Wastewater of Textıle Industry and Its Treatment Processes

ONUR TEKOĞLU

CELALETTİN ÖZDEMİR

1. INTRODUCTİON

- Textile is one of the important sectors in Turkey and the leading sector which produces excessive waste (Gönüllü, 2004).

- In that branch of industry there are different production processes. Thus wastewater amount, pollutant types and consentrations show different datas (Ölmez et al.,2003).

- In textile industry wastewater are changeable in terms of amount and composition. The first reason of pollutants in the wastewater is the natural impurity in fibres. The second is the chemical materials that are used in processes. A huge amount of dye, carriers, chrome and its derivations and sulphur are found in wastewater (Kestioğlu, 1992).

- The common characteristics of textile wastewater are high chemical oxygen need (KOI), high biological oxygen need (BOI), high temperature, high PH, solid materials, phenol, sulphure and the colours caused by different dyes (Demir et al., 2000).

- Important pollutants in textile wastewater are especially the organics and then colour, toxic materials, inhibitor compounds, active substances, chlorine compounds (AOX), ph, salt and dying substances (Sandyha and Swaminathan, 2006).

- In textile industry most of the wastewater that carries great importance with respect to the formation amount and the pollutants which it comprise, are caused by dying processes. The main characteristic parameter of the wastewater that appears at the end of the dying process is colour and the source of that decomposed and colloidal formed colour are the dying substances used in those processes (Ölmez et al., 2006).

- Besides its complex forms textile wastewater creates problems due to their high volume. This industry which takes place in the first ranks on account of water consumption, is one of the industries that have become the subject of works of recycling wastewater for the purpose of saving water sources. The other problem about the textile industry is that it produces wastewater in different forms and volumes since this industry has many subdivisions. That situation makes so difficult to make generalization in selecting refining methods and makes it compulsory to handle every production factory as a different sample (Demiral, 2008).

❖ Upon selecting parameters that form the basis for the control of textile industry wastewater, the factors which are shown below have been considered (Erol, 2007):

- The sources of pollutant parameters must be determined in respect of inspection.
- Selected pollutant parameter must be characteristic for that wastewater.
- The effects and damages on the environment of pollutant parameters must be determined.
- Pollutant parameters must be refinable with the advanced methods.
- Selected pollutant parameters must be measured in definite sensitivity.

1.1. The classification of wastewater caused by textile industry

- In general, textile wastewater can be classified in 3 classes according to KOI content and colour density; high, average and lower intense wastewater. High intense wastewater is dark coloured water which has KOI concentration over 1600mg/l and very low light permeability.

- Average intense waterwaste contains 800-1600mg/l KOI whereas lower intense wastewater contains under 800mg/l KOI content (Lın and Peng, 1994).

Table 1. The average characteristics of textile wastewaters (Lın and Peng, 1994).

Type	BOI (mg/L)	KOI (mg/L)	ph	AKM (mg/L)	Temperature (° C)	Oil (mg/L)	Conductibility (µS)
High Strong	500	1500	10	250	28	50	2900
Middle Strong	270	970	9	137	28	21	2500
Low Strong	100	460	10	91	31	10	2100

1.2. Dyeing wastewater caused by textile ınDustry

- Due to the dyeing substance in the content, the textile industry wastewater is quite coloured water than those of the other industries.

- Some values related to the characterization of wastewater in the dry-house in which different dyes and fibers are dyed are shown in Table 2.

Table 2. The characterization of dying wastewater (Correira et al., 1994).

Type of dye	Fiber variety	Colour (ADMI)	BOI (mg/L)	TOK (mg/L)	AKM (mg/L)	CKM (mg/L)	ph
Acid	Polyamide	4000	240	315	14	2028	5,1
1:2 Metal complex	Polyamide	370	570	400	5	3945	6,8
Alkaline	Acrylic	5600	210	255	13	1469	4,5
Direct	Viscose	12500	15	140	26	2669	6,6
Reagent, non-continious	Cotton	3890	0	150	32	12500	11,2
Reagent, continious	Cotton	1390	102	230	9	691	9,1
Vat	Cotton	1910	294	265	41	3945	11,8
Dispers, high temperature	Polyester	1245	198	360	76	1700	10,2

- The wastewater given to the main water decreases the light permeability in the water environment and effects the photosynthetic activities negatively. Furthermore, with the accumulation of the dyeing substance in water environment, there comes out the danger of toxic and carcinogenic products (Kocaer and Kalkan, 2002).

- Giving coloured wastewater to the environment may cause great damages to the human body, functions of kidneys, reproductive system, liver, brain and nervous system (Özcan and Özcan, 2004).

- In natural water masses there occurs aesthetic corruption due to the existence of colour and it hinders the permeability of oxygen. The decrease of the decomposed oxygen in water masses severely affects the life in water environment (Kaykıoğlu and Debik, 2006).

- For that reason getting rid of dyes in wastewater is the basic environmental problem and it is vital because the dyes are visible even in the low consantration (Gomez et al., 2007).

- Dyeing wastewater may contain toxic components and heavy metals caused by chemicals and dyeing subtances. With this structure dying wastewater causes problems in refining facilities.

- These problems are swelling in the mud, continuousness in colour, excessiveness in ph, temperature and heavy metals and the changes in speed of hydraulic flow. Also removing wastewater with biological methods cannot be provided since many kinds of dyes have been developed showing resistance to biological decomposition. Thus removing colour has become the most important environmental problem that can be faced in the matter of wastewater (Buckley, 1992).

Discussion

- The dyeing substance that are used in textile industry gives colour to the water. Coloured textile wastewater accumulates in water environment and deteoriates the aesthetic appearance of the water and decreases the light permeability. Decrease in the light permeability and the amount of decomposed oxygen causes the extinction of living beings and restricts the reuse of the water. Furthermore it is known that some dying substance contain toxic materials.

- Not only the dyes but also wastewater caused by chemical materials cause vital problems. For this reasons refining the textile industry wastewater is very important.

- The results obtained from the studies on textile industry wastewater are summarized below:

- Depending on the most suitable refining technology the parameters which forms the basis for decharge quality limits should be determined for the inspection of textile industry wastewater.

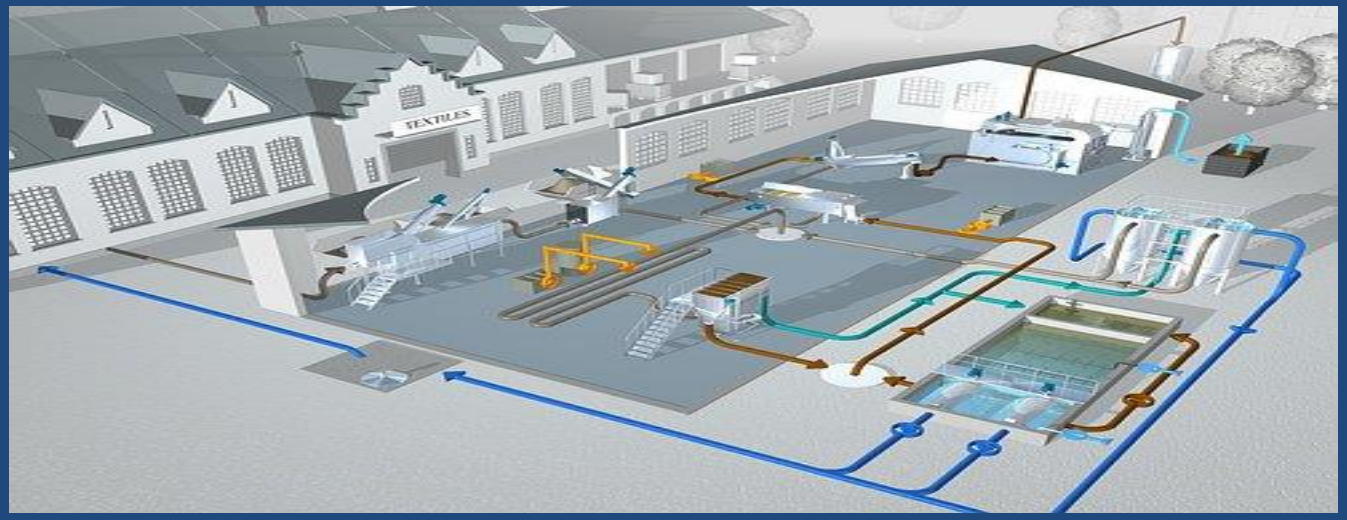
- Generally the textile wastewater is classified in 3 as high, average and lower intensity wastewater. The degree of difficulty in refining these wastewater is closely linked with relative pollution degree. In general most of the textile wastewater is in the class of lower or average intensity dirty wastewater.

- In order to decrease the initial investment and working cost of wastewater refining facility, the most suitable refining method should be determined. There are traditional methods which are composed of different compounds of biological, chemical and physical methods.

- According to the removing datas obtained from the comparison between refining alternatives It is stated that fenton process is more suitable method in removing KOI and colour from textile industry wastewater than the other advanced oxidation methods.

- Colour removing is not provided by biological refining but with chemical refining colour it has been observed that removing is happened effectively. However it is strictly stated that there aren’t colour parameters in decharge standards and limit values about it in our country.

- It has been seen that the colour removing is provided by anaerobic refining however it is not provided by aerobic refining.



- Membran process is a new technology which has found a wide using area in refining wastewater. By using this process especially the industries which decharge consantre waste supplies economical advantange and the amount of pollution will diminish in other areas (recycle etc.).

- It is observed that reverse osmose and nanofiltration membranes can be successfully used in refining textile wastewater.

- It is observed that the nanofiltration membrane stoppage is low and the efficiency of removing colour reaches almost 95%.

- As a consequence membrane techonologies carries great potential in refining in the future. For that reason it is essential to begin to work in order to determine technological and economical advantage and usage area of unknown technologies in Turkey.

- Textile industry that takes places in the first ranks in water consumption have become mostly the subject of the studies and efforts on recycle and reuse of wastewater with the aim of saving watersources which are diminishing day by day.

- Turkey have to solve colour problems with advanced refining methods and reach the decharge criteria which European Union uses.

Thank You for your relation…