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Research Article

ANALYSIS OF EFFLUENT USING PHYSICO-CHEMICAL PARAMETERS AT PHARMACEUTICAL INDUSTRIES

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ABSTRACT
Present study deals with study of physic-chemical parameters of effluent of pharmaceutical industry. The analysis of effluent of pharmaceutical industry was done with physical and chemical parameters such as water temperature, turbidity, total dissolved solid, pH, dissolved oxygen, total hardness, chlorides, alkalinity and sulphates. The work was carried on the seasonal basis in order to determine the effect of the climatic factors on the water quality; three samples were collected in every season for two different stations of the pharmaceutical industry.

Key Words: *Transparency Hardness, Seasonal Variation, Dissolved Oxygen (D.O.)*

INTRODUCTION
Waste management strategies adopted in India have failed to keep pace with the industrial growth and urbanization. Of even greater concern have been the adverse environmental effects associated with waste disposal activities, particularly sewage sludge and dredged spoil dumping, oil spills and leakages as well as municipal and industrial waste water discharges.
Drug industry is one of the most important parts of the industrial growth as it is the prime sources of saving life but most tragic phase of this is that it produces enormous pollution which is responsible for many diseases. Today drug sector is of vital importance therefore it is necessary that the drugs produced by these industries apart from saving life do not create much pollution. Wastewater from basic drugs industry is one of the worst liquid wastes.
A large amount of water is used in drug industries during different processes. After using the water is discharged as a waste and this waste contains many soluble and insoluble pollutants.
The wastewater discharged is highly polluted in nature with highly variable characteristics such as temperature, color, total solid, biological oxygen demand, chemical oxygen demand. Due to highly polluting nature, it is not possible to discharge treated and untreated waste either into water course on land without causing great damage. Thus these wastes create a great problem for environmental engineers.
Different types of pollutants are present in the wastewater generated during the manufacturing process of different drugs. Wastewater treatment at source is required to deal with pollutants, acids and alkalies before they are allowed to get mixed with other effluents. The possibilities of corrosive action on sewers are to be taken into account.
The wastewater from basic drug industry is one of the worst polluting industrial liquid wastes containing high concentration of organic matter having COD as high as 48,000 mg/l. This is acidic with a pH of 4.0 to 4.5. Discharge of untreated basic drug industrial effluent water bodies results in rapid depletion of oxygen content of water and making the environment unfit for aquatic life. The effluent may also impart odor to the water and results in unsightly conditions in the water bodies. Stagnation of effluent on land results in obnoxious condition in the region and affects the ground water quality. Effluent discharge with high temperature can affect the fauna and flora in the eco system of the water bodies. Hence, these effluent present significant disposal and treatment problems. Different methods have been tried with little success.
Problem in the basic drug industries can be classified as either normal or exceptional. normal problems include the possible pollution of water due to wastes, wash-up, ejector condensate etc. whereas exceptional problems are the unplanned situation, like spills, that find their way to floor drains and

leakage through a heat exchanger that results in chemicals entering a frequently as extreme problem, a fire or explosion , results in extensive , unanticipated water pollution.

Necessity of Treatment

Considering the pollution effects of the pharmaceutical waste effluent, adequate treatment is essential prior to its disposal. With the enforcement of pollution control laws, Pharmaceutical industries are required to have the pollution parameters within the limits prescribed by state pollution board. The approach followed for evolution of pollution load and treatment involved physic-chemical process, with a perspective of recovery of some products during waste water treatment.

MATERIALS AND METHODS

Collection of Samples

Polythene bottles of 2.5 L and 2.0 L were used to collect the grab water samples (number of samples collected). The bottles were thoroughly cleaned with hydrochloric acid, washed with tape water to render free of acid, washed with distilled water twice, again rinsed with the water sample to be collected and then filled up the bottle with the sample leaving only a small air gap at the top. The sample bottles were Stoppard and sealed with paraffin wax.

Physico-Chemical Study

The samples collected were analyzed for temperature, pH, total solids (TS), total dissolved solids (TDS), total suspended solids (TSS), chloride content, oil /grease, biological oxygen demand (BOD) and chemical oxygen demand (COD) values.

The samples were collected and preserved for testing as per the standard procedure described in "Standard Method for Examination for Water and Wastewater 1985" published by American Health Association. The analysis of wastewater samples were made in accordance with the standard methods.

The samples for our study were collected from tube wells inside the factory premises and also from inside the plant during last year [January 2011 to November 2011]

Samples were collected manually at regular intervals in two to four liter polythene jerry canes for physiochemical studies 2-3 liters volumes of the samples were taken.

All the parameters were analyzed in our laboratory except color and pH, which were noted at the site. All the observations are recorded in the tables.

Table 1: M/s. IPCA Laboratories [Untreated Effluent] Pologround, Indore(M.P.)

S. No.	STANDARDS	JAN.	MAR.	MAY	JUL.	SEPT.	NOV.
1	Color	Dark black	Dark black	Dark black	Light black	black	black
2	Appearance	Turbid	Turbid	Turbid	Turbid	Turbid	Turbid
3	Odor	Unpleasant	Unpleasant	Unpleasant	Unpleasant	Unpleasant	Unpleasant
4	pH	3.8	4.1	4.2	5.4	5.2	5
5	Total Solids	10297	11045	11527	9364	9940	10660
6	Dissolved Solids	9112	9710	10115	8256	8795	9420
7	Suspended Solids	1185	1335	1412	1108	1145	1240
8	Chlorides	2605	2890	3012	2210	2322	2715
9	BOD	5865	6125	6365	5580	5729	5990
10	COD	23899	24943	25575	22980	23485	24380

Note: All the parameters except Colour, Appearance, Odour, and pH are in mg/l.

Table 2: M/s. IPCA Laboratories [Treated Effluent]

S. No.	STANDARDS	JAN.	MAR.	MAY	JUL.	SEPT.	NOV.
1	Color	Light black	Light black	blackish	black	black	black
2	Appearance	Turbid	Turbid	Turbid	Turbid	Turbid	Turbid
3	Odor	Unpleasant	Unpleasant	Unpleasant	Unpleasant	Unpleasant	Unpleasant
4	pH	7.8	7.6	8.2	8.2	7.8	8.1
5	Total Solids	5934	6144	6271	5658	5800	6053
	Dissolved	5024	5195	5296	4810	4920	5105
6	Solids						
	Suspended	910	949	975	848	880	948
7	Solids						
8	Chlorides	1274	1325	1356	1225	1250	1295
9	BOD	685	765	790	580	615	710
10	COD	1298	1486	1592	1180	1210	1375

Note: All the parameters except Color, Appearance, Odor, and pH are in mg/l.

RESULTS AND DISCUSSION

The study of untreated effluent of IPCA Laboratories, Pologround, Indore reveals that the color of the effluent is dark black and it is turbid in appearance with unpleasant odor. The effluent is acidic with its pH ranging from 3.8 to 5.4.

The concentration of total solid ranges from 11527-9364mg/l. which shows that it is quite higher than permissible limit (i.e. 500mg/l). The values of dissolved solids and suspended solids range from 8256-10115mg/l and 1185-1108 mg/l respectively. These values are higher than permissible limits. The value of suspended solids is high in the month of May and decreases from July to November (rainy season to winter). This is because of evaporation in summer and addition of water in rainy season. Concentrations of chloride vary from 2210-3012mg/l which is much higher than permissible limit (*i.e.*, 250mg/l) BOD and COD values are high in the unit. BOD values range from6365-5580 mg/l and COD range from 25575-22980 mg/l. This shows that values of these two parameters are also many fold as compared to permissible limit.

The study of treated effluent of IPCA Laboratories, Pologround, Indore reveals that the color of the effluent is black and it is turbid in appearance with unpleasant odor. The effluent is acidic-its pH ranging from 7.6-8.2. The concentration of total solid ranges from 5658-6271 mg/l. which show that it is quite higher than permissible limit (i.e. 500mg/l). The values of dissolved solids and suspended solids range from 5296-4810mg/l and 975-848 mg/l. respectively. These values are higher than permissible limits .The value of suspended solids is high in the month of May and decreases from July to November (rainy season to winter). Concentrations of chloride vary from 1356-1225 mg/l. which is much higher than permissible limit (*i.e.* 250mg/l)

BOD and COD values are high in the unit. BOD values range from790-580 mg/l and COD range from 1592-1180 mg/l. This shows that values of these two parameters are also many fold as compared to permissible limit.

The study of drug and pharmaceutical industries is carried out in reference to various standard parameters. The effluent after treatment has not become clear. It still remains turbid but the turbidity has decreased slightly. The odor of the effluent remains unpleasant even after treatment. pH of the treated effluent in case of all the industries shifts from acidic (untreated) to alkaline (treated effluent) range. Effluent does not become neutral after treatment but it become slightly alkaline. This is probably due to the use of lime in the treatment process. The concentration of the parameters - color, temp ., pH, acidity, total solids, total dissolved solids, suspended solids, chemical oxygen demand, biological oxygen demand ,chlorides have decreased. But concentration has not come in the permissible limit.

Conclusions

Around the world as countries are struggling to arrive at an effective regulatory regime to control the discharge of industrial effluents into their ecosystems, Indian economy holds a double edged sword of economic growth and eco-system collapse. The present experimental data indicates high level of pollution. The experimental data suggests a need to implement common objectives, compatible policies and programmers for improvement in the industrial waste water treatment methods. It also suggests a need of consistent, internationally recognized data driven strategy to assess the quality of waste water effluent and generation of international standards for evaluation of contamination levels. The existing situation if mishandled can cause irreparable eco-logical harm in the long-term well masked by short term economic prosperity.

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