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Assessment Of A Wastewater And Treatment By The Lagoon Process

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Water is a natural and precious resource which is necessary to preserve. The agriculture, industrial and municipal use a considerable of hydrous resources. These domains of activity generate a quantity of wastewater. In several cases the wastewater is rejected without treatment. An important consideration must be given to wastewater reclamation.
This aim of this study was to investigate the application of system lagoon for treating wastewater collected at outlet of collector of a town located at the west (30km) of Algiers. The COD, MES concentrations of the wastewater were found in the range 140-690mg/L and 120-420 mg/L respectively, which is below the discharge standards. The influent COD, influent chlorophyll *a* and influent turbidity concentrations were selected as operational variables. It was observed that before treatment water is turbid after treatment the colour of water gradually becomes clear and the removal efficiency of turbidity being higher than 96%. We notice that in general chlorophyll *a*, Dissolved oxygen increased considerably with the decreasing of turbidity. Such as the removal efficiency of chlorophyll *a* was increased from 50 to about 98% when the COD decreased from 321 to 70mg/L. We notice also that there was a correlation between turbidity and concentrations of COD when concentrations of COD decreased the turbidity decreased. The performance of the treatment was satisfactory as the influent had respectively 70 and 5mg/L of COD and MES.

1. Introduction

Wastewater treatment is becoming increasingly important world-wide, many techniques have been developed to find an economic and efficient way to treat and reclaim the wastewater, including physicochemical and biological treatment such as active sludge, trickling filtration system lagoon etc..Such methods have been applied successfully to reduce the concentration of various pollutants. In this study a treatment of an urban wastewater was examined. The wastewater originating from the municipal town, are rejected without pretreatment in the sea.
The study was comprised of two steps. In the first step some physiochemical factors such as: pH, temperature, dissolved oxygen, turbidity, conductivity, TSS, VSS, PO_4^{3-} ,

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Biochemical oxygen demand (BOD) and Chemical oxygen demand (COD) were determined (Ghoualem,2005). Experimental results obtained of the parameters of pollution showed that this urban water widely exceeded the standards of rejection. For the second step we tested on the scale laboratory a treatment of wastewater in lagoons.
The system lagoon is a process of purification of used water, where develop bacteria, algae and zooplankton with the detriment of the organic matter and the nutritive salts contained in water to treat. At the end of a few weeks, a purified effluent is produced.
The treatment of wastewater in lagoons exploits the physical and biochemical interactions that occur naturally in aquatic systems to remove bacteria, biochemical oxygen demand, suspended solids and nutrients (Ghoualem,2008). The system lagoon seems to be an extremely simple process of treatmentThis process is far from being simple considering the diversity of its microbial ecology, algal and zooplankton (Tieheng ,1998; Lin,2001 ; Gnanadiphathy). The purified effluent is of quality physicochemical and medical completely satisfactory and usable in many fields without major risk.The objective of this study is to investigate the municipal sewage of wastewater treatment by lagoon method with an aim to decreasing the pollution, to elevating water quality, to protecting and to maintaining the quality of the receiving environment.

2. Materials and methods

For investigations were used samples of wastewater from municipal wastewater.
The samples were collected from the site. The samples were taken and reserved following methods standards. The wastewater samples were transported (in a cooler) to the laboratory for later analyses. The parameters such as; pH, temperature, turbidity, conductivity and dissolved oxygen have been done in situ. The other parameters were determinate at laboratory. The samples of raw wastewater were taken to preliminary analyses before treatment.The analyses of different physicochemical parameters including MES, COD, BOD and others parameters were determined according to the standard method (AFNOR).The COD values vary from140-690mg/L with an average 321,61mg/L.Methods are for BOD dilution -20°C incubation method, COD K_2CrO_4 boiling method, chlorophyll extraction method in an organic solvent such as acetone and its determination by UV-Vis spectrophotometer.
For the present work, a 70-L tank was employed for the experimental tests. The tank is composed of three basins of ventilation and decantation of volume (49, 62, 35, 8 and 18) liters with a useful height of water (0, 28, 0.31and 0.2) meters respectively. The wastewater was continuously fed to the tank at a constant flow rate of 6, 89liters/day (Ghoualem, 2007).

3. Results and discussion

The wastewater was brown in colour.The COD values of untreated wastewater amounted from 140 to 690 mg /L, whereas BOD values amounted from 132 to 162 mg /L respectively. The COD: BOD_5 ratio was found to vary in the range of 1, 42 - 2, 48 around a mean value of 2, 21. The concentrations of TSS, BOD and COD are higher than the dismissal standards (30, 40 and 120 mg /L) respectively. The characteristics of

the effluent, entering in the tanks are described in table 1.Both (COD, BOD) parameters are used as indices of the organic content of effluent during the treatment.

Table 1 : *Characteristics of effluent*

Parameters	pH	T(°C)	TSS (mg/L)	Tur(NTU)	COD (mg/L)	BOD (mg/L)	DO (mg/L)
Average	7,02	26,19	291,35	269	321,61	148	0,67
Maximum	8,4	28	420	369	690	162	0,98
Minimum	6,5	22	120	111	140	132	0,3

At the beginning of the test run, effluent was brown and turbid. We notice that, during biological treatment, the color of the effluent in lagoons going gradually from brown to green in the tanks which indicates the presence of algae. Purification of wastewater in the tanks was carried out through a biological equilibrium between bacteria and algae.

Chlorophyll *a* ($C_{55}H_{72}MgN_4O_5$) is responsible for the green color in the tanks. Chlorophyll *a* is a photosynthetic pigment present in all species of phytoplankton, including algae and in some photosynthetic bacteria, known as cyanobacteria (Gregor, 2004; Carlota and al, 2004). The spectrophotometric analysis showed that Chl *a* is higher in the lagoon 2(Fig.1). The decrease of Chl *a* in the lagoon 3 revealed the presence of rotifers.We observed samples of influent under the microscope and determinate the different species. The main found species in the phytoplankton are chlamydomonas, chlorella, diatoms, euglena, micractinium and scenedesmus. These species are conform to those cited in literature by Gloyna(1977), Angeli(1976) and Hammou (1991). In the zooplankton the principal populations observed were protozoa, rotifers, cladocers and copepods. The copepods consume primarily phytoplankton and bacteria; they gave an important production of oxygen water. Their presence indicates a very advanced purification, a significant dissolved oxygen increase was observed.

At the outlet of pilot, the water became clear. Samples were taken for measurements of water quality parameters.The values of the pH of exit are higher than the values of the pH of entry.

This result is in agreement with other studies (Maynard, 1999). This increase of the pH at the exit is explained by the degradation of the carbonaceous pollution carried out by the micro-organisms which leads to the CO_2 formation then to the consumption of this last. The carbon dioxide consumption is related to the more intense production of dissolved oxygen provided by the algae.

Maynard and Ouki (1999) did conclude that the high pH is caused by the uptake of CO_2 by algae during photosynthesis(Salter,1999). We observe a significant increase in the dissolved oxygen (Fig. 2). This increase comes from the photosynthetic activity provided by the algae and the presence of the Copepods (Ghoualem, 2005). We notice that, when concentrations of dissolved oxygen increased, the turbidity decreased (Fig. 3) We notice signification elimination as of DCO which reaches sometimes 75%, which represents a very good COD reduction (Fig. 4). We also notice a reduction of BOD removal achieved is 85% , which is excellent indeed (Fig. 5).

The concentrations of COD and BOD of effluent at the inlet of the pilot were higher at the outlet of the pilot the concentrations of COD and BOD were definitely weaker, what shows the treatment is well adapted.

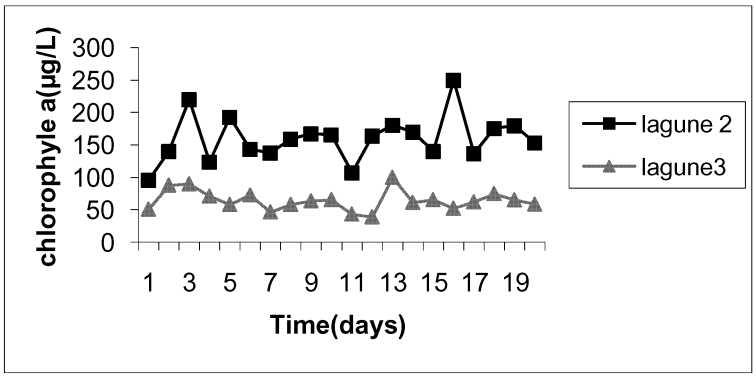

Fig 1: Evolution of Chl *a* as function of time

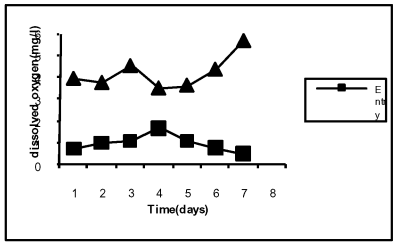

Fig 2: Evolution of DO as function of time

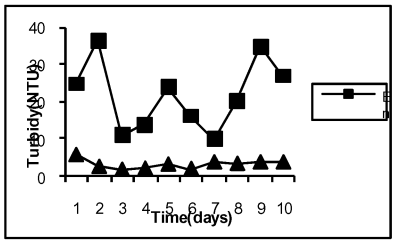

Fig 3: Evolution of Tur as function of time

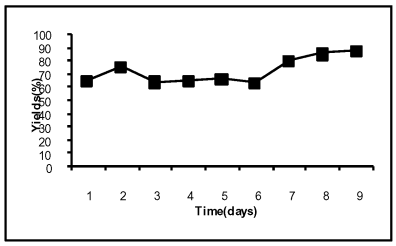

Fig 4: COD removal as function of time

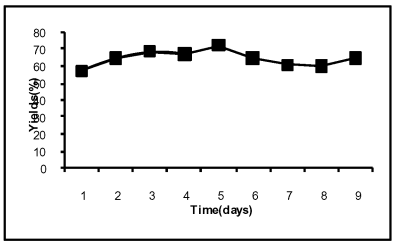

Fig 5: BOD removal as function of time.

4. Conclusion

Different means of treating effluents are used, in the present study was undertaken to test the treatment of an effluent. The system of lagoons was choosing for treating this wastewater. The obtained results were efficient enough.

The BOD and COD values of wastewater were many higher before treatment process than after.

The quantitative and qualitative evaluation of the polluting load has lead to choice the treatment for application for this effluent. The obtained results of the analyses of the

physicochemical parameters of pollution showed that their content widely exceed the standards of rejection.

The test of treatment of these waters permitted us to note that the treatment applied to this effluent decreased the load of the pollution parameters extensively. The treatment in lagoons applied to this effluent can be used because of its composition that is essentially organic and biodegradable.

The obtained results suggest us that the effluent is suitable to this type of treatment.

This technique can be improved and can be recommended in the urban wastewater treatment and exploited in the farming zones seen the availability of the lands.

This process of treatment will be able to decrease the pollution thus, to protect the environment and to maintain the quality of the receiving environment (sea).

This treatment can be applied therefore in the region seen the climatic conditions that are favourable to the treatment.

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