

NOTE**Physico-Chemical Characteristics of Effluent Exit
from Govada Cooperative Sugar Mills At Chodavaram, India**

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Present research work deals with the physical and chemical characteristics of the effluent discharged from the "Govada Cooperative Sugar Mills Ltd.", Chodavaram, Visakhapatnam district, Andhra Pradesh, India. The effluents from different zones of the sugar mill waste are collected. The samples from each zone are taken and the various parameters like colour, odour, temperature, pH, COD, dissolved oxygen, total dissolved solids and total hardness of the effluent are determined. The heavy and toxic metals such as mercury, lead, arsenic, cadmium, *etc.*, which may spoil the aquatic, plants, animals and human bodies are also measured. It is observed from the plots that the pH, dissolved oxygen and heavy metals like mercury, lead and arsenic increases from zone1 to zone 3, also the temperature, COD, total hardness, total dissolved solids and heavy metals of cadmium and chlorine decreases from zone1 to zone 3.

Key Words: Sugar mill effluent, DO Analyzer, Gravimetric analysis, Atomic absorption spectroscopy and Sigma plots.

In the past, a number of research reported that the water bodies contaminated due to domestic, agricultural and industrial effluents^{1,2} being drained into rivers, lakes, canals, seas and oceans. Due to this mixing, it spoils the life cycle of aquatic bodies. These industrial wastes after been mixed with water are responsible for the complete opaque of the light into euphotic zone of the water. This results in the turbidity of the water because of suspended particulate solids. Similarly deoxygenation of water occurs because of the formation of the surface film on the water surface due to presence of some oils, greases, paints and waxes. Immediate (or) long-term physiological changes in plants, animals and humans result due to hazardous metal elements.

The Govada Cooperative Sugar Mill Ltd., is located at Chodavaram, Visakhapatnam Dist. Andhra Pradesh, India. This sugar mill occupies the area of hectares and it provides the employment opportunities for more than 2000 people (which includes engineers, managers, technicians, labour workers and daily wise earners *etc.*). This sugar mill is very useful resource to develop the paper mills, poultry forms, beer

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and alcoholic industries. Chodavaram and surrounding villages are well developed by the Govada Cooperative Sugars Mill.

Here in this work, the author deals with the estimation of physico-chemical characteristics of effluents discharged by this sugar mill. The effluent from various zones of the sugar mill which are drained into the river are collected and the various parameters like COD, DO, total solids³⁻⁵, *etc.* and other hazardous chemicals and heavy metal elements are determined by using standard methods^{6,7}.

Different samples are collected from different zones. *i.e.* **Zone-1**: The effluent drained off into the river from sugar mill (it is nearly 0.5 km from the exit point of the sugar mill). **Zone-2**: It is 100 m from the zone-1. **Zone-3**: It is 200 m from the zone-2. All these samples are collected from the Govada Cooperative Sugar Mills Ltd., in industrial visit. Physical, chemical parameters, toxic chemicals and hazardous heavy metal elements are determined by standard methods^{6,7} to analyze the collected waste water effluent. pH is measured by digital pH meter. Dissolved oxygen has been measured by DO analyzer. Total dissolved solids measured by standard method. COD has been measured by standard method. Other hazardous and heavy metal elements are measured by using atomic absorption spectroscopy.

In the present study, the plots observed that the pH, dissolved oxygen and heavy metals like mercury, lead and arsenic increases. It is also observed that the temperature, COD, total hardness, total dissolved solids and heavy metals of cadmium and chlorine decreases. The experimental values are given in Tables 1 and 2 for comparison with the standard values are given in Table-3. According to the water (prevention and control of pollution) Act, 1974, proposed by 'Central Pollution Control Board of India', gives the complete data regarding the maximum allowable limits of various parameters.

TABLE-1
PHYSICAL AND CHEMICAL PARAMETERS

Parameter	Zone-1	Zone-2	Zone-3
Colour	Yellow	Light yellow	Very-less coloured
Odour	Sweet	Light sweet	Light alcoholic
Temperature (°C)	36	24	20
pH	4.3	5.8	6.1
COD	313	176	126
Total hardness	325	260	235
Total dissolved solids	8530	8546	7000
Dissolved oxygen	3.9	4.7	5.6

TABLE-2
HEAVY METAL ELEMENTS

Parameter	Zone-1	Zone-2	Zone-3
Cadmium	0.016	0.011	0.0080
Mercury	0.001	0.003	0.0050
Lead	0.003	0.018	0.0921
Chlorine	236.000	193.000	135.0000
Arsenic	0.006	0.039	0.0560

TABLE-3
MAXIMUM ALLOWABLE LIMITS OF VARIOUS PARAMETERS⁸

Parameter	Maximum limit for zone-1	Maximum limit for zone-2	Maximum limit for zone-3
Cadmium (mg/L)	2.00	2.00	2.00
Mercury (mg/L)	0.01	0.01	0.01
Lead (mg/L)	0.10	0.10	0.10
Chlorine (mg/L)	1000.00	1000.00	1000.00
Arsenic (mg/L)	0.01	0.01	0.01
Temperature (°C)	< 5	< 5	< 5
pH	5.5-9.0	5.5-9.0	5.5-9.0

The various parameters like colour, odour, temperature, pH, COD, dissolved oxygen, total dissolved solids and total hardness of the effluent and also the heavy and toxic metals such as mercury, lead, arsenic and cadmium were strictly controlled.

However, the standards may be relaxed in cases where the wastewater from small scale industrial units because they are collected and treated in a terminal treatment plant. These standards are laid down without prejudice to the board varying or modifying them while issuing consents pursuant to section 25 and 26 of the water (prevention and control of pollution) Act, 1974, India⁸.

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