Industrial Water Pollution: A Case Study on Azam Rubber Product of GIDA, Gorakhpur

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ABSTRACT

Azam rubber product is located in sector 13 of G.I.D.A Gorakhpur producing many rubbers products. It is well known industry and is a top supplier of pu slippers and pu shoes. Many industries dump its discharge in the river Ami, ultimately polluting it. Azam rubber product being among one of the industries polluting it. The statement of problem suggested that the temporal images of the industry showed the darkening of the images around the industry in the year 2009, 2015 and 2022 respectively. The research is carried out to find out the ground truth data. The physico-chemical parameters were analyzed, temperature, pH, Turbidity, Free Carbon Dioxide and Total Suspended Solids were recorded within the standard limit. Whereas Total Dissolved Solids, Dissolved Oxygen, Biological Oxygen Demand and Chemical Oxygen Demand were recorded much higher than standard value.

Keywords: Azam Rubber Product, Industrial Water Pollution, Physico-chemical parameters and Temporal images

1. INTRODUCTION

Water is a precious natural resource that is necessary for both human survival and the wellbeing of ecosystems. Water serves several purposes, including providing supplies of water for mining operations, livestock, irrigated agriculture, and home and industrial use. However, the quality of the water has drastically declined due to anthropogenic activities and the growth of industrial development. The quality of river water can degrade as a result of home

wastewater, industrial effluents, and agricultural waste. Three categories can be used to describe the characteristics of water: physical, biological, and chemical. Water bodies in particular are becoming contaminated as a result of wastewater discharge [1]. Industrial effluents are main hazards to the native biodiversity in fresh water [2-3].

Threats from industrial effluents to the hydrology of the ecosystem and the river system. Release of effluents results in modification to the structure and makeup of the community. Frequently, these effluents contain heavy metals, which may lead to a bioaccumulation problem [4]. Natural water sources have become significantly more contaminated as a result of the nation's growing industrialization [5]. When pollutants are directly or indirectly dumped into water bodies without proper treatment to eliminate hazardous substances, environmental degradation results [6-7]. Globally, industrial waste water represents main source of water pollution [8-12].

Azam rubber products limited is a non govt company, incorporated on 25 July, 1994. It has made a name for itself in the list of top suppliers of pu slippers, shoes in India. The supplier company is one of the top sellers of the products on the list and is based in Gorakhpur, Uttar Pradesh.

The company is registered with the registrar office in Kanpur, Uttar Pradesh. Located in AL 9 sector 13 Gida industrial area Gorakhpur Uttar Pradesh up 273209 in, Azam Rubber Products Limited's registered address.

Temporal images

Figure 1 shows that it is very evident from the above temporal images obtained in the year 2019, 2015 and 2022 respectively. The images show the increase in the level of the pollution around the industry as there is darkening seen in the image, so to investigate the true ground data the following research is carried out.

2. MATERIAL AND METHODOLOGY

2. 1. Study area

Study area: The selected area for study is Sehjanwa, Gorakhpur industrial development authority (GIDA-sector 13 industrial area) selected industry is Azam Rubber Product (A.R.P). water is collected from this industry-taken four sites in summer season of 2022.

The geographical location (Table 1), of the selected sites are as follows:

Table 1. Azam Rubber Product latitude, longitude and altitude.

Stations	Latitude	Longitude	Altitude
S1	26°44'50.74''N	83°11'50.2" E	19m
S2	26°44'50.70''N	83°11'55.3''E	22m
S3	26°44'50.64''N	83°11'54.8'' E	19m
S4	26°44'50.66''N	83°11'50.2'' E	-4m

2. 2. Methodology

Wastewater was collected from Azam Rubber Product (A.R. P) in GIDA, Gorakhpur during the summer season of 2021.Collected samples were transferred immediately to the laboratory and analysed the following parameters such as Temperature, Color, odour, pH, Alkalinity, Free carbon dioxide, Chemical oxygen demand (COD), Biological oxygen demand (BOD) by the help of methods [13]. The value compared with the Standard permissible limit of industrial effluents.

The temporal images obtained of the particular A.R.P industry of 2010, 2016, 2022 from Google Earth pro.
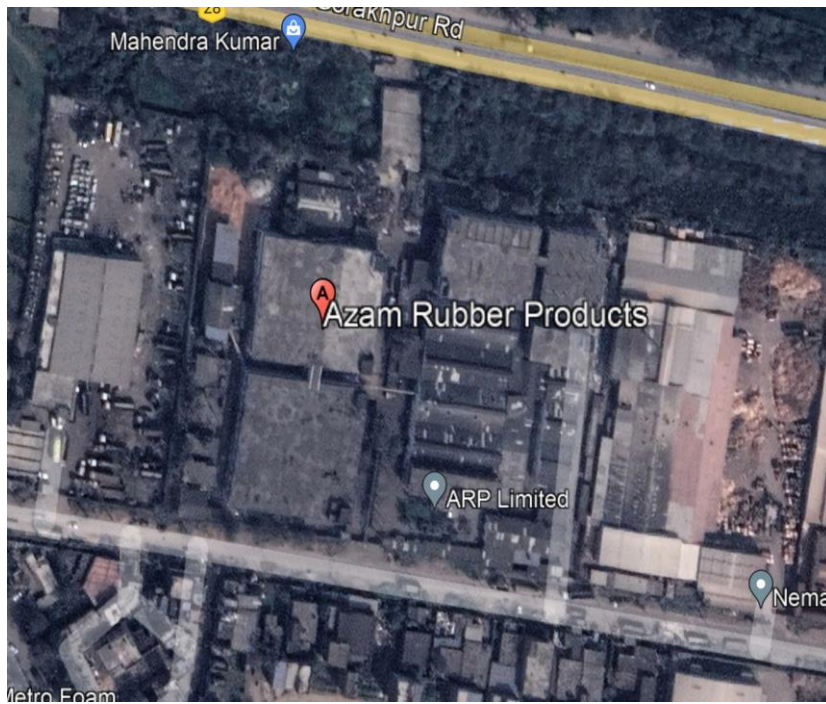
2. 3. Statistical analysis

Mean, Standard deviation and Coefficient Correlation Matrix performed on MS Excel.


2009

2015

2022

Figure 1. Temporal images of Azam Rubber product of year 2009, 2015 and 2022 respectively.
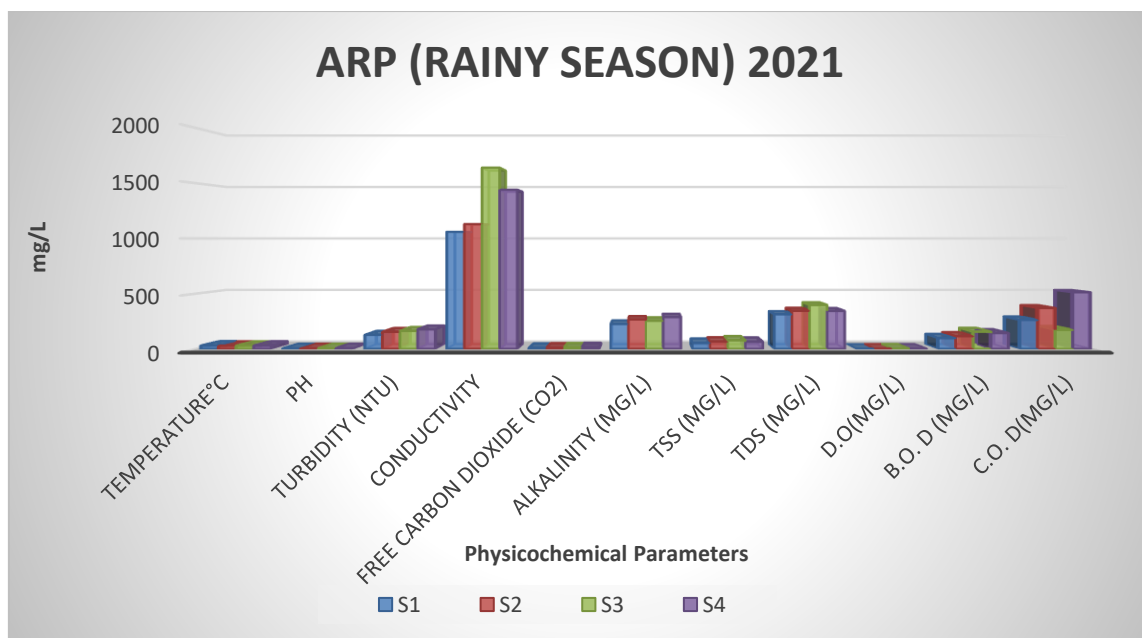
3. RESULT AND DISCUSSION

Table 2. Physio-Chemical Parameters of ARP During Summer Season of 2021

Parameter	Stations				Mean± SD
	S1	S2	S3	S4	
Temperature (degree Celsius)	30.2	31.4	32.5	33.6	31.92±1.26
pH	6.2	6.4	6.5	6.6	6.43±0.15
Color	Black	Dark brown	Black	Light brown	NA
Odour	odourless	Indistinct odour	Smell of rubber	odourless	NA
Turbidity (NTU)	166	167	165	160	164.5±2.69
Conductivity	1030	940	1010	990	990.25±30.34
Free carbon dioxide (CO_2)	8.1	7.6	7.5	8.2	7.85±0.30
Alkalinity (mg/L)	200	260	270	290	255±33.54
TSS (mg/L)	66.7	88.6	86.5	76.4	79.31±8.73
TDS (mg/L)	344.4	376.6	329.5	355.4	351.48±17.17
D.O (mg/L)	3.5	4.2	2.1	3.6	3.35±0.77
B.O. D (mg/L)	98.4	134.3	156.6	115.6	126.22±21.65
C.O. D (mg/L)	532	338.8	360.24	239.36	367.6±105.30
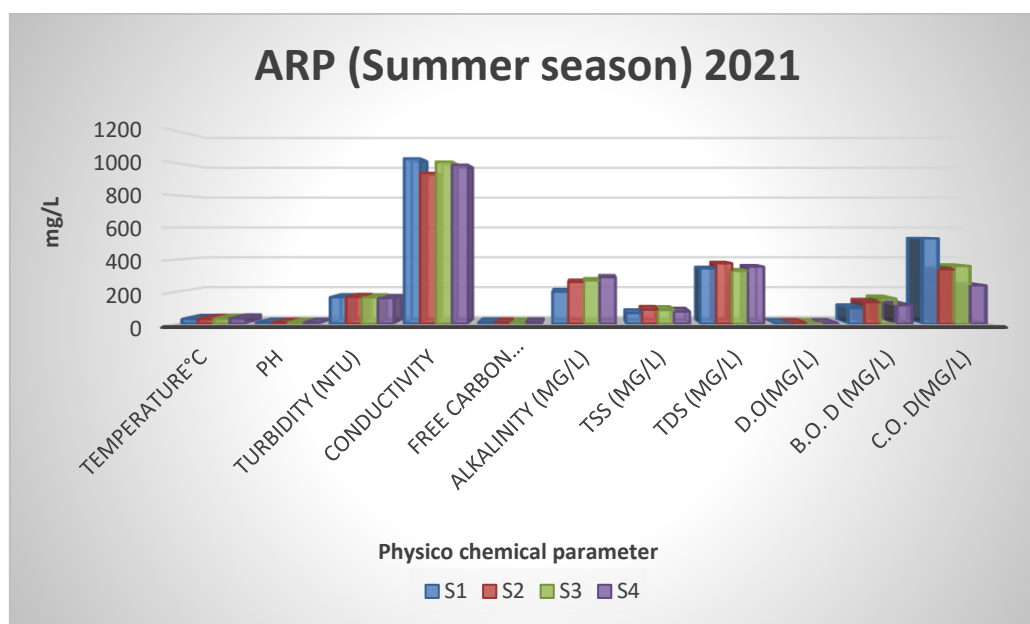
Table 3. Physio-chemical parameters of ARP during rainy season of 2021

Parameter	Stations				Mean± SD
	S1	S2	S3	S4	
Temperature (degree Celsius)	31.4	28.9	29.5	30.4	30.05±0.94
pH	6.1	5.9	6.0	6.3	6.08±0.15
Color	Black	Reddish brown	Brown	Orangish	NA
Odour	Indistinct odour	Odourless	Smell of burnt rubber	Odourless	NA
Turbidity (NTU)	128	155	164	178	156±18.25
Conductivity	1060	1130	1640	1440	1310.075±230.47
Free carbon dioxide (CO_2)	9.8	11.5	13.6	15.4	12.58±2.11
Alkalinity (mg/L)	226	267	256	289	259.5±22.70
TSS (mg/L)	55.5	67.4	78.4	65.7	66.75±8.12
TDS (mg/L)	313.6	345.6	398.4	344.2	350.45±30.50
D.O (mg/L)	1.2	2.3	2.5	1.61	1.90±0.52
B.O. D (mg/L)	99.4	116.4	156.4	144.3	129.13±22.47
C.O. D (mg/L)	263.20	371.20	173.60	513.36	330.34±126.73

Table 4. Physio-chemical parameters of ARP during winter season of 2021

Parameter	Stations				Mean± SD
	S1	S2	S3	S4	
Temperature (degree Celsius)	27.4	28.3	27.9	28.7	28.08±0.48
pH	5.3	6.2	5.9	6.1	5.88±0.35
Color	Brown	Dark brown	Greyish	Off white	NA
Odour	Indistinct odour	Odourless	smell of rubber	Odourless	NA
Turbidity (NTU)	150	130	155	133	142±10.70
Conductivity	1530	1580	1600	1620	1580.25±30.34
Free carbon dioxide (CO_2)	8.1	7.6	8.4	7.3	7.85±0.43
Alkalinity (mg/L)	200	260	320	370	287.5±63.79
TSS (mg/L)	66.6	72.3	77.3	75.3	72.88±4.04
TDS (mg/L)	333.4	324	345.6	401.2	351.05±29.95
D.O (mg/L)	3.5	4.2	2.2	3.2	3.28±0.72
B.O. D (mg/L)	109.5	134.3	115.2	132.3	122.83±10.70
C.O. D(mg/L)	532.00	338.80	360.24	239.36	367.6±105.30
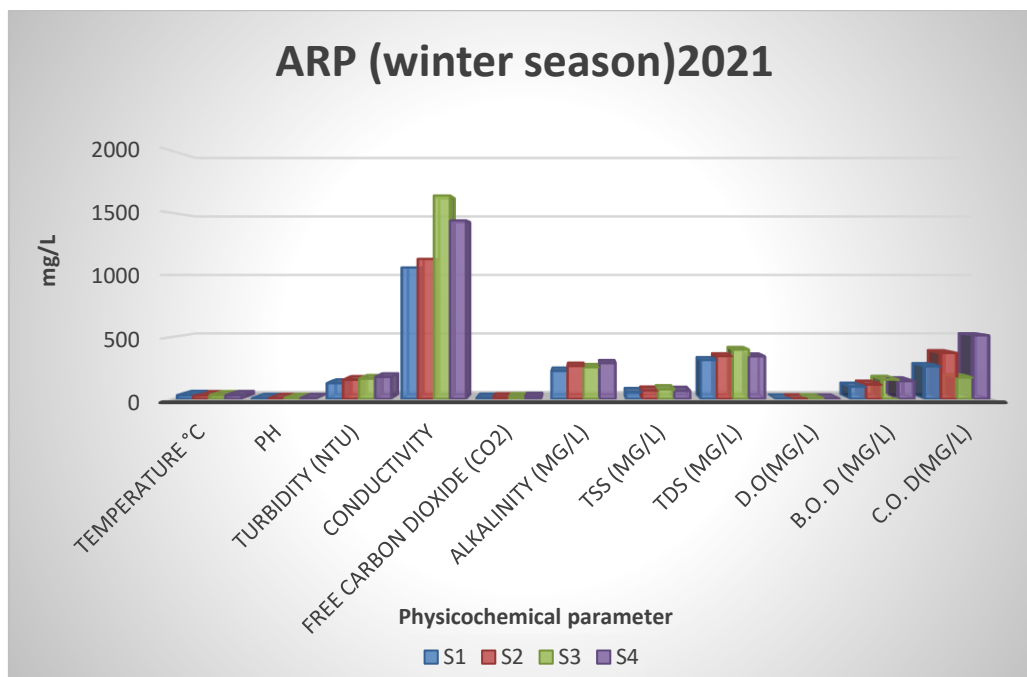
Temperature – Table 2 shows the temperature variation during summer season (31.92±1.26) °C of 2021, Table 3 shows the temperature variation during rainy season (30.05±0.94) °C of 2021 and Table 4 shows the temperature variation during winter season (28.08±0.48) °C of 2021 respectively. Maximum temperature is seen during summer season and minimum is seen during winter season. In case of river water temperature, the DoE standard for sustaining aquatic life is 20 to 30 °C both in dry and wet season [14]. The temperature variations are seen to be within the standard permissible limit of industrial effluent.

pH – Table 2 shows the pH variation during summer season (6.43±0.15) of 2021, Table 3 shows the pH variation during rainy season (6.08±0.15) of 2021 and Table 4 shows the pH variation during winter season (5.88±0.35) of 2021 respectively. Table 2 and Table 3 are showing the pH variation which is seen to be within the standard permissible limit of industrial effluent, whereas Table 4 are showing the values below the standard permissible limit of industrial effluent. Maximum temperature is seen during summer season while minimum is seen in winter season Seasonal variation mentioned in (Figure 2, 3 and 4). The pH values are seen to be in within to be in the standard value of industrial effluent.

Color: -Table 2, Table 3 and Table 4 are showing different colours on the surface of the water during summer, rainy and winter season of 2021 respectively. It is seen due to the various impurities present in the discharged industrial water.

Odour: - The recorded odour of all three seasons is distinct in all three seasons. The sampled water had an odour of burnt rubber and some indistinct odour.

Turbidity: - Table 2, Table 3 and Table 4 are representing the various turbidity units of sample water measured in NTU during summer (164.5±2.69) NTU, rainy (156±18.25) NTU and winter seasons (142±10.70) NTU 0f 2021. All the recorded values are seen to be within the standard permissible limit of industrial effluent**.** Maximum is seen during summer and minimum is seen during winter season.

Conductivity: – The concentration and degree of ion dissociation, temperature, and ion migration velocity in the electric field all affect the EC value. The number of ions in water is measured via electrical conductivity [15]. The table 2, table 3 and table 4 are representing the various conductivity units of sample water measured in during summer (990.25±30.34) μs/cm, rainy (1310.75±230.47) μs/cm and winter (1580.25±30.34) μs/cm seasons of 2021. Maximum is seen during rainy and minimum is seen during summer season. For recreational purposes, the permitted range of EC is 500 μs/cm; for irrigation, it is 750 μs/cm, and for aquaculture, it is 800 to 1000 μs/cm [16]. Elevated EC levels may have detrimental effects on aquatic life's ability to survive as well as grow and develop sustainably. From the study, the measured EC of all the water samples was higher than the acceptable range. The conductivity variations are seen to be above the standard permissible limit of industrial effluent.

Alkalinity (mg/L): - Table 2, Table 3 and Table 4 are representing the various alkalinity units of sample water measured in summer (255±33.54) mg/L, rainy (259.5±22.70) mg/L and winter (287.5±63.79) mg/L seasons of 2021. Maximum is seen during winter and minimum is seen during summer season. The values of alkalinity are showing more than the standard permissible

limit of industrial effluent of 200 mg/L affecting the quality of water discharged ultimately affecting the water quality of river Ami.

Free carbon dioxide (CO_2): - Table 2, Table 3 and Table 4 are representing the free carbon dioxide of sample water measured in summer (7.85±0.30) mg/L, rainy (12.58±2.11) mg/L and winter (7.85±0.43) mg/L seasons of 2021. All recorded values of water sample are showing variations during different seasons Seasonal variation mentioned in (Figure 2, 3 and 4). Maximum is seen during rainy and minimum is seen during summer season and winter season. The discharged water is showing higher CO_2 during the rainy season due to the decomposition of organic waste and due to the microbial activities increased during rainy season.

TSS (mg/L): - Table 2, Table 3 and Table 4 are representing the free carbon dioxide of sample water measured in summer (79.31±8.73) mg/L, rainy (66.75±8.12) mg/L and winter (72.88±4.04) mg/L seasons of 2021. Seasonal variation mentioned in (Figure 2, 3 and 4). Maximum is seen during summer season and minimum is seen during rainy season.

TDS (mg/L): – Total dissolved solids (TDS) refer to the sum of all the organic and inorganic salts matter dissolved in water. The Table 2, Table 3 and Table 4 are representing the free carbon dioxide of sample water measured in summer (351.48±17.17) mg/L, rainy (350.45±30.50) mg/L and winter (351.05±29.95) mg/L seasons of 2021. Seasonal variation mentioned in (Figure 2, 3 and 4). All the three seasons showing almost same values of TDS. The values of the TDS are seen to be within the standard permissible limit of industrial effluent.

D.O (mg/L) – Table 2, Table 3 and Table 4 are representing the free carbon dioxide of sample water measured in summer (3.35±0.77) mg/L, rainy (1.90±0.52) mg/L and winter (3.28±0.72) mg/L seasons of 2021. Maximum is seen during summer season and minimum is seen during rainy season. The D.O levels are seen to be above the standard permissible limit of industrial effluent.

B.O. D (mg/L) – Table 2, Table 3 and Table 4 are representing the free carbon dioxide of sample water measured in summer (126.22±21.65) mg/L, rainy (129.13±22.47) mg/L and winter (122.83±10.70) mg/L seasons of 2021. The recorded value of B.O.D found in the experiment is almost the same. The B.O.D levels are seen to be above the standard permissible limit of industrial effluent.

C.O. D (mg/L) – Table 2, Table 3 and Table 4 are representing the free carbon dioxide of sample water measured in summer (367.6±105.30) mg/L, rainy (330.34±126.73) mg/L and winter (367.6±105.30) mg/L seasons of 2021. Seasonal variation mentioned in (Figure 2, 3 and 4). Maximum is seen during summer and winter season and minimum is seen during rainy season. The higher values of C.O.D values are seen during all the three seasons indicating the level of the pollution in the area. The values recorded are seen to be above the standard permissible limit of industrial pollutants. The higher C.O.D levels adversely affect the aquatic life thus affecting the river body in which it enters.

3. 1. Coefficient corelation

Table 5. This Table Showing Coefficient Corelation of ARP during Summer Season of 2021

	Temperature	pH	Turbidity	E.C	CO₂	Alkalinity	TSS	TDS	D.O	B.O. D	C.O. D
Temperature	1										
pH	0.98	1									
Turbidity	-0.81	-0.72	1								
E.C	-0.184	-0.31	-0.152	1							
CO₂	0.055	-0.083	-0.61	0.38	1						
Alkalinity	0.94	0.982	-0.609	-0.47	-0.196	1					
TSS	0.36	0.509	0.223	-0.70	-0.84	0.636	1				
TDS	-0.08	0.0002	0.127	-0.86	0.048	0.139	0.255	1			
D.O	-0.25	-0.230	0.072	-0.59	0.373	-0.135	-0.137	0.929	1		
B.O. D	0.396	0.505	0.177	-0.31	-0.885	0.569	0.892	-0.20	-0.567	1	
C.O. D	-0.91	-0.951	0.65	0.558	0.046	-0.97	-0.549	-0.30	-0.069	-0.40	1

Temperature is showing strong positively corelation with pH (0.98), alkalinity (0.94), CO₂ (0.05). Temperature is showing strongly negative corelated with turbidity (-0.81) and C.O.D (-0.91). Temperature is not showing any significant corelation with electrical conductivity (-0.18), TSS (0.36), TDS (-0.08), D.O (-0.25) and B.O.D (0.39).

pH is showing strong positively corelation with temperature (0.98), TSS (0.50), alkalinity (0.98) and B.O.D (0.50). pH is showing strongly negative corelated with turbidity (-0.72), CO₂ (-0.08) and C.O.D (-0.95). pH is not showing any significant corelation with electrical conductivity (-0.31), TDS (-0.0002) and D.O (-0.23).

Turbidity is showing strong positively corelation with temperature (0.98), D.O(0.07) and C.O.D (0.65). Turbidity is showing strongly negative corelated with pH (-0.72), alkalinity (-0.60) and CO₂ (-0.61). Turbidity is not showing any significant corelation with electrical conductivity (-0.15), TSS (0.22), TDS (0.12), and B.O.D (0.177).

Electrical conductivity is showing strong positively corelation with temperature (0.98), and C.O.D (0.55). Electrical conductivity is showing strongly negative corelated with pH (-0.72), TSS (-0.70), TDS (-0.86), D.O(-0.59). Electrical conductivity is not showing any significant corelation with turbidity (-0.15), alkalinity (-0.47), CO2 (0.38) and B.O.D (-0.31).

Total Suspended solids is showing strong positively corelation with temperature (0.98), alkalinity (0.63) and B.O.D(0.89). Total Suspended solids is showing strongly negative corelated with pH (-0.72), electrical conductivity (-0.70), CO2 (-0.84) and C.O.D (-0.54). Total Suspended solids is not showing any significant corelation with turbidity (-0.15), TDS (0.25) and D.O (-0.13)

Total Dissolved solids are showing strong positively corelation with temperature (0.98) and D.O (0.92). Total Dissolved solids are showing strongly negative corelated with pH (-0.72), electrical conductivity (-0.70), and C.O.D (-0.54). Total Dissolved solids is not showing any

significant corelation with turbidity (-0.15), TSS (0.25), alkalinity (0.13), CO_2 (0.04) and B.O.D (-0.20).

Alkalinity are showing strong positively corelation with temperature (0.98) and B.O.D (0.56). Alkalinity are showing strongly negative corelated with pH (-0.72), electrical conductivity (-0.70), and C.O.D (-0.97). Alkalinity is not showing any significant corelation with turbidity (-0.15), TSS (0.25), TDS (0.13), CO_2 (-0.19) and D.O (-0.13).

CO_2 are showing strong positively corelation with temperature (0.98) and. CO_2 are showing strongly negative corelated with pH (-0.72), electrical conductivity (-0.70) B.O.D (-0.88) and C.O.D (-0.97). CO_2 is not showing any significant corelation with turbidity (-0.15), TSS (0.25), TDS (0.13), alkalinity (-0.19) and D.O(0.37).Dissolved Oxygen (D.O) are showing strong positively corelation with temperature (0.98). Dissolved Oxygen are showing strongly negative corelated with pH (-0.72), electrical conductivity (-0.70) B.O.D (-0.56) and C.O.D (-0.69). Dissolved Oxygen is not showing any significant corelation with turbidity (-0.15), TSS (0.25), TDS (0.13), alkalinity (-0.19) and CO_2 (0.37). Biological Oxygen demand (B.O.D) is showing strong positively corelation with temperature (0.98). Biological Oxygen demand is showing strongly negative corelated with pH (-0.72), electrical conductivity (-0.70) and D.O (-0.56). Biological Oxygen demand is not showing any significant corelation with turbidity (-0.15), TSS (0.25), TDS (0.13), alkalinity (-0.19) CO_2 (0.37) and C.O.D (-0.4).Chemical Oxygen Demand (C.O.D) is showing strong positively corelation with turbidity (0.65), electrical conductivity (0.55) and. C.O.D is showing strongly negative corelated with temperature (-0.91), pH (-0.95), conductivity (-0.95), TDS (-0.97), CO_2 (-0.54) and D.O(-0.69). C.O.D is not showing any relation with TSS (0.04), alkalinity (-0.30) and B.O.D(-0.40).

Table 6. This Table Showing Coefficient Corelation of ARP during Rainy Season of 2021

	Temperature	pH	Turbidity	E.C	TSS	TDS	CO_2	Alkalinity	D.O	B.O. D	C.O.D
Temperature	1										
pH	0.635	1									
Turbidity	-0.483	0.35	1								
E.C	-0.300	0.214	0.73	1							
TSS	-0.740	-0.313	0.64	0.839	1						
TDS	-0.63	-0.281	0.576	0.876	0.985	1					
CO_2	-0.26	0.541	0.96	0.802	0.574	0.538	1				
Alkalinity	-0.48	0.35	0.936	0.455	0.420	0.305	0.857	1			
D.O	-0.92	-0.639	0.461	0.53	0.908	0.853	0.295	0.332	1		
B.O. D	-0.41	0.214	0.851	0.980	0.860	0.864	0.878	0.613	0.5888	1	
C.O. D	0.026	0.588	0.498	-0.15	-0.300	-0.41	0.465	0.738	-0.316	-0.001	1

Temperature is showing strong positively corelation with pH (0.63). Temperature is showing strongly negative corelated with TSS (-0.74), TDS (-0.08) and D.O(-0.92). Temperature is not showing any significant corelation with turbidity (-0.48) electrical conductivity (-0.30), CO_2 (-0.26), alkalinity (-0.48), B.O.D (-0.41) and C.O.D (0.02).

pH is showing strong positively corelation with temperature (0.63), CO2 (0.54) and C.O.D (0.58). pH is showing strongly negative corelated with and D.O (-0.63). pH is not showing any significant corelation with turbidity (0.35) electrical conductivity (0.21), TSS (-0.31), TDS (-0.28) alkalinity (0.35), B.O.D(0.21).

Turbidity is showing strong positively corelation with temperature (0.63), electrical conductivity (0.73), TSS (0.64), TDS (0.57), alkalinity (0.93), CO_2 (0.96) and B.O.D (0.85). Turbidity is not showing any significant corelation with pH (0.35), D.O (0.46) and C.O.D (0.49).

Electrical conductivity is showing strong positively corelation with temperature (0.63), turbidity (0.73), TSS (0.83), TDS (0.87), CO_2 (0.80), D.O(0.53) and B.O.D(0.98). Electrical conductivity is not showing any significant corelation with pH (0.35), alkalinity (0.45), and C.O.D (-0.15).

Total Suspended Solid (TSS) is showing strong positively corelation with temperature (0.63), turbidity (0.73), electrical conductivity (0.83), TDS (0.98), CO_2 (0.57), D.O (0.90) and B.O.D (0.86). Total Suspended Solid is not showing any significant corelation with pH (0.35), alkalinity (0.42), and C.O.D (-0.30).

Total Dissolved Solid (TDS) is showing strong positively corelation with temperature (0.63), turbidity (0.73), electrical conductivity (0.83), TSS (0.98), CO_2 (0.53), alkalinity (0.30), and B.O.D (0.87). Total Dissolved Solid is not showing any significant corelation with pH (0.35), D.O (0.29), and C.O.D (0.46).

CO_2 is showing strong positively corelation with temperature (0.63), turbidity (0.73), electrical conductivity (0.83), TSS (0.98), TDS (0.53), alkalinity (0.85), D.O (0.85) and B.O.D(0.87). CO_2 is not showing any significant corelation with pH (0.35), and C.O.D (0.46).

Alkalinity is showing strong positively corelation with temperature (0.63), turbidity (0.73), electrical conductivity (0.83), TSS (0.98), TDS (0.53), CO_2 (0.85), B.O.D (0.61) and C.O.D (0.73). Alkalinity is not showing any significant corelation with pH (0.35) and D.O(0.33).

Dissolved Oxygen (D.0) is showing strong positively corelation with temperature (0.63), turbidity (0.73), electrical conductivity (0.83), TSS (0.98), TDS (0.53), CO_2 (0.85), B.O.D (0.58) and. Dissolved Oxygen is not showing any significant corelation with pH (0.35) and alkalinity (0.33) and C.O.D (-0.31).

Biological Oxygen Demand (B.0.D) is showing strong positively corelation with temperature (0.63), turbidity (0.73), electrical conductivity (0.83), TSS (0.98), TDS (0.53), CO_2 (0.85), D.O (0.58) and. Biological Oxygen Demand is not showing any significant corelation with pH (0.35), alkalinity (0.33) and C.O.D (-0.0019).

Chemical Oxygen Demand (C.O.D) is showing strong positively corelation with pH (0.58), alkalinity (0.73). C.O.D is showing strongly negative corelated with alkalinity (-0.90) C.O.D does not show any relation with temperature (0.026), turbidity (0.49), electrical conductivity (0.15), TSS (0.30), TDS (0.41), CO_2 (0.46), D.O (0.31) and B.O.D (0.001).

Table 7. This Table Showing Coefficient Corelation of ARP during Winter Season of 2021

	Temperature	pH	Turbidity	Conductivity	TSS	TDS	CO_2	Alkalinity	D.O	B.O. D	C.O. D
Temperature	1										
pH	0.888574	1									
Turbidity	-0.7763	-0.68262	1								
Conductivity	0.857588	0.818932	-0.34925	1							
TSS	0.623513	0.723421	-0.04399	0.924498	1						
TDS	0.660891	0.299001	-0.26429	0.693661	0.46284	1					
CO2	-0.80817	-0.56156	0.935194	-0.41116	-0.04712	-0.5516	1				
Alkalinity	0.803748	0.682022	-0.25273	0.9755	0.882406	0.817696	-0.38991	1			
D.O	0.142622	0.126999	-0.73443	-0.37167	-0.59294	-0.31227	-0.59014	-0.47019	1		
B.O. D	0.914582	0.893092	-0.9369	0.624173	0.383847	0.344742	-0.85423	0.507488	0.491245	1	
C.O. D	-0.96786	-0.90396	0.603313	-0.95798	-0.79909	-0.67487	0.637884	-0.90858	0.092064	-0.817241	1

Temperature is showing strong positively corelation with pH (0.88), electrical conductivity (0.85), TSS (0.62), TDS (0.66), alkalinity (0.80), B.O.D (0.91). Temperature is showing strongly negative corelated with turbidity (-0.77) and CO_2 (-0.80) and C.O.D (-0.96). Temperature is not showing any significant corelation with D.O (0.14).

pH is showing strong positively corelation with temperature (0.88), electrical conductivity (0.81), TSS (0.72), TDS (0.66), alkalinity (0.68), B.O.D (0.89)). pH is showing strongly negative corelated with turbidity (-0.68) and CO_2 (-0.56) and C.O.D (-0.90). pH is not showing any significant corelation with D.O (0.12).

Turbidity is showing strong positively corelation with temperature (0.88) and CO2 (0.93). Turbidity is showing strongly negative corelated with C.O.D (-0.90). Turbidity is not showing any significant corelation with pH (-0.34), TDS (0.46), CO_2 (-0.04) and B.O.D (0.38).

Conductivity is showing strong positively corelation with temperature (0.88), TSS (0.92), TDS (0.69), alkalinity (0.97) and B.O.D(0.62). Conductivity is showing strongly negative corelated with pH (-0.68) and C.O.D (-0.95) Conductivity is not showing any significant corelation with turbidity (-0.34) CO_2 (-0.41) and D.O (-0.37).

Total Suspended Solid (TSS) is showing strong positively corelation with temperature (0.88), conductivity (0.92), alkalinity (0.88) and. TSS is showing strongly negative corelated with pH (-0.68), D.O(-0.59) and C.O.D (-0.79). TSS is not showing any significant corelation with turbidity (-0.34), TDS (0.46), CO_2 (-0.04) and B.O.D (0.38).

Total Dissolved Solid (TDS) is showing strong positively corelation with temperature (0.88), conductivity (0.92), alkalinity (0.81) and. TDS is showing strongly negative corelated with pH (-0.68), CO_2 (-0.55), and C.O.D (-0.67). TDS is not showing any significant corelation with turbidity (-0.34), TSS (0.46), D.O (-0.31) and B.O.D (0.34).

CO_2 is showing strong positively corelation with temperature (0.88), conductivity (0.92), and alkalinity (0.81). CO_2 is showing strongly negative corelated with pH (-0.68), TDS (-0.55),

and C.O.D (-0.67). CO_2 is not showing any significant corelation with turbidity (-0.34), TSS (0.46), D.O (-0.31) and B.O.D (0.34).

Alkalinity is showing strong positively corelation with temperature (0.88), conductivity (0.92) and B.O.D (0.50). Alkalinity is showing strongly negative corelated with pH (-0.68), TDS (-0.55), D.O (-0.59) and C.O.D (-0.90). Alkalinity is not showing any significant corelation with turbidity (-0.34), TSS (0.46) and CO_2 (-0.38).

D.O is showing strong positively corelation with temperature (0.88), conductivity (0.92) and B.O.D (0.50). D.O is showing strongly negative corelated with pH (-0.68), TDS (-0.55), D.O (-0.59) and C.O.D (-0.90). D.O is not showing any significant corelation with turbidity (-0.34), TSS (0.46) and CO_2 (-0.38).

B.O.D is showing strong positively corelation with temperature (0.88) and conductivity (0.92). B.O.D is showing strongly negative corelated with pH (-0.68), TDS (-0.55), and C.O.D (-0.90). B.O.D is not showing any significant corelation with turbidity (-0.34), TSS (0.46), CO_2 (-0.38) and D.O (0.49).

Chemical Oxygen Demand (C.O.D) is showing strong positively corelation with turbidity (0.60), CO_2 (0.63) and D.O (0.09). C.O.D is showing strongly negative corelated with temperature (-0.96), pH (-0.90), conductivity (-0.95), TSS (-0.79), TDS (-0.67), alkalinity (-0.90) and B.O.D (-0.81).

4. CONCLUSIONS

The research here is being conducted around a particular industry named Azam Rubber Product located in sector 13 of GIDA Gorakhpur region. The results in particular showed that the in all the three seasons (summer, rainy and winter) conductivity, D.O, B.O.D, C.O.D has exceeded the standard for standard permissible limit of industrial effluent, making it one of the major contributors in the pollution of River Ami by ultimately dumping its effluents in the river body. Thus, preventive measures need to be taken by the industry in order to reduce its water pollution level.

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