CASPIAN SEA ENVIRONMENTAL POLLUTION PREVENTION

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ABSTRACT

Extraction and transportation of oil in the Sea are one of the pollution sources in the Seawater. Caspian Sea contains about 100000 million barrels of oil. It also contains over 35000 millions cubic meter of flue gas. Daily extractions of crude oil and gas and transportation of them are the main pollution sources of the Caspian Sea.

Many truck to carry goods and oil tankers to carry oil from ports along the Caspian Sea are considered as point and nonpoint sources along the seaboard. In addition, many ships, which are navigating in the Sea, are emitting pollution to the Sea.

Many cities and industries are surrounded Caspian Sea. Pollution from these cities and industries enter the Caspian Sea either directly or through rivers. Better house keeping and in plant maintenance resulted in up to 80 percent reduction in waste generation from the Iran Wood & Paper Industry (CHUKA). Several modifications have been proposed and applied in the Iran Wood Fiber Company that resulted in up to 50 percent reduction in waste production from the plant.

The purpose of this paper is to look at the benefits of environmental management strategies in pollution prevention such as waste minimization and clean technologies. This minimizes the environmental problems due to waste generation and eliminates the cost of treatment and disposal of the waste. The benefits of the environmental management program along the Caspian Sea will ensure the clean water and the better environment of the Sea.

KEYWORDS

Caspian Sea, COD, color, fiber, industry, papers, oil, pulp, total solids (TS), waste minimization, wood.

INTRODUCTION

Lots of industrial wastewater is produced every day in all countries. Large amount of
money is spent for treatment of this wastewater. The industries do not like seriously to spend the money because they will not get any profit from that. In another words, industries do not get back any money that they expect on treating their own wastewater. But it is a real requirement from the environmental protection agencies that the wastewater discharges have to obey certain constituent's level.

Cleaner production resulted in the conservation of raw materials and energy. It ensures the elimination of toxic materials, and the reduction of quantity and toxicity of all emissions and wastes from the product materials. The clean technologies have been practiced in process plant, recycling, process modification, and improved plant operation and input substitution. The clean products have been obtained by many ways such as redesigning, and modification of the process and changing chemicals used to less hazardous ones.

Many cities, industries and factories are surround Caspian Sea of the I.R. Iran. Pollution from these cities and industries enter the Caspian Sea either directly or via rivers. Several rivers that carry the wastewater from cities and industries are first entering the Anzaly Marsh (wetland) that is located in the west part of the Caspian Sea.

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By the definitions of the worldwide organizations such as UNEP, the objectives of the cleaner production programs are given as follows:

- Worldwide awareness of the preventive environmental production strategy should be increased.
- Insuring development of cleaner production programs and activities for the cleaner production expansion by helping government and industry.

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Chemical coagulant, synthetic, and natural polymers have been shown very effective in removing both color and COD from pulp and paper wastewater (Ganjidoust, et al. 1997). Enzymatic treatment of bleached pulp and paper wastewater has been shown to result in high chloroorganics and absorbable organic halides (AOX) removal efficiency (Ganjidoust, et al. 1996).

Several investigators have shown good removal rate of COD from similar type of wastewater. Ferguson (1993) has shown that about 70% of COD from bleaching wastewater were removed using aerobic reactor. Kroiss, 1993, in his paper called: "Water Protection at the Pulp Industry" has shown that the full size aerobic treatment plant in Austria in 1992 had over 90% of its COD removed. Eilbeck and Mattock (1987) have reported from 85 to 92% and 40 to 60% reduction in color and in COD respectively. Several aerobic batch studies have been shown a reduction of about 70% in the COD of either alkaline or cellulose fiber or combine of them (Ganjidoust, et al., 1994).

Oil Pollution is another pollution source along the Anzaly Port and Chaloos City is the ship, which carry mechanizes and oil. Many truck to carry the goods and oil tankers can be
considered as point and nonpoint sources along the seaboard. In addition, many ship which are navigating around coastal area and emitting pollution to the Sea. Oil burns cause other oil pollution problems in the Sea. This may happened due to accidental fire or by fight. Persian Gulf war in 1991 is an example of the oil burns due to fight. In January 1991, the invasion of Kuwait by Iraq resulted in firing over 900 millions barrels of oil which was burned over nine months in 8 cities of Kuwait. In addition to air, land, birds, animals and agricultural pollution that were recorded due to the invasion, sea pollution was also mentioned. Over one million of crude oil has been entering the Persian Gulf and then into the Indian Ocean. This has caused a lot of problems for fishes. Marine organisms were strongly damaged by the War. Lots of sea birds could not fly because of being polluted with the oil (Badkoubi, et al., 1994, Taniyama & Nagaya, 1994, SGRO, 1994).

RESULTS AND DISCUSSIONS

In this section, the waste minimization program that has been seriously applied is discussed into present situation, applied cases and future program.

I. Present Situation

The Caspian Sea is exposed to environmental crises caused by man and nature. Point and non-point sources of pollution from cities and industries into the sea are not well identified and controlled. Human activities in the Sea have to be environmentally controlled.

Oil Pollution: oil pollution sources in the Seawater are mainly due to the following:

- Daily extraction and transportation of oil in the Sea;
- Oil tankers accidents; and
- Oils spillage from the oil tankers.

Physical, chemical and biological processes of the oil in the sea will cause many environmental pollution and problems. The oil in the sea will spread very fast on the sea surface. Portion of that will evaporate and some will be dissolved in the water. Oxidation and photochemical reaction will take place at the surface of the water. Sedimentation of the heavy oil by any means to the bottom of the sea is another way of polluting the plants in the sea. Biodegradation of oil by microorganisms may also happen.

There are many means of collecting oil pollution from the sea, but expensive. It is very important that the oil pollution prevention be practiced in the sea. It is wiser to control the oil pollution from the oil tanks, which carry oils from Anzaly Port every day. It has been observed that many oils are spread on the surface of the streets in Anzaly City, which are close to the seashore. This pollution will enter the Sea by any means.

Industrial Pollution: Caspian Sea is located in north part of the Islamic Republic of Iran (I.R.Iran). Three prefectures; Gilan, Mazanderan and Gorgan surround it. Many cities and many industrial factories surround the seaboard. Astara, Anzali, Rasht, Lahijan, Ramsar, Chaloos, Babolsar, Sari, Shahi, Mahshahr, and Gorgan are the main cities, which are also industrialized in the seaboard area. Industries such as wood & paper, textile, chemicals, food products and foods processing, electronics, and fish processing are the
major ones in the surrounded seaboards cities. Among these industries, Wood and Paper Company (CHUKA) in Talesh city, Gilan, Wood Fiber Company in Hassan Rood, Gilan, Iran Poplin in Rasht, Many food products and food processing industries in all of the are pollution sources for water as well as atmosphere. However, the industrial sector in the Islamic Republic of Iran is young in the field of environmental control technology envelopment and application.

II. Applied Waste Minimization Program

Not much work has been done for the oil minimization in the Caspian Sea. Waste minimization program has been applied to many industries Two companies in which the waste minimization is practiced are discussed in this section. One having both line of wastewater (fiber, and alkaline wastewater) and the other has only fiber wastewater. The results of the program applied in these two industries are given as follows:

- One of the main successes in waste minimization management is to try to use fewer chemicals in the process. This has been practiced in Iran Wood Fiber Company. The paraffin used in the process was reduced to half, which resulted in COD reduction of 30% without any changes in the quality of the products.

- The grease has made a lot of problem in aerobic lagoons of the so-called industry. Because it has been accumulated on the surface of lagoons which inhibit the transfer of oxygen from air into lagoons which reduced the amount of oxygen required for the aerobic bacteria. A lot of odors, which were an indication of anaerobes bacterial activities, have been smelt all over the factory's area. The grease was then collected in separate small grease collector and removed from the area separately. This results not only to eliminate the previous discussed problem, but also reduced 40% COD and 30% total solids of the wastewater.

- In another study, it has been observed that the alkaline wastewater COD concentration was high due to concentrated black liquor which was entered into the wastewater stream from the spillage of the filtrate tank in the CHUKA industry (Akbari, Kh., 1994, Neyzehbaz, H., 1996). The collection of the black liquor into separate tank was managed in the plant. In addition to this collection, another one was the concentration of black liquor from the pump leakage. All were sent into the burning tower after collection. The effect of this action resulted in about 60% reduction in both color and COD of the wastewater.

- In recent investigation of the Iran Wood Fiber Company, It has been obtained that part of wastewater volume was due to leakage of the pumping of water in the boiler room, and from the cooking room department. Special collection of this clean water into separate stream was then applied in the company, which resulted in 15% reduction the daily wastewater volume.

- Another important study in so called industries which are in progress is wastewater reuse in the plant. The wastewater is high in COD and suspended solids. It was the objective of our study to investigate the effect of the wastewater recycle after chemical treatment. In chemical treatment, almost all suspended solids are removed. The effluent from the chemical units is clear from suspended matter but are high in COD. The constituents of the organic material are mainly the same as used in the process. Due to low biodegradability of this wastewater, biological
treatment is difficult. Therefore, it is most suitable if the wastewater were reused in the process. The program has been suggested to the company. This program has been applied for several testing to see the effect of it on the quality of the wood fiber. So far, no adverse effect has been recorded on the wood fiber. This for sure is one of the best waste minimization programs, which resulted in the elimination of wastewater production for slow biological anaerobic/aerobic treatment.

III. Future Programs

There are many research programs, which will be investigated in the future for waste minimization in the Caspian Sea. The important ones are given as follows:

- The first plan is to identify the point sources of pollution in the Caspian seaboard. This includes the pollution from all industries, commercial places and cities around the Caspian Sea.
- The second task is to identify as much as possible, the nonpoint pollution sources and to characterize them as point sources of pollution.
- The third plan is to determination of the contribution of each point source pollutant including domestic, industrial, business offices and nonpoint sources in the Caspian Seaboard and to prepare dispersion map of pollutant sources.
- The forth task is to investigate the effect of these pollution on the aquatic life of the Caspian Sea.
- The last plan is to measure the amount of oil pollution in the Caspian Sea.

CONCLUSIONS

The following conclusions can be drawn from this paper.

- Present situation of the Caspian Sea environment is not good.
- Application of waste minimization plan was successful in some industries nearby the Caspian Sea.
- Over 50% of the industrial wastewater strength were reduced by the implementation of wastewater minimization program in two wood industries by the Caspian Sea.
- More waste minimization program is required in the future for the environmental protection of the Caspian Sea and its surroundings.

REFERENCES


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