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PHYSICOCHEMICAL EVALUATION OF INDUSTRIAL WASTEWATER OF (SAIDAL) GROUP LOCATED IN THE INDUSTRIAL ZONE PALMA OF CONSTANTINE (ALGERIA)

C. Saouli* **and R. Assabaa**
Laboratory Rehabilitation of Ecosystems and Sustainable Development (REDD), Mentouri Brothers University of Constantine, Algeria
*E-mail: saouli.chouaib@umc.edu.dz

ABSTRACT
The main objective of this work is studied the physicochemical evolution of industrial wastewater of SAIDAL Group located in Palma industrial zone of Constantine (Algeria). Bimonthly samples were taken at the collector between the years 2010 and 2012. The results of the analysis presented in this work have shown that the wastewaters of 2010 have maximum temperatures up to 16.1°C. The pH is between 7.51 and 8.41, Conductivity ranges from 29 to 13160 [µs/cm], the material in suspension is between 1-28 mg/L and dissolved oxygen fluctuates 5.2-6.4 mg/L, the pollutant load is between 18.09-444.15 mg/L. The wastewaters of 2011 have maximum temperatures up to 22 °C. The pH is between 1.29 and 12.06, the conductivity varies between 1057 and 26200 [µs/cm], suspended matter between 3 and 212 mg/L and dissolved oxygen ranges 5.8-12.9 mg/L the pollution load is between 106.565 and 441.618 mg/L. The Wastewaters of 2012 have maximum temperatures up to 21 °C. The pH is between 7.51 and 10.75, the conductivity varies between 206 and 14200 [µs/cm], suspended matter ranges from 1 to 57 mg/L and dissolved oxygen ranges 5.2 and 6.9 mg/L, the pollution load is between and 304 339 mg/L. The Bacteriological analysis of the wastewater showed that the concentrations of acid-base and oxidizing chemicals are very high and physicochemical parameters exceed the limits of the Algerian Ministry of environmental values.
Keywords: Pollution, pharmaceutical Releases, Physicochemical parameters, Pollution, Wastewater.

INTRODUCTION

Water is an essential component of most major processors of food products of animal origin. After being used, the largest part of the process effluent is returned to the environment. As this water is usually loaded with organic matter, it becomes an important source of pollution to the surroundings who receives it.
The SAIDAL group manufactures pharmaceutical and syrup of insulin, the behavior of insulin is of amino acids and the behavior of syrup it's more like molecule alertine, bromehexine, HCl, encofluide adult, oxyladine sitrate, and salbutamol valcine. It is for that finds them several molecules in water-worn by this group, responsible for the physicochemical and bacteriological quality of industrial wastewater group (SAIDAL). Several studies have interested in characterization and treatment of this type of wastewater through treatment plants or by aerobic processes.[1-3] Either by anaerobic processes.[3-7] Other methods of treatment are adopted for sewage namely sand infiltration[8-9] and electrocoagulation.[10-12]

EXPERIMENTAL

Study Site

The group of SAIDAL (Fig.-1) has located the city of Constantine and the town was the center of eastern Algeria distance of 420 km from the capital Algiers, SAIDAL group manufactures pharmaceutical and insulin syrup.

Sampling and analysis of wastewater

The physicochemical parameters are determined from the quarterly and bimonthly samples (years 2010, 2011 and 2012). Conservation of wastewater samples was done according to the general guide to the

preservation and handling of samples according to ISO 5667/3 (1994)[14]. PH, temperature, conductivity, dissolved oxygen are determined using a multi-parameter analysis CONSORT type - Model 835[15]. An important pollution index of industrial wastewaters is the oxygen content in chemical oxygen demand (COD) and biological oxygen demand
(BOD) [16]. COD is determined by the oxidation of the excess acid by potassium dichromate at a temperature of 148 °C oxidizable material under the conditions of the assay in the presence of silver sulfate as a catalyst and mercury sulfate medium[17]. Suspended solids were determined by filtering a volume of wastewater of cellulose filter (0.45 .mu.m) according to Rodier (1996).[18]

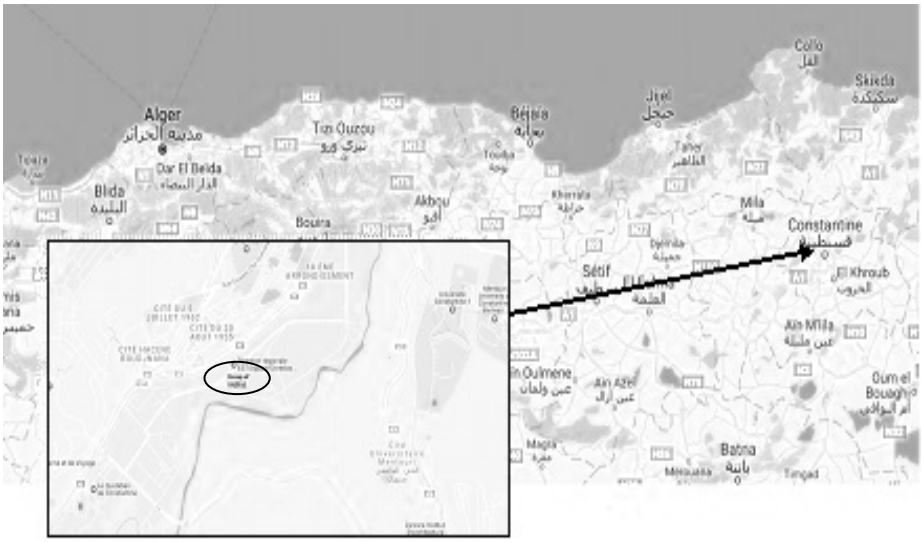

Fig.-1: Maps of study site (group SAIDAL)[13]

RESULTS AND DISCUSSION

The evaluation of the pollution of rough wastewater is based on determining the number of physicochemical parameters characterizing this wastewater. The physicochemical characteristics of the wastewater group SAIDAL between 2010 and 2012 years summarized in (Fig.2, Fig.-3 and Fig.-4). For 2010 was made five values of measures but for the other two years, the measures based on six values.
Cumulates results obtained during the three years of the study are presented in the Table- 1.
The temperature of the wastewater is between 13 and 16.1 °C like extreme values minimal and maximum with an average value of 15.46 °C, this is in 2010 years (Table-1). This average value augmented to 15.71 °C in 2011 years, and decreased to 13.96 °C in 2012 years, with variation between 9-22 °C and 10.6-21°C like extreme values minimal and maximum in 2011 and 2012 years respectively (Table-1).
The pH measurements change from the minimal value of 7.51 to 8.41 like maximal value in 2010 years, the average value is 7.96. In 2011 years this average register small variation (7.42) but in 2012 years augmented to 8.36, with variation between 1.29-12.06 and 10.6- 21 like extreme values minimal and maximum of pH in 2011 and 2012 years respectively (Table-1).
The electric conductivity change between 29 and 13160 µs/cm in 2010 years, the average value is 3030.6 µs/cm, this last decrease to 1057 µs/cm in 2011years and augmented to 4918.33 µs/cm in 2012 years, with variation between 1057-25143 µs/cm, and 606-14200 µs/cm, like extreme values minimal and maximum of electric conductivity in 2011 and 2012 years respectively (Table-1).
The MES concentrations analyzed wastewater vary from 28 to 1mg/L with an average of 14 mg/L in 2010 years.

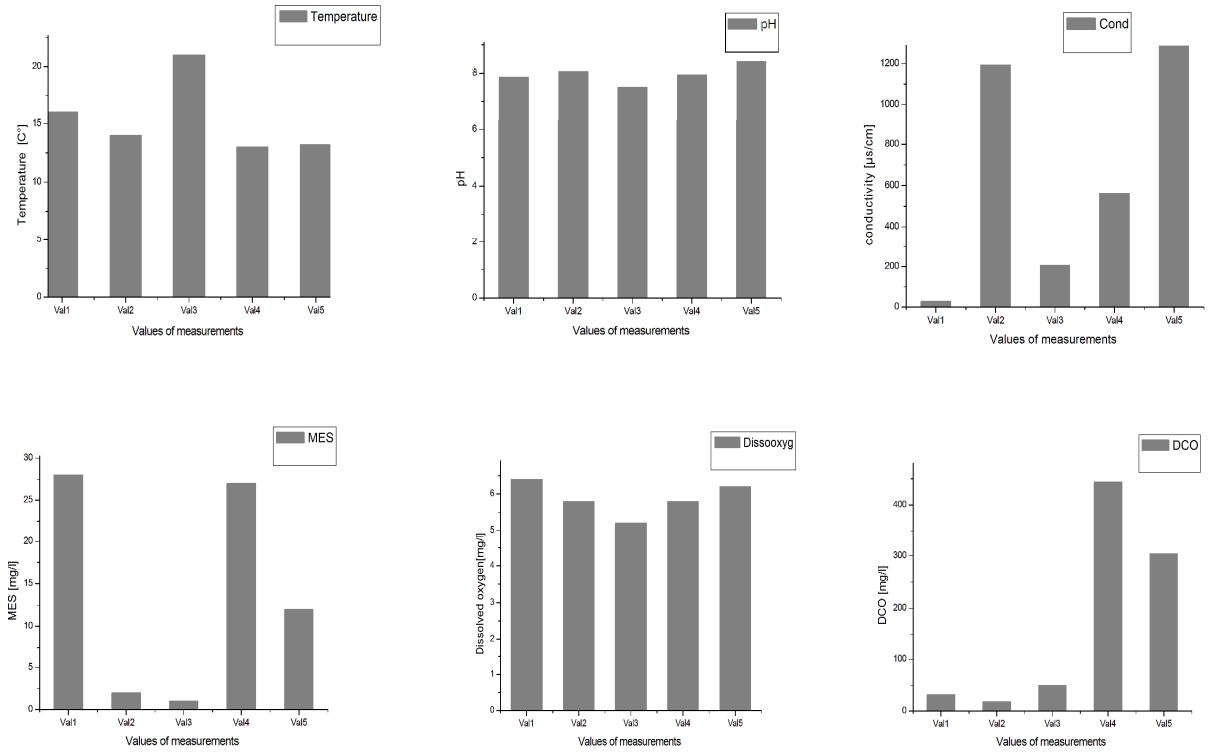

Fig.-2: Physicochemical parameters of wastewater group SAIDAL 2010.

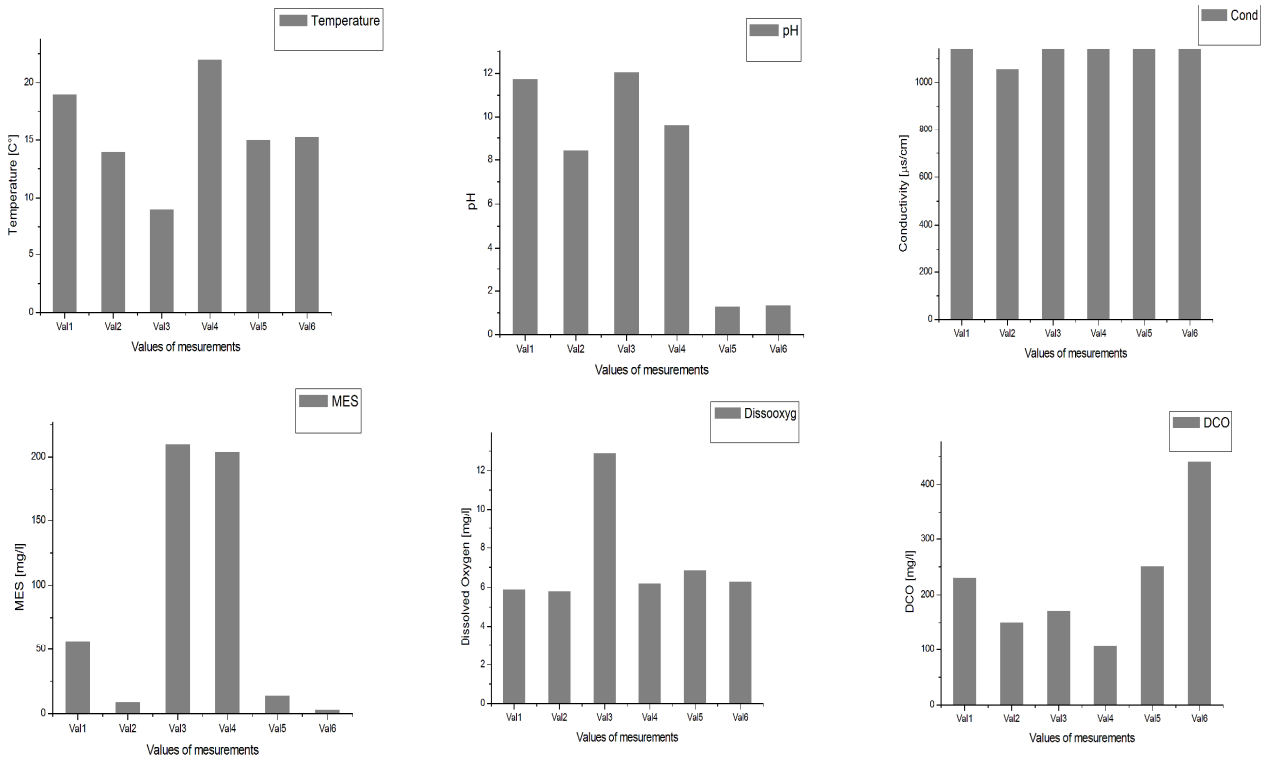

Fig.-3: Physicochemical parameters of wastewater group SAIDAL 2011.

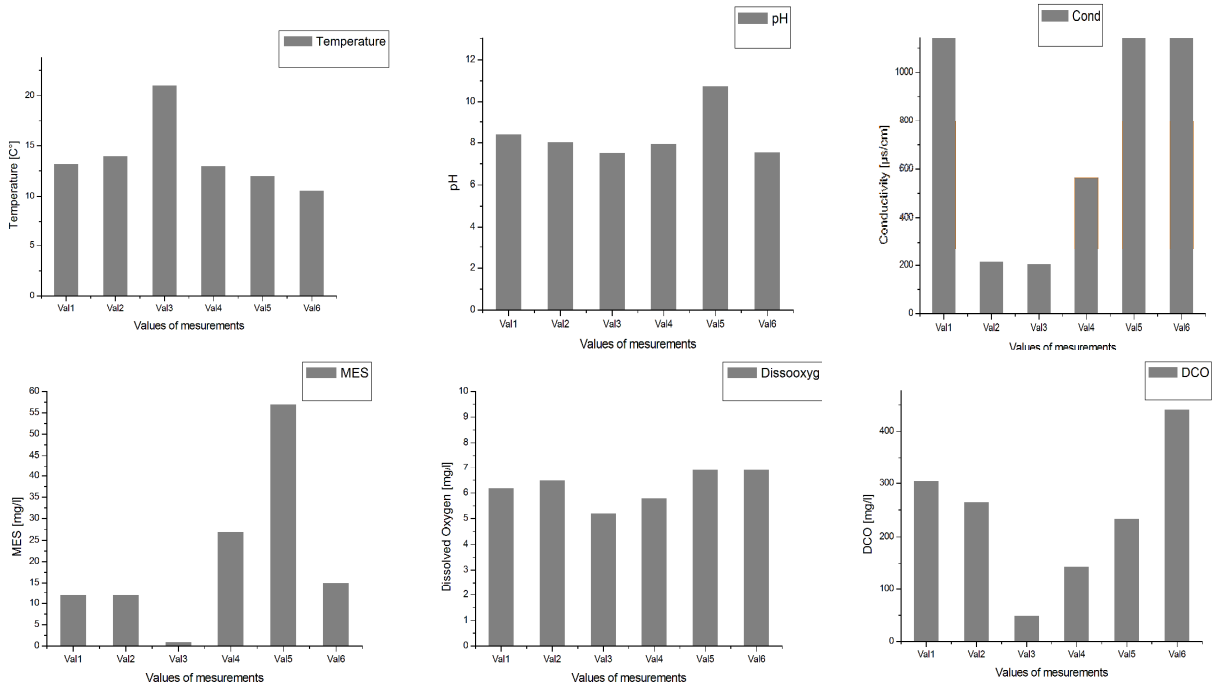

Fig.-4: Physicochemical parameters of wastewater group SAIDAL 20112.

Table-1: Physicochemical parameters of wastewater group SAIDAL of three years (2010, 2011 and 2012).

Years	2010					2011					2012				
Parameters	Average	Min	Max	Standard deviation	Number of sampling	Average	Min	Max	Standard deviation	Number of sampling	Average	Min	Max	Standard deviation	Number of sampling
T °C	15.46	13	16.1	3.1	5	15.71	9	22	13	6	13.96	10.6	21	10.4	6
PH	7.96	7.51	8.41	0.9	5	7.42	1.29	12.06	10.77	6	8.36	7.51	10.75	3.24	6
Conductivity [µs/cm]	3030.6	29	13160	13131	5	14061	1057	26200	25143	6	4918.33	606	14200	13994	6
MES mg/L	14	1	28	27	5	82.83	03	210	207	6	20.66	01	57	56	6
Dissolved oxygen mg/L	5.88	5.2	6.4	1.2	5	7.32	5.8	12.9	7.1	6	6.25	5.2	6.9	1.7	6
COD mg/L	18.09	169.59	444.15	426.06	5	225.50	225.50	441.618	335.11	6	170.65	26.99	304.339	277.34	6

This later augmented to 82.83mg/L in 2011 years and decrease to 20.66 mg/L in 2012 years, with variation between 3-210 mg/L, and 1-57 mg/L, like extreme values minimal and maximum of MES concentrations in 2011 and 2012 years respectively (Table-1).

The Dissolved oxygen concentrations measurements change between 5.2 and 6.4mg/L with an average of 5.88mg/L in 2010 years.

This last register an augmented to 7.32mg/L in 2011 years and decrease to 6.25 mg/L in 2012 years, with variation between 5.2-6.9 mg/L, and 1-57 mg/L, like extreme values minimal and maximum of Dissolved oxygen concentrations in 2011 and 2012 years respectively (Table. 1).

Finally, the COD concentrations measurements register change between 444.15 and 18.09mg/L in 2010 years, the average value is 169.59mg/L. This last augment to 255.50 mg/L and decrease to 170.65mg/L in 2011 and 2012 years respectively, with variation between 225.50-441.618 mg/L and 26.99-304.339 mg/L, like extreme values minimal and maximum of COD concentrations in 2011 and 2012 years respectively (Table-1).

The values of the wastewater temperature recorded are below 30 °C considered the limit value of direct discharge into receiving waters[19] (Table-2).

The pH indicates alkalinity of wastewater, its role is essential for the growth of microorganisms which typically have a pH optimum ranging from 6.5 to 8.5 (Table-2). When the pH is less than 6.5 or greater than 8.5, the growth of microorganisms is directly affected. In addition, the pH is an important element in the interpretation corrosion in pipelines facilities purification. The measured pH values vary little and remain around 7.51, 7.42 and 8.36 on average of 2010, 2011 and 2012 years respectively (Table- 1). The values obtained are comparable to those found elsewhere for wastewater group that SAIDAL present generally neutral to slightly basic pH (12 to 13.4). The electrical conductivity is probably one of the simplest and most important for the quality control of wastewater. It reflects the overall degree of mineralization, it tells us the salinity. This is a numerical expression of the ability of water to conduct an electrical current measured in microsecond per centimeter (µs/cm). The results obtained show a greater or lesser variation of the average conductivity expressed in mineralization.

Reported average values ranging between 3030.6, 14061 and 4918.33µs/cm registered in 2010, 2011 and 2012 years respectively (Table-1), show a strong mineralization of Wastewater. Comparing the values of the electric conductivity on wastewater analyzed with water quality standards for irrigation can be inferred that these are acceptable wastewater for irrigation of crops. Similarly, these average values are less than 2700 [µs/cm] considered the Limit value of direct discharge into receiving waters[19] (Table- 2).

Generally, MES involved in the composition of the water by its effect in ion exchange or absorption on both the chemical elements in the state of traces to microorganisms. Moroccan why TSS concentrations are between 1 and 28 mg/L.[20-21]

Table-2: Parameter limit values of industrial liquid effluents discharges from the Ministry of Environment of Algeria[19].

No.	Parameters	Units	Limit Values	Tolerances with the Values Limit Old Installation
1	Temperature	°C	30	30
2	pH	-	6.5-8.5	6.5-8.5
3	conductivity	[µs/cm]	2700	2700
3	MES	mg/L	35	40
4	Kjeldahl Nitrogen	mg/L	30	40
5	Total Phosphorus	mg/L	10	15
6	COD	mg/L	120	130
7	BOD5	mg/L	35	40
8	Aluminium	mg/L	3	5
9	Toxics bioaccumulable	mg/L	0.005	0.01
10	Cyanide	mg/L	0.1	0.15
11	Fluorine compounds	mg/L	15	20
12	Index phenols	mg/L	0.3	0.5
13	Total hydrocarbons	mg/L	10	15
14	Oils and fats	mg/L	20	30
15	Cadmium	mg/L	0.2	0.25
16	Total Copper	mg/L	0.5	1

17	Mercury total	mg/L	0.01	0.05
18	Total Lead	mg/L	0.5	0.75
19	Total Chrome	mg/L	0.5	0.75
20	Tin total	mg/L	2	2.5
21	Manganese	mg/L	1	1.5
22	Total Nickel	mg/L	0.5	0.75
23	Total Zinc	mg/L	3	5
24	Iron	mg/L	3	5
25	Chlorinated organic compounds	mg/L	5	7

Moreover, these average values TSS in wastewater Analyzed are greater than the value set by Algerian standards.[19] The significance of setting the oxygenation of the water is very clear since the presence of dissolved oxygen conditions the degradation reactions of the -aérobie- Organic matter and more generally the biological balance of environments Water. The pollution load of wastewater, as measured by the COD, is one of the most important criteria used in the design of a wastewater treatment to determine the degree of treatment needed. The load to be processed is the COD of wastewater are brought.[20]

CONCLUSION

The wastewater of SAIDAL Group situated in Industrial Zone of palma in Constantine department (Algeria) have values of major physicochemical parameters of pollution beyond the relative values overall limits direct and indirect discharges to the receiving environment, which is a risk of environmental pollution in the latter where the need for treatment of the raw sewage. After the evaluation of the degree of organic pollution, we can see that all the studied parameters (especially, COD and TSS) wastewaters are analyzed in the wafer average high concentration[24]. The treatment of wastewater is necessary to produce effluent discharge standards compliance by the Algerian Ministry of Environment.

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