CHAPTER VI

INDUSTRIAL POLLUTION

Bangalore City witnessed a spurt in population growth since the 1950's and the rapid growth is mainly attributed to the rapid urbanization. The turning point in industry was observed in 1959, and particularly from 1965 when growth increased due to the liberal policy of the state government by inviting industries to the state when Sharavathi became available (Basu, 1992). Hence Bangalore City’s growth is haphazard, developed by migrant population, with a lack of integrated planning by the state government authorities.

In spite of the state government’s policy to set up industries in backward and other areas, half of Karnataka’s large and medium scale industries are concentrated in Bangalore district, especially around Bangalore. As far as small-scale industries are concerned, Bangalore has 35 percent of the total units with 20 percent in urban district. There are also around 18 percent of the non-registered small-scale industries in the city. Nearly 60 percent of the employment in large and medium industries and 45 percent in the small-scale registered units are found in and around Bangalore.

Industrial development prior to independence was concentrated in small pockets in the northern and western sides along the margins of the city and few pockets of industrial areas were found within the city limits. The actual industrial development took place during the post independence period. Most of the new industrial layouts were established on the outskirts of the city i.e. Northeast, South, Southwest part of the city. A few pockets are found in North, West and Southwest. The concentration clearly indicates that the industrial development was along major roads, highways and railways. Industrial units had been established along major highways namely, Bangalore-Mysore, Bangalore-Kanakapura, Bangalore-Pune, Bangalore-Hosur and Bangalore-Chennai to form industrial corridors, industrial estates and industrial township. Some of the large and medium scale industries were located along high ways and the outskirts of the city as
large tracks of land were available at cheap and free from taxes. Bharat Electronic Ltd., Bharat Earth Movers Ltd., Hindustan Machines Tool Ltd., Bharat Heavy Electronic Ltd., Hindustan Aeronautics Ltd., Indian Telephone Industries etc., are located on the margins of the city. There are few older units like Binny Mills, Minerva Mills, Karnataka Soaps and Detergents Ltd., Wheel and Axial, Mysore Lamps etc., within the city, but by and large most large and medium industries are on the outskirts of Bangalore City along the highways.

Table No. 6.1 : Structure Of Medium And Large Scale Industries In Bangalore Urban-1998

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>SECTOR DESCRIPTION</th>
<th>NUMBER OF UNIT</th>
<th>INVESTMENT (IN LAKHS)</th>
<th>NUMBER OF EMPLOYEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ELECTRICAL/ELECTRONICS</td>
<td>166</td>
<td>143869</td>
<td>78962</td>
</tr>
<tr>
<td>2</td>
<td>BASIC METAL &amp; PRODUCTS</td>
<td>48</td>
<td>32654</td>
<td>9212</td>
</tr>
<tr>
<td>3</td>
<td>CHEMICALS</td>
<td>36</td>
<td>11690</td>
<td>6444</td>
</tr>
<tr>
<td>4</td>
<td>GENERAL ENGG. &amp; JOB WORK</td>
<td>83</td>
<td>183593</td>
<td>77496</td>
</tr>
<tr>
<td>5</td>
<td>AUTOMOBILES/TRANSPORT EQP</td>
<td>9</td>
<td>6298</td>
<td>2319</td>
</tr>
<tr>
<td>6</td>
<td>FOOD &amp; BEVERAGES</td>
<td>48</td>
<td>14923</td>
<td>7763</td>
</tr>
<tr>
<td>7</td>
<td>GLASS &amp; CERAMICS</td>
<td>19</td>
<td>6195</td>
<td>2939</td>
</tr>
<tr>
<td>8</td>
<td>LEATHER &amp; LEATHER GOODS</td>
<td>12</td>
<td>5587</td>
<td>5129</td>
</tr>
<tr>
<td>9</td>
<td>PRINTING &amp; STATIONARY</td>
<td>12</td>
<td>4194</td>
<td>2100</td>
</tr>
<tr>
<td>10</td>
<td>TEXTILES</td>
<td>20</td>
<td>9325</td>
<td>14103</td>
</tr>
<tr>
<td>11</td>
<td>RUBBER &amp; PLASTICS</td>
<td>15</td>
<td>12234</td>
<td>6199</td>
</tr>
<tr>
<td>12</td>
<td>WOOD &amp; WOOD PRODUCTS</td>
<td>3</td>
<td>282</td>
<td>1277</td>
</tr>
<tr>
<td>13</td>
<td>MISCELLANEOUS</td>
<td>31</td>
<td>14975</td>
<td>7279</td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td>452</td>
<td>445819</td>
<td>221222</td>
</tr>
</tbody>
</table>

Source : Compiled from the Records of Directorate of Industries and Commerce.

The table no 6.1 indicates the number of units, investment and size of the employment in different categories. According to the Directorate of Industries and Commerce, Bangalore Urban had 452 large and medium scale industrial units employing...
more than 2.2 lakhs people during 1997-98. Of these a majority of 116 units are Electrical/Electronic, employing 78962 persons, thus explaining the growth and dominance of the electronic industry. Engineering industries play a vital role in the industrial growth. These units are mainly concentrated in and around Bangalore City mainly because of the availability of skilled labour and growing commercial and industrial centers. There are 83 engineering and job work units with an employment of more than 77 thousand people. Engineering industries in Bangalore are found to be on the increase each year. There are about 48 units engaged in basic metal and metal products, employing about 9212 persons. There are also 48 large and medium units engaged in Food and Beverage, employing about 7763 persons. Bangalore has 20 large and medium scale textile units employing 14 thousand persons. The increase in the proportion of textile industries could be mainly because of the increased number of establishments of readymade garment workshops and factories.

Structure Of Small Scale Industries In Bangalore Urban

The vital role of the small scale sector is creating substantial employment opportunities at a relatively small capital cost, facilitating mobilization of local resources of capital and skill, and ensuring more equitable distribution of income. One of the important objectives of the small industrial development program is to broaden the base of entrepreneurship and to diversify the operational capacities of the small units. The industrial policy resolution of 1956 clearly indicated that the small-scale industries provide immediate large-scale employment. To meet the requirements of small-scale industries on the peripheries in 1980's was the setting up of industrial estates and industrial townships. There are about 40 industrial estates in the city providing shelter to nearly 40,000 industries accounting for production of more than Rs. 4,000 crores. (Ramesh, 1999).
Table No. 6.2: Small Scale Industries In Bangalore Urban-1998

<table>
<thead>
<tr>
<th>SL No.</th>
<th>SECTOR DESCRIPTION</th>
<th>NUMBER OF UNIT</th>
<th>INVESTMENT (IN LAKHS)</th>
<th>NUMBER OF EMPLOYEE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ELECTRICAL/ELECTRONICS</td>
<td>1527</td>
<td>7763</td>
<td>18955</td>
</tr>
<tr>
<td>2</td>
<td>BASIC METAL &amp; PRODUCTS</td>
<td>4216</td>
<td>20792</td>
<td>37006</td>
</tr>
<tr>
<td>3</td>
<td>CHEMICALS</td>
<td>1666</td>
<td>7454</td>
<td>18193</td>
</tr>
<tr>
<td>4</td>
<td>GENERAL ENGG. &amp; JOB WORK</td>
<td>3533</td>
<td>15609</td>
<td>30146</td>
</tr>
<tr>
<td>5</td>
<td>AUTOMOBILES/TRANSPORT EQP</td>
<td>324</td>
<td>1824</td>
<td>3477</td>
</tr>
<tr>
<td>6</td>
<td>FOOD &amp; BEVERAGES</td>
<td>1101</td>
<td>4720</td>
<td>10181</td>
</tr>
<tr>
<td>7</td>
<td>GLASS &amp; CERAMICS</td>
<td>1037</td>
<td>5554</td>
<td>9965</td>
</tr>
<tr>
<td>8</td>
<td>LEATHER &amp; LEATHER GOODS</td>
<td>532</td>
<td>2711</td>
<td>7457</td>
</tr>
<tr>
<td>9</td>
<td>PRINTING &amp; STATIONARY</td>
<td>2472</td>
<td>9470</td>
<td>17064</td>
</tr>
<tr>
<td>10</td>
<td>TEXTILES</td>
<td>3290</td>
<td>20823</td>
<td>53435</td>
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<tr>
<td>11</td>
<td>RUBBER &amp; PLASTICS</td>
<td>1570</td>
<td>7488</td>
<td>13943</td>
</tr>
<tr>
<td>12</td>
<td>WOOD &amp; WOOD PRODUCTS</td>
<td>1041</td>
<td>1970</td>
<td>7140</td>
</tr>
<tr>
<td>13</td>
<td>MISCELLANEOUS</td>
<td>1894</td>
<td>3985</td>
<td>11397</td>
</tr>
<tr>
<td>Grand Total</td>
<td></td>
<td>29104</td>
<td>135321</td>
<td>266704</td>
</tr>
</tbody>
</table>

Source: Compiled from the Records of Directorate of Industries and Commerce.

The table no. 6.2 clearly shows the total number of small-scale units, total investments and size of the employment in different categories. The proportion of the number of registered small-scale industrial units in Bangalore is found to be increasing. According to the records of the Directorate of Industries and Commerce, Bangalore had 29,104 registered small-scale units with an employment of 266704 persons during 1997-1998. The reason for this growth is government’s policy to improve small-scale and cottage industries by supplying machinery, financial aid etc. There are 4216 units engaged in basic metal and metal products, employing about 37 thousand persons. These industries are found clustered in and around the city. There are 3533 general engineering/job work units employing more than 30 thousand people. The textile industries also play an important role in the establishment of small-scale industries. Bangalore has 3290 textile units nearly 54 thousand workers are employed in these units. There are 2472 printing and stationary units with an employment of more than 17 thousand persons.
LOCATION OF MAJOR INDUSTRIAL AREAS AND INDUSTRIAL ESTATES IN AND AROUND BANGALORE CITY
INDUSTRIAL LOCATIONS OF SELECTED LARGE AND MEDIUM SCALE UNITS IN AND AROUND BANGALORE CITY.
Industrial Structure Of Bangalore

The pattern of distribution of industries in Bangalore clearly indicates that it is not evenly spread throughout the city. Industrial concentration is noticed along Magadi road, Rajajinagar, Malleshwaram, Yeswanthapur, Jalahalli in the north with Doorvaninagar in the northeast. Interestingly these areas lie in the older part of the town which are also serviced by railway lines.

In olden days industries in Bangalore were developed in the old pettah more as small-scale units. Over the last few decades due to the phenomenal increase of these units, industries are distributed throughout the city, inspite of concentration in certain areas (Singh, 1962).

These include:

1. Area to the west of the city railway station.
2. Northwest part of the city around Yeshwanthpur and Rajajinagar.
3. The old Pettah.
4. Area west of Lalbagh Road.
5. Industrial ribbons along M.G. Road.

1. The area around city railway station was congenial for transshipment of goods. Textile mills and engineering industries were located here. These are at the southern extremity of Rajajinagar. Some of the major industries are Minerva Mills, Binny Mills, T.R. Mills etc. The major industrial area i.e., Rajajinagar Industrial Area, West of Chord Road is situated in this region.

2. The Yeshwanthpura area spread south wards, to include the Karnataka Soap and Detergent Ltd., Mysore Lamps, Kirloskars, Macksons Industrial Estate, Yeshwanthapur industrial area etc.

3. The old pettah started on a small scale and gradually grew up to house chemicals especially the perfumery industry.
4. The area to the West of Lalbagh and East of Kalasipalyam specialize in engineering industries, transport workshop and transport company e.g., MM Industrial Estate.

5. The area near M.G. Road, developed auto servicing centers, ball bearing manufacturing units, military servicing stations and repair workshop for military equipment.

The HAL in Domlur, ITI in Doorvaninagar, HMT and BEL at Jalahalli developed on industrial concerns on the outskirts of the city.

Impact Of Industries On The Health And Environment Of The City

The rapid growth of urbanization and agglomeration of the Bangalore City, the steady increase in the growth of the population since the eighties and ever growing number of large medium and small-scale industries all over the city and its periphery have given rise to environmental problems. Examples of industrial pollution have indicated severe/acute impacts on the health and environment of areas and people around industries. One of the most affected residential areas is Malleshwaram and the within the city is Brigade Regency, where deadly toxic waste and fumes are let out by the Bharat Heavy Electronics Ltd’s. (BHEL) Electronic Porcelain Division. (Narasimhan, 1999).

Another residential area affected by the same unit is Pandurangashram, a middle class housing complex. The actual trouble started when BHEL, took over the Mysore Porcelain Ltd., and started in the manufacture of electric insulators and ceramic liners. In the process of making it was found there were no control measures taken in height of chimney. The entire range of activities took place exactly almost in the corner of the foundry unit where the residential apartment is located. Thus Electronics Porcelain Division pollutes the area with smoke, black fire powder, metal filings, toxic gases and noise. The terraces in the buildings are black topped due to waste deposit. Sediments of dust particles can be seen on plants in the garden and on vehicles. More than that, several residents are suffering from respiratory problem and skin diseases mainly due to the toxic gas and fine metallic dust. Besides air pollution, noise pollution also affected these
residential localities. The public complains that disturbance at wee hours affects their sleep (Narasimhan, 1999).

Unable to put up with this problem the residents of both Brigade Regency and Pandurangasharm complexes took up the issue with the Karnataka State Pollution Control Board (KSPCB). The KSPCB has asked BHEL to shift those operations, which polluted the environment with in three months.

The residents of another elite complex in the Cooks Town of east Bangalore face a different problem. The tobacco smell from ITC, a private sector cigarette manufacturing company, is a cause for concern. The worst affected are the residents of Purva Park especially when the tobacco is roasted. After repeated complaints and stringent reactions of these residents, the management has decided to shift the entire operations to Chikkajala on the Bellary Road (Narasimhan, 1999).

Industrial pollution and its impacts are difficult to ascertain as the brunt from pollution is visible only over long periods of time, secondly as industries especially small scale units are grouped together, it is difficult to ascertain the exact industry polluting the environment and finally most industries do not abide the pollution control norms by discharging waste in sewers and on open land and obtaining a true picture from them is virtually impossible. Hence case studies, one from small scale industry, i.e., Electroplating and one from large scale sector the Binny Mills are studied to depict the nature of pollution and their impacts on man and the environment.

CASE STUDIES: SMALL SCALE INDUSTRIES

A case study on Electroplating Unit in Bangalore

Bangalore with a host of small scale and service industries generates large quantities of wastes. Industries such as breweries, manufacture of detergents, distilleries, pharmaceuticals, electroplating etc., are some that generate large quantities of waste. Apart from these service industries such as dairing, coffee pulping, hospitals, laundries, bakeries, photo processing units, slaughterhouses, poultry process etc., all tend to generate large quantities of waste. The present study attempts to analyze one small-scale
industry namely, Electroplating in relation the waste generated and attempts at recycling the wastes. Electroplating was an important industry around Bangalore as an ancillary industry to major public and private sector industries. Electroplating or metal finishing was an important industry to major engineering and electronic industries. The process of metal finishing was essential as the base metal had to develop certain properties such as improved appearance, resistance to corrosion, resistance to wear, increased electrical conductivity and low contact resistance, improved frictional properties, specific metallic appearance and improved solederability. Plating is also employed to increase the dimension and repair maintenance works (John et al, 1981).

Electroplating is a branch of electro metalling, the art of depositing metals by means of an electric current. It usually involves the reduction of a metallic compound dissolved in water, and the deposition of the metal on a chemically clean conductive surface. Electroplating is classified as wet process industry which uses large quantity of water as a raw material in its process of manufacture. Only a small quantity of water is absorbed in the process and rest is discharged as effluents. Water, which is used as coolant is also discharged as waste containing organic and inorganic substances, which are usually toxic.

**Electroplating effluents contain the following types of pollutants:**

1. **Effluents containing acids or alkalis, or metallic salts or a mixture of metals and acids, or metals and alkali** from pickling solutions, chemical and electro-polishing solutions, passivating solution and plating baths.

2. **Effluents containing impurities, which are immiscible with water such as greases, oils and their solvents such as kerosene, benzene, trichloro ethylene etc.**

3. **Effluents containing cyanides from plating baths for copper, zinc, brass etc., cleaners and strippers.**

4. **Effluents carrying chromate from chromes baths, etching baths, electro-polishing, passivating and chromatery solution and copper strippers.**
Distribution Of Electroplating Units In Bangalore City

Electroplating industries in Bangalore, both licensed and unlicensed sheds are distributed in almost all part of city. Most of the newer units are concentrated in Peenya Industrial Estate, Rajajinagar Industrial Estate, Yeswathapur Industrial Estate, MS Ramaiah Industrial Estate (Goal), Koramangala Industrial Estate and in the crowded streets of central and older part of the city i.e., Chamrajpet, Oakalipuram etc., (Map no. 6.1) Most of the sheds cover a maximum area of 200 sq.mts, where a series of operations, do not permit adequate space rendering no room for treatment or any other environmental considerations.

Consequently the idea of setting small-scale industries in industrial estates was mooted to mobilize power, waste disposal, water availability, common treatment plant, post office and road for a cleaner environment. But industrial estates, be it power or water, sanitation or drainage, waste disposal or transport, the industrial estates are reeling under the burden of poor infrastructure and struggling to stay afloat (Ramesh, 1999). The small-scale units mainly industries such as chemical, textile, paper, electroplating have grown in a haphazard manner. Instead of being located in-groups of industries, they are scattered. Hence with no adequate drainage system in operation, chemical industries discharged effluents and hazardous chemicals over ground and drains and industries generating solid waste, including garbage, find it difficult to dispose them. The wastes are found to be dumped in the nearest open spaces thus polluting the environment and leading to out break of diseases such as cholera and gastro-enteritis.

Some large scale engineering units such ITI, Ashok Layland, MICO etc., have their own plating ancillary units on site. The needs of these industries are met by their own plating units.

The distribution of small-scale industries spread over the city especially in central and western side of the city indicates that wastes are largely let out into sewers or on land. As most electroplating establishments, which are major offenders where effluents go untreated people cannot afford treatment plant and it becomes situation where they either run the company or treatment plant. They cannot run both, as the size of the
company does not justify the treatment economically. In view of this it would be viable for the electroplating industries setup common treatment plants where the groups of industries jointly treat industrial waste. Some of the chemicals let out that find their way in the natural water and food chain are known to produce harmful effects on human health. The following are some of the impacts experienced.

Acids And Alkalies

Alkalies cause risk of perforation of oesophagus and stomach, vomiting of blood and mucus may occur in the case of acids along with coagulative necrosis. Hypertension, metabolic acidosis, renal and liver dysfunction can occur.

Bleaching Agents

In the form of sodium hypochloride, they irritate the gastro-intestinal mucous and mucous membranes of the lungs, mouth and eyes. Industrial bleaches cause deep burns of the oesophagus with potential for stricture formation. Arsenic soot and tar products cause skin cancer.

Mercury in organic poisoning causes corrosive effects on the gastro-intestinal tracts, vomiting of blood, bloody diarrhoea and sometimes even acute and renal discharge. Mercurial erethism causes timidity, memory loss, insomnia, excitability and delirium. It can also lead to loosenings of teeth and hypersensitive reaction of the skin.

Cyanides

Cyanides cause headaches, fainting spells, vertigo and burning sensation in the mouth and throat. It also causes hypertension and in extreme cases, coma, convulsions, paralysis, respiratory depression and death.

Heavy Metals

Arsenic gas combines with hemoglobin and causes break down of red blood cells. Subsequent jaundice may be severe. They also cause abdominal pain, vomiting, diarrhoea, difficulty in breathing, hypertension and in severe cases lung cancer.
Lead

Abdominal pain, anemia, renal disease, ataxia (inability to maintain balance) and memory loss. In children it affects the development of the central nervous system.

Radioactive Elements

These cause blood cancer, shortening of life span, genetic mutations and affect physical and mental growth. Aluminum is known to bring premature senility.

A study conducted in 1975 on ground water the dissolved solid load was 400 ppm. Today in that belt it is about 2800 to 3200 ppm and in the economic sense is not treatable. Bore well water in part has indicated it is hard with 600 ppm indicating that effluents are percolated and contaminated ground water (Shivaram, 1992). Studies have also indicated the occurrence of heavy metals in the environment and the possible contamination of food and water. Studies have shown the presence of chromium in south Indian food of rice, leafy and non leafy vegetables and some masalas. These have know to cause harmful effects associated with chromium are known to cause stomach acidity and gastro-intestinal absorption (Pitchai, 1991).

CASE STUDY OF A LARGE SCALE INDUSTRY – BINNY MILLS

The metamorphosis of Bangalore from garden city to an industrial and commercial center has affected the environment. Some of the industries that play a major role in contribution towards pollution are chemicals, pharmaceuticals, food and beverages, paper and pulp, distilleries, textiles, metals and electroplating. The pollution caused by indiscriminate disposal of untreated industrial effluents is very serious. These effluents contain pollutants like detergents, solvents, cyanides, heavy metals, minerals and organic compounds. All these chemical pollutants contaminate surface water, ground water and spread the water borne dreadful diseases like jaundice, typhoid, cholera, gastro-enteritis etc.. (Shivaram, 1992).

The Karnataka State Pollution Control Board has identified 237 industrial units generating hazardous wastes in the city. These include chromium plating and battery
manufacturing units, textile mills, dyeing units, distilleries (Basu, 1992). Large areas around Bangalore are being damaged due to environmentally hazardous wastes are let into sewage lines, land and water sources, quarries etc.

One of the major pollutants of Bangalore's ground was sources is the effluents from a distillery on the Kanakapura road. The distillery owned by Khoday's group has been discharging effluents into an open lagoon polluting ground water sources in the region. The other sources of water pollutants are cyanides and lead emissions from chromium plating and battery manufacturing units. Bangalore has ten textile mills letting out toxic dyes into the ground water sources through open drains and sewers (Basu, 1992).

Some of the toxic chemicals that find their way into natural water sources including ground water, result in harmful effects to human and animal life. The increasing incidence of water borne diseases i.e., jaundice, typhoid, cholera, gastro-enteritis, diarrhea in Bangalore are attributed to the large level of contamination of water.

Treatment Of Textile Mills Wastes From M/S Binny Ltd., Bangalore

M/s. Binny Ltd., Bangalore, is one of the oldest textile mills in India and is situated on the eastern side of Bangalore - Mysore meter gauge railway line very close to the Bangalore City railway station. This factory processes mainly cotton fabrics besides the famous Binny silks, terry cotton and woolen fabrics.

The water supply for the mill is partially derived from the Bangalore Water Supply and Sewarage Board (BWSSB) and partially from the bore wells, dug in the factory premises. The total quantity of water used is about 3000 to 3600 cum, per day which includes water used for humidification also.

The wastewater from different sections is collected into a main drain and passed on to the wastewater treatment units designed and erected by M/s. Voltas Ltd., during 1980-81 and the effluent from the treatment units is discharged into a nearby nallah leading to Vrishabhavathi valley. A portion of the effluent water is pumped to an over
head tank which is used for flushing the water closets. The water from the water closets goes to the public sewers.

The sewage of the factory is not being mixed with the textile waste and the sewage is directly linked to the sewers of the BWSSB where as the industrial effluent is discharged over land to a nallah which ultimately discharge into Vrishabhavathi valley.

Sources Of Waste Waters

Composite wastes from an integrated textile plant may contain many of the polluting characteristics depending upon the process employed. In mill the cotton is carded, spun, spored and warped, sized, drawn and woven into cloth before being sent to finishing unit i.e., wet-processing units. No water borne pollution originates in this sequence of operations since all are dry mechanical process except sizing operation. In general, the processes connected with preparations for weaving, preparation for dyeing (Cleansing), printing and finishing produce most of the objectionable wastes that requires disposal.

Textile industries such as the Binny Mills manufacture cottons and silks and doing so employ a range of process in bringing out the end product. These processes in turn let out effluents that degrade the environment. Explained below are 8 process listed with their respective pollutants.

1) Sizing section 2) Kiering (Scouring) 3) Bleaching 4) Fancy dyeing
5) Screen printing 6) Finishing 7) Cots wool dyeing and 8) Silk dye house.

1. Sizing Section

The warp is sized using tapioca/maize, starch, various sizing gums, sarcell, softness, textallow/mutton tallow sicofig, antimiletes agents. The purpose of sizing is to give the yarn sufficient strength and abrasive reistance to withstand the stress and strains in the process of wearing. There is practically no effluent from sizing section except for the spill over and washing during weekends. However, the small volume of waste from this operation is very strong in pollutional materials. Several compounds can be used in
sizing including starch, starch substitutes polylvinyl acetate and carboxy methly cellulose (CMC), Numerous investigations have suggested substitution of CMC for starch in warp sizing will lower the BOD load.

2. Kiering (Scouring)

Kier wastes are produced from boiling or cooking the goods in a strong caustic liquid along with detergent or soap solution to remove cotton wax, dirt and grease in order to develop a white colour. This process also removes natural impurities. Caustic soda, soda ash, chlorine peroxides, silicates, sodium bisulfate, acids, detergents and penetrants are used in scouring to prepare a clean white cloth for finishing. Scouring may contribute up to 30% of the total waste loads. The approximate quantity of wastewater let out from this section is about 200 to 250 m³ per day.

3. Bleaching

The bleaching operation usually follows the cleaning or deterging process. This process is necessary wherever fabrics are to be given a full white finish or where they are to be dyed in specific colour shades. Its purpose is to remove or destroy the natural colouring matter in the fiber. Chlorine hypo-chloride and peroxide bleaching compounds are widely used in the cotton industry. About 10 percent of pollution loads are contributed by this operation (bleaching). The quantity of wastewater let out from this section is around 40 to 50 m³ per day.

4. Fancy Dyeing

It is necessary to improve the aesthetic and functional values of the fabric. Various salts and auxiliaries are used to aid the process of dyeing. The pollution load may be 20-40 percent, but the volume is large and there is a high degree of colour. The quantity of wastewater let out from this operation in the mill is about 200 m³ per day.
5. Screen Printing

It is similar to dyeing except that various colours are applied according to the desired pattern in order to present the spreading of the colour. After fixation of the print, the fabric is given a thorough wash in an open soaper or a winch to remove unfixed dye stuff and the thicking materials.

6. Finishing

The object of this section is to impart various finishes to the fabrics, smooth appearance and desired stiffness to the cloth, a final size or resin is applied to cloth. Chemical used are varied and include starches and dextrines, natural and synthetic waxes, synthetic resins, ammonium and zinc chlorides, special chemical to improve service and wash wave qualities or rain proofing, oil and soil repellery and fire proofing. The waste is low in volume, with some BOD contribution from starch, gums, waxes and resins.

7. Cots Wool Dyeing

This section handles goods in the form of cloth in 120 meters lengths. First milling operation is carriedout with enzymes to strip of size, dirt and grease adhering to the cloth. By this process, texture of the cloth is improved and softened. The cloth is bleached and dyed in winches with standard procedures using chemicals and auxiliaries. The quantity of wastewater from this section is about 600 to 700 m$^3$ per day.

8. Silk Dye House

Silk dye section handles goods in the form of cloth and yarn. The operation like degumming, bleaching and dyeing are carried out. The approximate wastewater let out from this section is about 35 to 50 m$^3$ per day.

Existing Waste Treatment Plant and the Treatment Process

For the textile waste treatment the following units have been provided (1) Screen Chamber (2) Oil Skimmer (3) Balancing Tank (4) Flash Mixer (5) Chemical House
(6) Pre-Settling Tank  (7) Aeration Tank - I  (8) Settling Tank - I  (9) Aeration Tank - II  
(10) Settling Tank - II  (11) Sludge Drying Beds.

The treatment units are designed and erected by M/s. Voltas Ltd., Bangalore. In these units the treatment takes places in the following manner.

The combined waste from different units is collected through a common drain across which a fine screen is provided. This is operated manually and removes coarse floating solids like cotton waste, rags and leaves etc.

After screening the waste is passed through an oil skimmer which works on the principle of gravity separator and floating oil is skimmed off by rotating arms.

The waste from the oil skimmer then comes to a balancing tank. The pH reduction is brought about by adding sulfuric acid from the acid tank originally prepared. The pH control system has been set so as to obtain a pH of 7.5-8.0 by controlling the opening of the valve located at the outlet of the acid tank which is used to allow a steady stream of acid to flow.

From the balancing tank, the waste flows to the flash mixer, where the waste is allowed for primary settling of suspended particles. The sludge from the settling is either recirculated for pH adjustment or sent to sludge drying beds. The effluent is allowed to flow into the first stage aeration tank into which fresh sludge is added.

As the effluent itself does not contain microorganisms, this is done by providing by “Seeding” with fresh sludge or cow dung. Then the microorganisms are acclimatized to the effluent by starting with a low flow of the effluent and then steadily increasing the daily flow till it reaches the full flow rate. The aerations are run intermittently in order to prevent excessive transfer of oxygen with intervals not exceeding two hours.

The waste is let into settling tank-I after I stage aeration and again from settling tank-I the waste is let into II stage aeration and to final setting tank II. The final effluent from the settling tank II is let into a nullah which goes parallel to the Bangalore-Mysore railway line and finally joins the Vrishabhavathi Valley along Mysore road. The excess sludge is pumped to the sludge drying for final disposal.
Waste Water Drains In The Mills

The following are the major drains through which wastewater are discharged in the factory.

1. Drain carrying wastes from sizing section.
2. Drain carrying wastes from dyeing section.
3. Drain carrying waste from finishing, soaper, bleaching, scouring etc.
4. From yarn dyeing section.
5. From kiering section.
6. From cots wool section.
7. From silk dyeing section.

From wet processing section all the wastewater together pours in a channel leading to a nullah outside the factory compound. Thus the Binny Mills has made some attempt at treating wastes, though much more can be done. It is essential that other industries too should that their effluents for a cleaner environment.

CONCLUSION

Bangalore liberalization policy had let to industrial growth since the 1960's, this was given a further boost in the 1980's where industries were invited to setup in Karnataka. Consequently not only did industrial growth takes places in a haphazard manner wherever cheap plan was available but give little scope for discharging or even recycling pollutants from each of the industries. Since industrial concentration was along the highways large and medium scale industries sprang up, small-scale industries were mainly planned for location on industrial estates. Though these aimed at treating pollutants by common treatment plants most of the wastes were let into either sewers or the unoccupied areas of industrial estates. Small scale industries or industrial estates were not properly planned to have the same type of industries in contiguous areas. Hence effluents were let out into streams or sewers, they’re by polluting both surface and ground water sources. Under these circumstances measuring pollution level becomes
extremely difficult. Hence case studies for one small scale industry namely electroplating located in small shed all over the town and one large scale industry namely the Binny Mills located in the heart of the city were studied in detail. Findings of these have been indicated above.

Reference


SHIVARAM CHOODIE (1992) “Bangalore’s Toxic Sewage”, Deccan Herald, 12th June P IV.