment by mills in modernization programme to some extent.

In 1987 when the world cotton prices were very high, there was a shift in production pattern in the developed countries. Spinnings, in spite of considerable advancement in technology, continued to remain predominantly labour intensive and, therefore, many of the manufacturers in the advanced countries moved away from spinning. They found it economi-
The basic philosophy for setting up the ambitious funds for TUF scheme is that in spite of strong fibre and production base, for various historical reasons, the industry suffered from severe technological obsolescence and lack of economies of scale. Relatively high cost of state-of-the-art technology and structural anomalies in the industry have been major contributory factors. Accepting the significance of this industry to the overall health of Indian economy, its employment potential and huge backlog of technology upgradation, particularly in the context of globalization of textile trade, it has been emphasized by experts that to sustain and improve its competitiveness and overall long term viability, it is essential for the textile industry to have access to timely and adequate capital at internationally comparable rates of interest.

5 Textile Industry and its Impact on Environment

5.1 Environmental Legislation

India is the first country which has provided in its constitution the protection and improvement of environment. There are no specific environmental laws for textile sector alone. However, there are industry specific standards, which the textile industry has to comply while setting up or operating an industrial unit. In addition to environmental standards, the Indian textile exporters confronted with social issues like child labour, poor and unhygienic conditions at the work place, low wages, etc. It is pertinent to mention the thinking of Europeans regarding Social Accountability Standards (SAS).
The Indian environmental legislation is very stringent but poorly enforced. The regulatory authorities are the Ministry of Environment and Forests, Central Pollution Control Board at the central level, and the State Pollution Control Boards at the state levels. In India, the policies are good enough; however, these policies are poorly enforced and in some cases the judiciary had to intervene to enforce the environmental policies. Judiciary has got its own limitations and cannot act as enforcement agency. Making law only does not help. Environment is a social responsibility. Desirable compliance should come voluntarily from the industry and not by policing.

5.2 Impact on Environment

Any industrial activity causes pollution in one form or the other and so is the textile industry. This industry covers a wide spectrum of manufacturing activities and is diverse in terms of raw materials and techniques employed, chemicals used and the final products. The impact of textile production on the environmental aspects such as air, water, land and human body, and the social aspects such as child labour and poor unhygienic working conditions must be considered. Recently, another dimension is introduced for the environment friendliness of the finished product. This includes the ban on certain azo dyes, which are known or suspected to be carcinogenic, and the presence of harmful chemicals (such as formaldehyde) and certain metals. Some of these aspects are briefly discussed.

Although there are environmental hazards during the entire production chain (Fig. 2), the textile wet processing possesses serious environmental problems. Large number of chemicals in vast quantities are used in textile wet processing to satisfy consumer’s demands as regards aesthetics, handle, imparting desirable properties, etc. Some of these chemicals, such as dyes and finishing agents, remain attached to the textiles, whereas a substantial proportion of these chemicals remain in the processed water, causing air and water pollution. Air pollution is also caused during drying and polymerization sequence of finishing operations. Many of the dyes and finishing agents remaining on the finished fabric have been found to pose health hazards. Reports about cases of health damage with slogans “poison in wardrobe” have greatly mobilized the public opinion in developed countries. That is why government authorities and textile industry have taken a number of measures to reduce the pollution and potential health hazards originating from textile industry. The typical input/output analysis for cotton wet processing is shown in Fig. 3.

5.3 Air Emission Sources

Emissions from textile processes, including boiler emissions, fall into four general categories, such as oil and acid mists, solvent vapours, odour, and dust and lint.

5.3.1 Oil and Acid Mists

Oil mists are produced when textile materials contain oils (spinning oil), plasticizers and other materials that evaporate or degrade thermally when subjected to heat. The most common source of oil mists is stenter frame.

Acid mists are produced during wool carbonization and volatilization of organic acid like acetic acid. These mists are corrosive.

5.3.2 Solvent Vapours

Solvent vapours generally contain a large number of toxic chemicals in varying concentrations, depending on the substances used in dyeing and printing operations. Examples of these compounds are kerosene or mineral turpentine oil (MTO), formaldehyde, chlorofluorohydrocarbons, mono- and dichloro-benzene, ethyl acetate, hexane, styrene, etc.
5.3.3 Odour
Odour is often associated with oil mists or solvent vapours. Problem of this type arises from the carriers used for polyester dyeing, resin finishing, sulphur dyeing of cotton, dye reduction or dye stripping with hydrosulphite, and bleaching with sodium hypochlorite.

5.3.4 Dust and Lint
These are produced during the processing of natural fibres and synthetic staple fibres prior to and during spinning, napping, carpet shearing, etc. To a lesser extent most other textile processes produce lint. Inhalation of dust and lint from spinning is associated with many respiratory diseases. The presence of lint also interferes with other pollution abatement processes.

5.4 Water Pollution Sources and Characteristics
Textile effluents are generally coloured and have high BOD and total dissolved solids (TDS). Natural and added impurities, dyes and pigments, and chemicals used are the main sources of water pollution. Each chemical process produces effluents with its own distinctive characteristics, e.g. wool effluents are characterized by high BOD, suspended solids and grease content. Cotton effluents have high colour content, high BOD, no grease and relatively low suspended solids. Synthetic fibre processing effluents are generally low in volume than those generated in cotton processing, but may contain toxic substances, especially from dyeing streams where carriers are used.

Typical textile processing operations can include the use of several non-process chemicals such as machine cleaners, biocides, insecticides and boiler treatment chemicals. If any of these non-process chemicals enter the effluent, they would greatly increase the pollution load. In addition, process and non-process chemicals can enter the effluent stream through spillage, leakage, clean ups (drums and tanks), batch chemical dumping, poor house keeping, etc.

The pollution load of the effluent can be characterized by the ratio between BOD and COD, which generally represents the degree to which the wastes are easy or difficult to biodegrade. Ratio ranging between 1:2 and 1:3 should imply good potential biodegradability. For most textile effluents, the ratio lies in this range. For wool scouring effluents, the ratio may be as high as 1:5, indicating difficult biodegradability due to the presence of high suspended solids and grease content.
Textile mill effluents are also highly coloured due to the use of dyes and pigments. Direct discharge of such effluents can lead to significant deterioration in the aesthetic value of downstream water quality. The presence of detergents and surfactants in the effluent would often be a risk to aquatic life and health risk, especially if the receiving water is to be used downstream as drinking water in large population areas. The sources of major metal pollutants such as copper, zinc, chromium, etc. are mainly the metal complex dyes and chromium salts used in wool dyeing or as oxidizing agent in sulphur dyeing. The potential sources for organic pollutants are sizes, organic acids, other chemicals, carriers used in polyester dyeing, cleaning solvents or scouring agents (trichloroethylene and perchloroethylene), plasticizers, etc.

6 Classification of Textile Wastes

Wastes generated in textile industry can be classified into four categories:

- Hard to treat.
- Hazardous or toxic.
- Dispersible.
- High volume wastes.

6.1 Hard-to-Treat Wastes

These include primarily colours, metals, phenol, toxic organic compounds, phosphates, etc. Hard-to-treat wastes also include non-biodegradable organic materials such as certain surfactants and solvents. These can resist biological effluent treatment process, pass through standard activated sludge systems and produce aquatic toxicity when the effluent treated water is discharged into downstream. Since the primary problem associated with these wastes is toxicity, they can also be included in hazardous or toxic category.

6.2 Hazardous or Toxic Wastes

These are generally sub group of hard-to-treat waste and include materials such as metals, chlorinated solvents, non-biodegradable surfactants and volatile organic materials. Some of these wastes can also come from non-textile processes such as machine cleaning, boiler chemicals, etc.

6.3 Dispersible Wastes

These include waste stream from continuous operations, print pastes, wastes from back coating operations, batch dumps of unused process chemicals, etc. Thus, the sources of dispersible wastes are wide spread in textile wet processing.

6.4 High Volume Wastes

The most common high volume wastes include wash water from preparatory, dyeing and printing operations and the exhausted dyebaths. These can be reduced by recycle process and equipment modification.

7 Pollution Control Strategies

There are two major pollution control strategies which could be followed:

- Cleaner production techniques and processes.
- End-of-pipe treatments.

7.1 Cleaner Production Techniques and Processes

Complex environmental issues demand a comprehensive integrated approach to tackle the problems of pollution. Reduction in the use of water and other raw materials along with waste minimization and elimination, wherever and wherever possible, should be the highest priority. This implies that all types of resources, along with entire product life cycle, should be used as optimally as possible to reduce environmental impacts. In a textile process, this can mean substituting a non-toxic raw material, reducing water flows or changing operational parameters.

Simple good housekeeping measures can deliver cleaner processes. Entire existing process technology should be reviewed to evaluate the choice of process, a processing sequence and equipment used. Examples of such options include water conservation by counter current washing, recovery of chemicals such as size, caustic soda, dyes and grease, replacement of high BOD chemicals by low BOD ones, etc. Textile equipment manufacturers are becoming more aware of the need to conserve water, chemicals and energy. Many new production technologies have been developed. Examples of such process and equipment changes include modification of equipment for washing, dyeing, printing, drying, etc.

7.2 End-of-pipe Treatment

Having reviewed the improved production processes to eliminate and reduce waste as much as possible, it is necessary to select the best effluent treatment strategy.

Segregation and separate treatment of specific effluent streams is more efficient than attempting to
treat combined and complex effluents. Such a strategy will often provide opportunities to reuse water or recover chemicals and reduce the size of the treatment plant. Combined chemical and biological treatment is one of the most commonly employed methods for liquid wastewater treatment in textile industry. In such instances, flow equalization tanks and appropriate pretreatment units must be constructed to remove toxic substances such as chemical additives and dyestuffs in the waste stream and to ensure the proper operation and maintenance of any biological unit.

Residues from textile operations include sludge from biological or physico-chemical units and waste materials from the production process. Disposal alternatives include a range of options such as compaction, land filling and anaerobic digestion or incineration.

For practical implementation, the relative emphasis on these various strategies would vary, e.g. existing old textile mills or small units with mostly batch or semi-mechanized operating methods might find few opportunities for new cleaner equipments. Better house keeping, minimization of chemical and water usage, recycle of water and low-cost technologies for end-of-pipe treatments such as aerated lagoons or common effluent treatment plant may be the most practical approaches. For large new state-of-the-art textile mills, using continuous methods of operations, environmentally sound processes and equipment options could be more attractive.

7.3 Sludge Treatment and Disposal

During the biological treatment of effluent, sludge is formed. If the sludge formed is small, it may be recycled or can be used in lagoons. In case of substantial quantity of sludge, it may be subjected to aerobic digestion. The digested sludge may be thickened by a gravity thickener. Supernatant from this process should be returned to the aeration tank and thickened sludge may be de-watered. The liquid taken off may be returned to rapid mix tank of the chemical coagulation process. Sludge from the centrifuge is best disposed off to a sanitary landfill facility on or off site.

Apart from sludge, other residues from textile processes include solid wastes such as cans, rejected fabric pieces, willow dust, etc. These are generally carted away to landfill or incinerated either on site or away from the site of production activity. During incineration, adequate air pollution control measures must be taken to control particulate and scrub flue gases.

7.4 Air Emission Control

The conventional source of air pollution from a textile mill is boiler chimney. These emissions normally consist of pollutants such as suspended particulate and sulphur dioxide. Regulations often specify the type and composition of the fuel to be used and the minimum chimney height for satisfactory pollutant dispersal. Air emission control methods commonly installed at textile mills include cyclone separators, bag filters and wet scrubbers.

Oil mists and volatile organic carbon (VOC) are more difficult to control. Reductions can be achieved by controlling the application of spinning oils and finishing agents to fabric. Proper air ducting and the installation of mist eliminators are other important control techniques. Oil mist elimination generally consists of following four steps:

• Pre-removal of dust and lint. This is accomplished either with fabric filters or high energy mist eliminators.
• Condensation of vapours by cooling the contaminated air. This may be achieved by direct contact cooling or heat recovery via heat exchange. Examples of direct contact cooling techniques are low energy scrubbers, spray towers and packed towers. These methods generate some additional effluent which must be tackled at the effluent treatment plant.
• Mist removal from air using equipment such as electrostatic precipitator. Where oil mists contain water, the high efficiency fibre mist eliminators are better than electrostatic precipitators because water droplets can cause arcs and short circuit. Incineration with heat recovery is also popular. In this case, no pre-cooling or condensation is necessary. Virtually, everything in exhaust is destroyed and final emissions are odourless.
• Collection and disposal of contaminant is achieved by ducting to chimney with adequate dispersal height. Since some mists are corrosive, the material for ducting must be carefully chosen.

The other major source of air emission is organic solvent vapours released during and after drying, finishing and solvent processing operations. These vapours cannot be treated by scrubbing because they have a limited solubility in water. Incineration is expensive and emissions from incineration also need
to be handled separately, e.g. from chlorine-based chemicals the hydrogen chloride gas is released by incineration which needs careful treatment. Particulate removal techniques are also not applicable since the solvents are present entirely in the vapour phase. The only effective way to solve this problem is to use activated carbon for vapour adsorption and attempt some form of solvent recovery.

8 Managing and Auditing Resource Consumption

In India, the textile research associations such as ATIRA, BTRA, MANTRA, NITRA, SASMIRA, and SITRA have developed norms for manufacturing, which indicate the desirable usage of resources such as water, labour, electricity and common chemicals like caustic soda, and hydrogen peroxide per kilogram of fabric weight processed. These norms are not imposed legally but member mills are encouraged to follow them as closely as possible and this has brought a more professional approach to the overall management of various operations. It is necessary to have records of simple material balance for usage and wastage of various resources, e.g. it may be extremely useful to set up a norm for water usage for dyeing, printing and washing units to establish the efficiency of water usage. Material balances need not be confined to processing sequences alone. It is worth examining the record of store keeper and the processing departments to track losses of expensive and/or hazardous chemicals during handling and processing.

Preparations of material balances must be supplemented by carefully planned environment monitoring exercise. This involves measuring flows in pipes and open channels, gas flows in chimney and vents, and collection and analysis of liquid, solid and gaseous samples. Analysis of parameters, such as VOC in air from finishing operations and noise levels during weaving on looms, should be done periodically to assess their impact on occupational health and safety. Another important and routine monitoring exercise is the assessment of effluent treatment plant and air pollution control equipment performance. It is important to ensure that the locations for measuring water consumption are accessible, the underflow drains and manholes are constructed to allow liquid sampling for analysis and the holes are drilled for collecting chimney emission samples. Managers must also procure the equipment and fixtures necessary for at least simple in-house monitoring exercises. This will include meters on major water lines and weir (stairs) construction for measuring flows in open channels (especially down streams from chemical processing equipments). Likewise, the managers must procure chimney (stack) monitoring kits and equip a wet analysis laboratory to analyze routine parameters such BOD, COD and suspended solids. It is also necessary in most operations to employ a full time professional environmental team or train senior staff and workers to undertake monitoring and environment audit tasks. Commitment to this exercise and participation by top management will help to establish sound environment management system. In most cases, it will also improve the productivity and the profitability of the organization.

Careful auditing and accurate material balance often identify room for improvement and cleaner production options. Some of the simple options could be improved house keeping, better equipment maintenance, optimization of various process sequences, especially washing and changes in process operating parameters. The managers must have baseline data for similar operations in other industries to compare and interpret their results with open mind. They must also allow discussion between staff and encourage team members to bring forward innovative ideas. These ideas must then be evaluated from a technical and economic perspective because they must lead to cleaner production without impairing productivity and product quality.

9 Policy Management by the Government of India

In most cases, the policies adopted by the government, industry and trade associations will influence both the technology used and the environment management standards.

In textile industry, there have been several changes with regard to policy and regulations at national as well as international levels. Recent example is the German ban, which became effective from April 1996, on the use of certain azo dyes for coloration of textiles and the eco-standards set by the various international organizations for eco-worthiness of textiles. Thus, certain types of dyes and chemicals are now banned in many developed countries due to their known hazardous nature or impact on health, e.g. the use of benzidine (a known carcinogen) has been banned for dye formulations. About 22 amines have been identified which are known or suspected to be carcinogenic. Dyes based on these amines have been banned. In many countries, for environmental reasons, kerosene or mineral turpentine oil based emulsion
thickeners in pigment printing have also been banned. Severe fuel restrictions have also been imposed on boiler houses, especially for production units operating in cities. In many looms, modernization projects preferences are given to machines which produce less noise while guaranteeing improved quality.

9.1 German Ban and Government Response

During the production of finished textiles, it is now realized that a number of dyes and chemicals being used by industry contain certain toxic and hazardous substances which not only affect the consumer but also cause irreparable damage to environment. In this regard, Germany has taken a lead and imposed ban on the use of azo dyes containing harmful amines which are used as raw material during dye manufacture. The ban imposed by Germany on specific azo dyes has already come into force since 1 April 1996. Violation of the ban is being dealt with severely by Germany.

Apart from Germany, the Netherlands has also imposed a similar ban from 1 August 1996. This is applicable to clothing, bed linen and footwear. The European Union has also circulated a working document relating to the restrictions on marketing and use of dangerous chemicals and dyes for the consideration of European parliament and the council. The draft proposal aims to restrict the use of dyes based on harmful amines on textiles and leather articles which come in prologed contact with the human skin. It is also understood that the European Union is preparing for the imposition of ban on around 300 dyes which are suspected to be carcinogenic in nature.

9.2 Some Ecofriendly Considerations for the Indian Textile Industry

The main issue before the Indian textile industry is the prohibition of the use of banned dyes and auxiliaries and other toxic substances. Many textile units have already started using alternate ecofriendly dyes and auxiliaries. In addition to this, the use of naturally coloured cotton, natural dyes, organic/green cotton (cotton cultivated without the use of fertilizers), ecofriendly packaging materials, etc need to be considered far more seriously. The industry may have to adopt cradle-to-grave approach for the manufacture of ecofriendly textiles, i.e. the industry should start applying ecofriendly approach right from the stage of cultivation/production of fibres and also during spinning, weaving, chemical processing, garment manufacture and even packaging.

9.3 Eco Standards and Eco Labels

To promote the concept of ecofriendly textiles, a comprehensive system of eco labels is advocated by European countries. For the purpose of issuing eco labels, certain norms/criteria are stipulated in respect of textile products on the basis of cradle-to-grave approach, i.e. these criteria are developed on analyzing the product’s entire life cycle commencing with the selection of raw materials, progressing through the stages of production, packaging, distribution, utilization and disposal after use. The norms are also referred as eco standards. The use of eco labels is voluntary in nature. While formulating eco norms for the issuance of eco labels, at present the use of seven different classes of chemicals in textile production and processing are taken into consideration. These are: formaldehyde, toxic pesticides, pentachlorophenol, heavy metal traces, azo dyes which release carcinogenic amines, halogen carriers, and chlorine bleaching.

The eco standards stipulated by MST (German Textile Association), OTN 100 (Okotex Institute from Austria), and Clean Fashion and Steilmann (private eco label issuing organizations in Germany) are popular in European countries. European Union is finalizing the criteria for a common European Union community eco label. Ministry of Environment and Forests, Government of India, has also evolved eco standards for the eco labeling of textile items in consultation with Indian textile trade and industry. The implementing agency is Bureau of Indian Standards. Each of these organization has also issued a logo to identify the ecofriendly textiles. The earthen pot is used as logo by the Ministry of Environment and Forests, Government of India.

9.4 Efforts Made by Government of India

To meet the challenges posed by eco regulations by Germany and other countries, the Government of India, through the Ministry of Textiles and the Ministry of Environment and Forests, charted two approaches, viz. regulatory and developmental. Some of the regulatory measures and development efforts include the following:

Regulatory Measures

- Prohibition on the use of 112 dyes, which are capable of releasing listed harmful amines.
- Evolution of eco standards and logo for ecofriendly textiles.
Table I—Eco and quality testing laboratories set up/upgraded/modernized during the last four years

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**Developmental Efforts**

- Organization of educative seminars, workshops and camps to inculcate the ecofriendly concepts among the industry and consumer.
- Assistance to be provided by Textile Research Associations and Textile Committee to textile units for securing ISO 9000 Quality System Certification and ISO 14000 Environment Management System Certification.
- Keeping in mind the need for modernization on war footing, the Ministry of Textiles has announced the scheme called Technology upgradation fund (TUF), wherein the credit is available at concessional rate of interest to enable industry to take up modernization projects in a big way.
- Similarly, as part to support textile industry for testing of ecofriendly textiles, the Ministry of Textiles took up a massive programme of setting up of eco testing laboratories. In this pursuit, the Textile Committee, a statutory body under Ministry of Textiles, is identified as a nodal agency. The number of eco testing laboratories set up/upgraded/modernized during the last four years is given in Table I.

During the year 1999-2000, the upgradation of laboratories of 15 powerloom service centres, creation of zari (metallic thread) testing facilities at MANTRA, Surat, and providing additional equipments to some laboratories which are already set up/upgraded during the last four years are being considered.

The International Trade Centre, UNCTAD/WTO, organized a workshop on “Eco labeling of textiles and clothing” in February 1999. In this workshop, the actions taken by different countries for promoting ecofriendly textiles was reviewed. The various action plans initiated by the Ministry of Textiles and the Ministry of Environment and Forests was presented during the workshop. It was noted that India is ahead of other South Asian countries in respect of actions initiated for promoting ecofriendly textiles.