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IMPACT OF OIL FACTORY EFFLUENT ON WATER QUALITY OF AAMI RIVER

Arpita Singh*, Sunil Kumar Singh and Ajay Singh

India.

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***Corresponding Author**
Arpita Singh
India.

ABSTRACT

The purpose of the study was to assess the Aami River's water quality in the area close to the edible oil factory. This study attempts to determine whether the registered values of the tested parameters, based on physicochemical analysis of wastewater samples from various plants of the oil refinery in question, are within the allowable limits; that is, whether they negatively affect the Aami River's water quality as a natural water recipient and the environment as a whole. Water samples were gathered between July and December and subjected to physical and chemical testing. The oil factory by the Aami River has treated its produced water in strict accordance with the rules. The river water is still somewhat contaminated by the high levels of nitrite and ammonia, as well as oil and grease. To guarantee the purity and safety of the river water close to an oil refinery, tests must be conducted on a regular basis.

KEYWORDS: Oil factory, Effluents, pH, Temperature, BOD, COD, Oil and Grease.

I. INTRODUCTION

The expansion of economic activity and industrialization are frequently associated with environmental damage (Carvalho et al., 2018; Tran et al., 2019; Nasrollahi et al., 2020). Waste water is any water that has undergone physical, chemical, or biological changes after usage and is unfit for its intended purpose or any other. Depending on the manufacturing process, industrial effluent can contain both biodegradable and non-biodegradable materials. Large volumes of wastewater are produced by vegetable oil production facilities, which can have detrimental effects on the environment (Yu, X et al, 2010). According to Bagheri et al. (2018), produced water (PW), which makes up over 80% of all wastewater, is brought to the surface after the extraction of crude oil and contains hydrocarbons and their derivatives.

According to McLaughlin et al. (2020), PW is frequently released into rivers by onshore operations. A river's ecology, the nearby towns that rely on its water, and several other advantages can all suffer greatly when pollutants are introduced (Zhao and Khan, 2019). Wastewaters from the vegetable oil industry are rich in organic compounds and have a high concentration of oil components (Sharma, S, Simsek, H., 2018). High inchemical oxygen demand (COD), oil and grease, sulphate, and phosphate content are some of its features that are mostly dependent on the type of oil produced and the procedure used. These factors cause both high inorganic and organic loading of the pertinent wastewater treatment works (Un, U. T, 2009). Due to its high chemical and biological oxygen demands (COD and BOD), the effluent can undoubtedly cause major environmental issues if it is released untreated (Khoufi, S et al, 2006). According to Jail, A. et al., (2010) elevated phosphorus levels can also be discovered, especially when phosphoric acid is employed in significant amounts for cleaning or the degumming of vegetable oils. Therefore, removing waste oil and other byproducts from oil manufacturing facilities' wastewater is a crucial step in preventing environmental and aquatic contamination. A number of variables, including the pollutants' concentration, characteristics, and type, as well as the efficiency of the purification apparatuses themselves, affect the removal of contaminants using physicochemical and biological techniques. As a result, there are notable differences in the purification process's performance between cases (Dkhissi O et al, 2018).

Aami River is referred as “GANGA” of Gorakhpur District, but the ground level reality of Aami River is a matter of concern. In this paper we have just covered a segment of this river near Maghar where an edible oil factory (Figure 2) is located. The condition of the river is not upto the mark as shown in Figure 1. Certain parameters were analysed during the study procedure, the results are mentioned below.

Figure 1: Condition of the river water near oil factory.

Figure 2: Image showing the edible oil factory.

II. MATERIAL AND METHODS

In order to better understand the effluent's properties and any effects on the water recipient, measuring stations for wastewater sampling were established following an inspection of the subject oil refinery's production facilities and procedures. In wastewater analysis, the fundamental physicochemical parameters are covered.

Site 1: Waste water from the oil production and refinery unit that enters the sewer system through the multi-chamber separator's exit

Site 2: 200 metre upstream river

Site 3: 200 metre downstream river

The study sites were sampled at regular intervals between 8 and 9 a.m. The sample was collected in plastic containers with great care to prevent any inconvenience from the loose stones and silt in the river water. Following the packing of the sample bottle to the rim, the cap was placed in the river itself to prevent the entry of unnecessary air bubbles. The physicochemical properties of the water samples were evaluated as soon as the collected samples were brought into the lab.

Total Kjeldahl nitrogen, oil and grease, sulphate, chloride, dissolved biochemical oxygen demand (BOD), total suspended solids (TSS), pH, temperature and chemical oxygen demand (COD) were utilized to assess the water samples. The Central Pollution Control Board (CPCB) and World Health Organization (WHO) standards are compared with the results.

III. RESULT AND DISCUSSION

The information gathered from sampling all three locations is examined, and the findings are presented here for a range of water quality metrics.

Table 1: Result of the physico-chemical analysis at Site 1, Site 2, Site 3.

Parameters	Site I	Site II	Site III	Standard Value
Temperature	36.0	26.5	33.34	40
(^{o}C)				
pH (pH units)	8.00	7..21	7.56	6.50-9.50
Total	300	100	270	500
Suspended				
Solids				
Biochemical	600	360	550	350mg/l
Oxygen				
Demand				
Chemical	400	230	420	250mg/l
Oxygen				
Demand				
Total Kjeldahl	3.00	1.67	2.50	100
Nitrogen				
Oil and Grease	155	30	140	-
Sulphate	135	50	110	200
Chloride	110.0	102.0	115.0	250

The three samples had different wastewater temperatures (T^{o}). The waste water from Site 1 had the highest temperature at 36.0 °C, whereas the effluent released from Site 2 (the upstream river) had the lowest temperature at 26.5 °C. Although the recorded readings were all below the allowable limit, the effluent temperatures at all three sites varied between samplings. The lowest pH value was obtained at Site 2 (7.21) while the highest pH value was obtained at Site 1 (8.0). BOD and COD values were not under permissible limits. Highest value of BOD and COD was observed at Site 1 while the lowest values were seen at Site 2 (upstream river). Other authors (Anyanwu et al, 2019) and Ikhu-Omoregbe et al (2001) explains this relation through the ability to register an oil as a TSS in a sample depending on its temperature and other physical characteristics. TSS as well as oil and grease showed significantly high values at the sampling sites. This may be due to the careless release of oil refinery effluent into the river stream. High BOD and COD values could also be releated with the same reason.

IV. CONCLUSION

Given that most industries in developed nations aim for quality and environmental conservation through sustainable development and cleaner technology approaches, Uttar Pradesh's widespread disregard for the environment, with particular reference to the Aami River, in reference to indiscriminate effluent discharge, is far from ideal. The rapid industrial and technical advancements in modern civilization necessitate the introduction of routine

monitoring and evaluation of the environmental concerns associated with the waste products released on a daily basis. Waste water from facilities that process vegetable oils is a complex blend of both organic and inorganic materials. With the ground level survey and questioning it was clear that the condition of Aami River is not upto the mark. A layer of oil and grease can be seen floating on the surface of river body which resulted in high mortality rates of aquatic flora and fauna. Fish were seen floating on the water surface because of mass death due to high level of oil and grease which is present in the river especially near the oil refinery plant. Local fishermen faced financial crisis due to the mass mortality of fishes in the Aami River. To keep the edible oil factory from negatively affecting the quality of the water recipient, we suggest that routine maintenance of the internal drainage system, wastewater treatment, and ongoing monitoring continue to ensure the satisfactory quality of technological wastewater discharged through the sewage system into the Aami River watercourse.

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