CHAPTER - I

INTRODUCTION

INTRODUCTION

Environment is the sum of all social, economical, biological , physical or chemical factors which constitute the surroundings of man, who is both creator and mouldor of his environment. Our immediate concern is the quality of space we live in, the purity of air we breathe, the food we eat, the water we drink and the resources we draw from our environment to support our economy (Sharma & Kaur) Natural environment is that part of planet earth which is especially untouched and has not been invaded by man. The environment performs three basic functions in relation to man. First it provides living space that make life qualitatively rich for man. Second, the environment is a source of agricultural, mineral, water and other resources that are consumed directly or indirectly. Third, the environment is a sink where all the waste produced by man is assimilated. (Mahajan, 1998). This natural environment is persistently polluted due to air, water pollutants and solid wastes. There is a steadily growing strain on the water we drink, the air we breathe and the land we live due to our present style of living.

In developing countries, chemical and physical contamination of water, air and soil presents acute problems. Environmental pollu tion is a global phenomenon. In the quest of attaining self-reliance, a country has to step up agricultural and industrial production. The envi ronmental contamination is increasing day by day due to increasing mechanical transport with the craze of speed, with machines moving faster than the speed of sound, creating noise nuisance with the use

of atoms for war or peace etc. This is contributing increasly large quan tities of dust, smoke, chemicals, toxic gases to air, chemicals, deter gents and organic wastes to public streams. These create complicated and uncontrolled municipal problems.

Water is the most essential ingredient in living organisms. Each day an adult person may drink about 1650 ml water, may eat food containing 750 ml more and produce an additional 350 ml by the oxi dation of the food he consumes. Out of this, 1750 ml are lost ultimately in urin, about 500 ml as perspiration, 400 ml by evaporation through lungs and 150 ml are discarded with feacal matter (Sastri, 1995) , Water is equally vital to plants. Agriculture demands a supply of water that far exceeds industrial uses.

Water gets contaminated due to physical, chemical and biological pollutants. There is an enormous strain on fresh water supplies and all the cities are starved of adequate, fresh and clean water supplies. The physical pollution brings changes in the water in regard to its colour, odour, taste and thermal differences which create special problems for the water authorities. People live in unhygenic conditions with improper and inadeqaute sanitation adding progressively to pollution and disease. The natural water resources are river streams, lakes and springs. Sea water is avalilable in abundant quantity but is unfit for human consumption. River water is heavily turbid while the ground water especilly well and spring water is sparkingly clear. The greatest use of water is for quenching the thirst. The main use of water may be grouped as domestic, industrial, agricultural, recreational , powar generation, fishing and fire fighting .

It is estimated that under modern living conditions, 25 to 30 gallons per capita per day of water is required for domestic purposes. Every year demand for water all over the world is increasing rapidly due to increase in population and industrialisation. The existing supplies are becoming inadequate. Man will soon have to find an answer to the challenge of increasing demands for water if he wants to prevent a threat to his civilized existence.

A livable environment is the utmost responsibilty of man in his own interest. It is therefore important to know the cause and effect of the environment on man and vice versa. Man is already responsible for a wide range of changes in ecosystem. Some of which are more or less stable and others are transient in nature. He has more recently brought about changes in the chemical composition of soil, of the waters, of the streams, lakes and sea, changes too of the air that collectively contribute a modification of the natural environment for living organisms of all the kinds. Biological contamination will long remain the problem of environmental pollution but other types of pollution are rapidly increasing and need to be controlled before these get out of hand. Fight against pollution is the foremost need of the day.

A new branch of science known as Environmental Engineering has emerged to find out ways and means to control environment so as to provide man with healthful living, It is a science concerned with all the problems faced by man in relation to the environment.

1. INDUSTRY AND ENVIRONMENT

The U. N. Conference on Human environment held in June 1972 at stockholm that focussed world attention as the problems faced by

developed countries in the sphere of industrial developement and pollution. In this conference, India voiced the concern of the developing countries of the potentially harmful effects of the measures taken by several developed countries to protect their environment leading to possible distortions in international trade, the flow of investment and air, increase in the price of capital goods and raw materials and loss to the export of manufactured goods from the poorer countries (Subramaniam, 1974).

Industrial growth plays a primary role in accelerating overall development and providing employment. The effIvent of an industry dumped into water, air and soil of its neighbourhood certainly leads to pollution and produces undesirable side effects. Science & Technology can play crucial role in tackling the pollution aspect of industrialisation. A locationwise analysis of 3948 units on our registers showed that 54% of them were located in Maharashtra, West Bengal and Tamilnadu, most of them in the principal cities of Bombay, Calcutta and Madras. It is necessary to prevent further growth in the metrapolitan cities. Financial incentives alone do not result in investments in backward areas, unless they are combined with development of infrastructure. Therfore it is necessary to identify growth centres in the backward districts and provide them with minimum facilities.

As India is predominantly agricultural country there are many agrobased industries which relate to preharvest and postharvest operations which can be taken up in a widely dispersed form. Although the new interest in environmental problems has arisen in the west, the concept that man is a child of nature and has to live and grow in

harmony with the ways and the wisdom of his natural endowments and environment is central to the Indian tradition. In our own times, this ancient insight was formulated by Gandhiji. He thought us the simple maxim of "Waste not, want not". A reduction of wants at all levels, avoidance of waste and concern for conserving all resources are the cardinal Gandhian virtues which we need to recall and rededicate ourselves to. In Maharashtra, the effects of pollution are noticeable in the Bombay Thana, Poona region which has a large concentration of industries. In some other areas, pollution on account of the wastes of sugar factories, distilleries and paper factories has also become noticeable. Apart from time and money involved the resulting pollution in Bombay which has a large concentration of textile mills will also have to be considered.

The Prime misnister said at an international conference hat poverty was the greatest pollutant. We can not afford to throw away the industrial baby with the polluted bath water. There are two ways in which we can do this. First it is necessary that we build the more pollution generating industries outside the pollution zones and secondly if pollution generating industry has to be set up in desirable that the polluting base is neutralised through treatment (Parekh, 1974).

Water is only next to air in importance for the sustenance of life. It has been reported by the National Institute of Communicable Diseases, Delhi that nearly 30% of the deaths due to infectious diseases and 50 to 60% of the morbidity in the country have been due to the waterborne diseases. One very important point that accentuates the seriousness of water pollution in India is the fact that

Indian rivers are in spate for 3 months and almost dry for 6 months because of monsoon type of rainfall. Liquid solid industrial wastes can damage soil and soil productivity and create soil pollution. A variety of liquid industrial wastes contain organic or inorganic substances which are toxic to plant life and humans beings. The problems arising from the dumping of the ever increasing amount of domestic and industrial wastes on land will become more acute as the world population and the degree of urbanisation increases. It is essential that the community has to take as much interest as the Government in eliminating or reducing pollution. The public conciousness will go a long way in improving the environmenr. Industry should take a far sighted view of keeping the1 industrial environment clean (Mohanrao, 1974).

What is the proportion of the problem and what are the checks actions that we propose to take? The first objective basically is a better quality of life. The kind of action that we can take is like the one we have taken in Jamshedpur where we have industrial production and yet a good quality of life.

2. TEXTILE INDUSTRY IN INDIA AND POLLUTION

Food. clothing and shelter are the three basic needs for human being. Out of these clothing is the secondmost and important need which is fulfilled by textile industry. The demand for fabrics in the world is increasing day by day due to population growth. To meet this demand, more industrialisation is necessary in textile sector. An ecological balance is distrurbed due to technological developments in textiles.

India has an international reputation of a textile producing country. It is the third largest textile producer in the world, only next to the U.S.A. and Japan. Textile industry in India is producting only 20% of India's total industrial production. Textile idustry constitutes one of the largest sector in our country employing millions of workers. Textile industry is widely distributed throughout the country. Most of the textile mills are concentrated in Tamilnadu followed by Gujarath and Maharashtra. There are about 700 integrated cotton textile mills in India. The total Production of cloth was assessed to be 8000 million meters (1000 million kg) of all varieties of cotton and cotton synthetic blended fabrics (Gadkari et. al. 1982). These mills are located in large cities like Ahmedabad, Baroda, Surat, Madras, Banglore, Coimbatore, Madurai, Tirupur, Bhubaneshwar, Bombay, Bhivandi, Malegaon, Ichalkaranji etc. (Trivedi, 1986).

Textile industry plays an important role in the economy of the country as it is one of the major foreign exchange earners. In spite of decline in exports because of both severe international competetion and growing import substitution in markets, earnings from cotton textiles are still third highest.

The pattern of fabric production in textile industry exhibits wide variation as regards to quantity, quality and type of fabrics (Sharma, 1997) . The manufacturing processes of textile industry may be broadly divided into two categories first cloth manufacture and second chemical processing of cloth. Most of the processes for the first category are dry processes. They are liable to affect the quality of air and give rise to noise whereas most of the operations of second

category are wet processes. Wet processes involve the use of various chemicals and hence are liable to affect the quality of both air and water in addition to creation of noise, The textile industry has also been developed in a vast number of small textile processing units. This sector comprises of processig units which do not have mechanical equipment and all operations are carried out by human labour only. These units carry out spectific processes like Bleaching , Mercerizing, Dyeing and Printing. In a small town of Jetpur in Junagadh district in Gujarat, there are nearly 1200 small screen printing units and a few big units also (Rajagopalan, 1985). The textile processes require large volumes of high purity and generate equally large volumes of waste water which are complex and highly variable in regard to quantity and characteristics. In the cities where drainage facility is not provided, the waste waters are discharged into open land. The ultimate disposal discharged into open land. The ultimate disposal of textile effluents conveyed through the municpal sewerage system is either on land or rivers or into the sea (Rajagopalan, 1985).

The gaseous emissions and particulate matter (dust, fibrous matter etc) emission in textile mill deteriorate the quality of air and exhibit their effect on human body through skin by ingestiton or inhalation. This could be either skin irritation, a severe headache, nausea vomitting sensation, dryness of throat , weakness etc. Prolonged exposures may lead to byssinosis, blood poisoning , cardiovascular collapse, several lung diseases like bronchitis, asthama etc. Noise reduces the efficiency of workers and give rise to psychological disorder.

The waste water generated from textile industry distroys the quality of waterbody in which they are disposed affecting the marine life. It also has deleterious effect on sewage handling system and the agricultural land. The soluble dyes present in the effluent exhibit their colour in the streams and interfere with penetration of sunlight essential for photosyntheisi which nature follows for self correction of rivers. Coloured rivers are certainly unacceptable. Only scums interfere the oxygen transfer mechanism at air water interface, colloidal matter clog the pores of soil, thus reducing the water holcing capacity of soil which results in loss of productivity. The toxic chemicals like sulphides, chlorine , mercury, lead, chromium, etc. and organic dyes make the textile effluent toxic which destroys the marine life. Several surfactants are non biodegradable and several others exhibit toxicity as they accumulate at gills of fish which leads to interference with respiratory functions of fish. High temperature of textile waste damages the drains leading to leakage and thus increasing their maintenance cost.

Long term discharges of the effluents are known to cause carcinogenesis and teratogenesis. Tirupur is famous for hosiery where 765 dyeing and bleaching industries are functioning. These units require about 150 chemicals and a large quantity of water more than 10000 m^3 of effluent from the industries without treatment are let out daily into the river Noyyal. As a result , the water quality of entire town has turned hazardous and unfit for any human use including irrigation (Senthilnathan et. al. 1999).

3. SURVEY OF LITERATURE

The Tirupur industrial units are involved in activities such as bleaching, dyeing and soaping. The study was done dealing with the physico - chemical characterictics of effluent at each stage of various processes involved in dyeing and bleaching to assess the intensity of pollution resulting from effluent - Senthilnathan et. al. (1999). To meet the demand for fabrics more industrialization is needed in the textile sector. The textile pollutants were from chemical processes like dyeing, bleaching and sizing treatments. An article was published as " Are Textile Finishing The Environment " by Ravikumar et. al. (1996). A study was carried out on the characterization, treatment and disposal of effluents from the Madhavnagar Cotton Mills, Sangli and a report was published by Trivedi et. al. (1986). There are atleast a few media reports every week on pollution related incidents in India which indicates that pubilc awareness and interests are increasing. A report was published on experience at Century mills, Mumbai by Sharma (1997).

The textile industry is a major user of water. The main sector of this industry contirbuting to water pollution is that of chemical pretreatement of cotton fabrics and dyeing operations which also release considerable amount of toxic effluent in nearest waterbodies. An article was published by Dutta (1994) on textile pollution and its remedy.

The water consumption in a selective group of mills was surveyed by Rajagopalan et. al. (1976), Rathod (1974), Bhat (1975). The volume of water consumed varies from 60 to 645 litres per kg of

cloth processed. The average water requirement was about 230 litres per kg of the cloth processed. The volume of effluent discharged by the mills varies from one mill to another mill. It depends on the water consumption in the mill and average daily production. The survey was carried out by Upadhyay et. al. (1991).

The utilization of methodology will greately facilitate the task of rapid monitoring of the status of pollution of a water body. The feasibility of this idea for a cotton textile industry was examined by Patnaik et. al. (1990) by the studying correlations between all possible water quality parameters from a particular environmental condition to which the textile industry effluent is charged.

A study was carried out to understand the microbial community of textile mill effluent to treat the effluent. The effluent samples for this study were collected from the effluent discharge stream fo Madura Coats textile unit situated in Tirunelveli district by Gowrisankar et. al. (1997) and analysed. The colour removal usually forms the major part of the treatment needed for any textile factory effluent. A study was carried out on a dyeing section of a factory situated in Calicut city , Kerala which produces the coloured effluent by Prasad et. al. (1989).

An investigation was carried out to assess the efficiency of Fly ash for removal of the dissolved COD from the effluent of a cotton textile mill by Patnaik et. al. (1996). The developments in single stage preparatory processes for cotton involving desizing, Scouring , bleaching and mercerizing were reviewed by Sekar (1999).

Today people all over the world have come to accept the fact that natural dyes are much more traditional and hygienic, Vegetable dyes are very good for skin and soothing of eyes. This suggestion was made by Bhattacharya et. al. (1999).

The river 'Bhadar' is a slow-flowing shallow river of Gujarath. It flows through the town Jetpur. Within and down stream of the town Jetpur, the river water was contaminated with the discharges from cotton textile dyeing industries. The physico-chemical analysis of river water was carried out by Raiyani et. al. (1994).

The microbial and physico-chemical analysis of azo-dye containing discharges from printing cotton textile industies was carried out by Doctor et. al. (1998). The testing of textile effluent helps to decide the type and extent of treatement to be given to the effluents was carried out by Dixit (1988). A case study was done about pollution due to textile industry by Mohapatra et. al. (1990).

The adsorptive capacity of five different low cost adsorbents was tested for the decolourization of waste water containing malachite green. This adsorptive capacity was compared with the adsorptive capacity of activated carbon by Sharma et. al. (1999). The adsorption of basic dye methylene blue on chitin was investigated with a view to obtain an information on treating waste water stream from dye works by Annadurai et. al. (1996). The adsorption of basic dye on chitosan was investigated to asses the possibility of treating waste water stream from dye works by Annadurai et. al. (1997).

The naphthol green B. waste water was decolourized with sodium perborate ferrous-ion system. This work was carried out by

Birundha et. al. (1998). A study was carried out by using synthetic polyelectrolytes for treatement of waste water from textile industrities by Bhola et. al. (1997). The coloured inks and various organic dye were used to study colour removal by Jalshakti from stimulated waste water by Dhodapkar (1996). The effect of treatement of peracetic acid (PAA) on cotton fabric was studied by Moses (1997). The effect of analysis on reactive dyes for cotton fabrics was studied by Gatewood et. al. (1997).

4. MANUFACTURING PROCESSES IN TEXTILE INDUSTRY

The production of the textile fabrics in the mills consists of a series of unit processes. The various unit operations are divided into two major catagories namely 1) Dry processes 2) Wet processes Dry processes consist of the following steps -

1) Opening , blending and mixing -

The compressed bales of cotton are opened and the contents are fed into a machine which loosen and fluffs up the fibres. The cotton fibres are mechanically cleaned to remove dirt and various forms of trash material. Then cotton is mechanically blended and this passes through picking machines.

2) Carding -

The carding process is carried out to facilitate the fibres into a rope like form known as sliver .

3) Combing -

This process removes all fibres which are too short to get twisted into the yarn. During this process, remaining impurities are removed.

4)Drawing -

Drawing reduces the crosssectional area of the sliver . Then sliver is passed through roving in which the strand attains an uniform and suitable dimension for spinning.

5) Spinning -

Most commonly ring spinning is adopted. Spinning is the final step of yarn formation. The yarn thus produced tis either used in the weaving section in the mill itself or it is packed and supplied to the mills elsewhere.

6) Weaving -

Before weaving yarn passes to winding, spooling warping and slashing. Slashing protects the yarn during weaving operation and also atrengthens it. Inthe weaving process the warp (longitudinal) and the weft (transverse) yarns are interlaced to form the fabric. Teh fabric produced in the weaving section is known as grey cloth.

7) Knitting -

It is a process in which rows of looped stiched are formed into various types of fabric structures in such a manner that each knitted course is looped through an adjacent course.

Wet processes-

The grey cloth produced is subjected to a series of operations which require appreciable quantities of water at each stage. The basic wet processes are as follows.

1.Singeing -

It is a continuous process in which woven fabric travels near a

series of jet burners at a faster rate through the machine in order to remove the protruding fibres from the surface. The flame burns of the fibres so as to render the surface of the fabric smooth.

2. Desizing -

It is necessary ro remove the sizing chemicals present in the grey cloth to make it suitable for further processing. Generally starch is used as a sizing agent. For removal of starch, two methods are used.

A) Acid treatement - The grey cloth is treated with dilute sulfuric acid and washed well.

B) Enzyme treatment - The cloth is steeped in bath and kept for 4 to 8 hours at 55°c to 80°c. The enzymes hydrolyse starch and converts to readily soluble substances. Then cloth is subjected to mild acid treatement and rinsed well with water.

3) Scouring -

Scouring is carried out for removal of natural impurities and acquired impurities from the fabric. There are two types of scouring.

A) Continuous Scour - Desized frabric is passed through caustic solution (3 to 6 % caustic soda, Surfactants and sodium phosphate) passed through J-boxes after saturation. In J-box, fabric is heated with live steam at a temperature 100°c for one hour. After one hour, fabric is rinsed well with water to remove excess chemicals.

B) Kier boiling - In a stainless steel vessels containing kiering liquor, fabric is heated under pressure using steam. Kiering liquor contains caustic soda (1 to 3 %) , soda ash , sodium silicate and sodium

peroxide with small amount of detergents. The boiling is carried out for several hours (2 to 12 hrs.). Then fabric is rinsed well with water and it is continued until no brown colour remains in the rinse water.

4) Bleaching -

Bleaching is required if the finished fabric is to be white or dyed. Alkaline hypochlorite or chlorine is used to bleach cotton textiles. For synthetic and superfine fabrics, hydrogen peroxide is used. The contact period of the fabric with the bleach liquid is variable according to the type of fabric processed, Bleaching is followed by washing the fabric with plain water followed by Scouring with dilute acid and sodium bisulfite to remove last traces of alkali and chlorine. In the next step fabric is soaped, washed and treated wiht optical whitening agents to improve the whiteness of fabric.

5) Mercerizing -

Mercerizing swells cotton fibre which gives dye affinity, tensile strength and lustre to the fabric. Most of the clothes are merceritzed prier to dyeing but rough varieties ate not mercerized and after bleaching they are sent directly for dyeing / printing without mercerizing.

Mercerization involves treatment of the clothes with cold caustic solution for a specified period (1 to 3 minutes) followed by thorough washing with water several times. Traces of alkali are removed by treatment with a dilute solution of acid followed by rinsing with water.

6) Dyeing -

Dyeing is carried out by either batch or continuous process. In a

continuous dyeing processes, the dye is transferred to the fabric by passing the fabric across rollers which are partially submerged in the dye solution. The moisture content of the fabric is reduced when the fabric passes through squeeze rollers in order to conserve the dyeing liquor and reduce the time required for drying.

A batch dyeing is carried out at atmospheric pressure or in jet dyeing machines. Jet dyeing is a specialised technique especially employed for applying disperse dyes to polyester. In this method, dye is impinged on to the moving fabric through the use of a venturi Jet system. After batch dyeing , the lots of the dyed fabric are sown together and dried and cured on a continuous range.

Innumerable dyes are employed in the textile industry. They are generally classified according to their chemical composition. In textile processing, dyes are classified according to their applications.

1) Acid dyes -

Sodium salts of sulfuric acids or carboxylic acids suitable for wool and other animal fibres.

2) Basic dyes -

Salts of coloured base or require an acid mordant such as tannic acid, tartaric acid or acetic acids are suitable for acrylic fibres and polyester.

3) Direct dyes -

Neutral and used for dyeing of cotton fabric because it has natural affinity to these dyes and are easy to apply without any mordants. The colours produced are stable and fast to light.

4) Reactive dyes -

These are used extensively on cotton fibres when bright shades are desired. They can be applied on nylon silk and wool.

5) sulfur dyes -

These are water soluble and applied in a soluble reduced form from a sodium sulfide solution and then reoxidized to insoluble form on the fibre. These dyes are mainly used for cotton dyeing when dark shades are desired.

6) Vat dyes -

These are most resistant to washing as well as sunlight, These are widely used for cotton, rayon, silk, wool etc. These are water insoluble dyes but are rendered soluble by strong reducing agents like sodium hydrosulphite.

7) Naphthol dyes -

The cloth is first treated with beta naphthol and then diazotised with sodium nitrite and Hcl. A hot soap and soda bath is used.

8) Mordant dyes -

Since they do not have affinity for textile fibres, they are applied after mordanting the fibre with a metallic oxide. The most commonly used mordant is chromium oxide. So these dyes are referred as chrome dyes also.

9) Disperse dyes -

In addition to the above dyes, aniline dyes, azo dyes, developed dyes, anthraquinone dyes are also used.

Type of dye	Fibres used on
1. Vat and sulphur dyes	Cotton , Rayon, Cotton-polyester blended.
2. Direct dyes	Cotton , Rayon, , Polyester-cotton, Nylon-cotton etc.
3. Disperse dyes	Acrylic, Acetate, polyester.
4. Acid dyes	Polyester-Cotton blends , Nylon woo Nylon.
5. Basic dyes	Acrylic , polyester, Polyester-cotton blend and Nylon.
6. Azoic and developed dyes	Cotton, Rayon.
7. Fluorescent dyes	Cotton wool, Polyester-Cotton blends.
8. Mordant dyes	wool.
9. Indigo dyes	Cotton, Nylon - cotton blends.
10. Reactive Aniline black	Cotton.

7) Printing -

The printing of the fabric is carried out either on a screen printing machine. Many of the dyes used for printing of fabrices, required the fabric to be aged either by heat or acid or some other means. The dye is applied as a paste prepared together with starch, gum etc. In printing print colour is applied to specific area of the cloth obtain the desired design. After printing, the goods are streamed or treated to fix the colour.

8) Finishing -

This is the final treatment given to the cloth to obtain certain desired

properties such as lustre, the feel of the cloth , wash and wear prop erties, anticrease, permanent press etc. According to the require ments, Starches, dextrins, natural and synthetic waxes are used for finishing.

5. WATER REQUIREMENTS OF TEXTILE PROCESSES

The textile processes require large volumes of high purity and generate equally large volumes of waste water. The overall consumption of water in the mill depends on various factors like quantity of cloth processed and their variety. The no of processing sequences employed, mode of rinsing and washing. Water consumption increases with the quality of the fabrics like superfine and fabrics made from man made fibres.

	Max.	Min.	Average
1. Quantity of cloth processed (mtrs/day)	55000	4167	17350
2. Total water consumption Litres/day	253000	3000	56155
3. Water consumption per meter of cloth processed	12	0.6	3.8

In textile industry water is required for various operations as well as other utilities such as steam generation, cooling , canteens and sanitary purposes. The water consumption in a selective group of mills surveyed varies from 60 to 645 litres per kg of cloth processed as per various reports (Rajagopalan et. al. , 1976). The

survey indicates that the average water requirement is about 230 litres per kg of cloth processed. The water consumption in mills in different states is as follows.

	Western region	Southern region	Total
1. No. of mills surveyed	61	4	65
2. Gross daily consumption M3/day	99100	6830	105930
3. Water consumed per kg of cloth (litres/day)			
Maximum	645	217	645
Minimum	101	61	61
Average	269	161	235

The break up of water usage in a typical large textile mill in Ahmedabad was observed as follows.

	Percentage (%)
1. Steam generation	5.7
2. Cooling water	6.0
3. D.M.water for specific processes	7.8
4. Wet processing department	72.3
5. Sanitary and other purposes	8.2

6. WASTE WATER GENERATION AND POLLUTION EFFECTS

The main sources of waste water from a textile process are

from desizing, scouring, bleaching , rinsing , mercerizing , dyeing and printing sections. In addition to above processes various utilities such as boiler house , cooling tower, washing of equipments, miscellanceous like sanitary, waste water etc. generate waste water effluents. Depending upon the process carried out , nature of dyes and other chemicals used , the volume and nature of the effluent vary from mill to mill. It is reported that sizing , desizing operation constitutes 16 % of total quantity of effluent, caustic wastes from bleaching and mercerizing operation contributes 19% of total quantity of effluent, dyeing operation contributes 52 % and the remaining due to rinsing , printing and final finishing operations. The pollutants released in all processes are present in the combined effluent. The approximate waste water generated is 7,00,000 litres per 1000 kg of finished cloth.

The untreated effluents if discharged into the streams causes rapid depletion of the dissolved oxygen of the receiving streams. High alkalinity of waste water causes adverse effect on acquatic life, incrustation in the sewers and damage the crops by impairing their growth . High acidity causes corrossion of sewers, sewage treatment plant and machineries. Souble dyes present in the effluent exhibit their colour in the streams. The colloidal matter clog the pores of soil which reduces the waterholding capacity of soil which results in loss of productivity of land, The salt content hardens the texture of soil and prevents penetration of roots. The toxic chemicals like suphides, chlorine, mercury, lead, chromium destroys the marine life. formaldehyde has been reported as a major pollutant.

(Sharma, 1997). High temperature damages the drains leading to leakage and thus increasing their maintenance cost. The effluents have strong colour, large amount of suspended solids , highly fluctu ating pH , temperature , BOD and COD concentration. For these characteristics the effluent causes serious environmental problems (Juwarkar et. al. , 1998). These effluents are generated to the nearby waterbodies without treatment. As a result , the water quality of entire town has turned hazardous and unfit for any use (Senthilnathan et. al. , 1999).