



Degradation of organic pollution aerated lagoons. In an arid climate: the case the treatment plant Ouargla (Algeria)



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ABSTRACT

The aim of the present work is to follow up and analyze the purgation performances of wastewater treatment plant (WWTP) by aerated lagoons, used to treat wastewater from Ouargla city, and ensure the reliability of the sewage sector in the studied area. The obtained yields for suspended solids (SS) vary from 23.50 to 92.12%. During the year 2013 the average yield varied between 63.63 and 87.40% for the biochemical oxygen demand BOD₅ and between 43.34 and 92.21% for the chemical oxygen demand COD.

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1. Introduction

The purgation of domestic wastewater by aerated lagoons remains one the most popular processes in countries with hot arid to semi-arid climates. Since the end of 2001, Algeria adopted aerated lagoons for wastewater treatment in rural and urban centers as the most suitable technical solution both in economic and climatic aspects. The peculiarity

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Fig. 1. Geographic map of Ouargla.

of this method is that it requires low investment and operating costs with little technical expertise. Nevertheless, the use of large areas remains a major constraint of this process especially in urban areas where land is expensive and sometimes not available. Compared with wastewater treatment systems already tested in Algeria, the lagoon system is the most widespread throughout the country. Indeed, the large number of stations yet achieved or under construction may confirm this approach. Despite these many achievements, very few studies have been performed to evaluate and improve purgation performance in the various regions. The present work aims the study the nature of the wastewater effluent from the city of Ouargla, to determine the levels of the removed pollutants and to calculate the purgation rate for each pollutant. (See Figs. 1–3.)

2. Presentation of the study area

2.1. Location

Ouargla is located in south eastern Algeria, at a distance of 800 km from Algiers in the north-eastern part of Sahara ($5^{\circ} 19'$ East longitude, $31^{\circ} 57'$ North latitude) [1]. It covers an area of 163,000 km². The population is estimated to be 633,967 in 2010, spread across 21 cities. It is limited geographically in the north by the states of Djelfa and El Oued, in the south by Illizi and Tamanrasset, in the West by Ghardaia, and in the east by Tunisia [2].

2.2. Geographical location of the STATION

The wastewater treatment plant is located in the region of Said Otba between the two branches of the drainage channel.

2.3. Purpose of processing the station (initially established)

- get rid of existing trouble and contamination risks in urbanized areas.
- Protect the receiving environment.

- Eliminate the risk of upwelling by decreasing the level of the ground-water.
- keep the possibility to reuse treated effluents.

2.3.1. Description of the installation

The system consists of essentially open-air structures, gutters, pipes, pumps, fans, measuring instruments, bodies' wickerwork and industrial automation with control devices.

2.3.2. Design of the station

- Capacity: 400,000 eq/habi
- Total area: 80 ha
- Number of drying beds: 11 beds
- Number of pools: 08 currency 03 levels basins

3. Materials and methods

As part of this work we carried out the analysis of samples during 2013 from January till December. Sampling was twice performed a month. The samples were kept in a cool box under 4 °C in accordance with the general guide for conservation and manipulation of samples ISO 566713 [3].

The sampling was made at the level of the main collector of the raw effluents at both the entrance and at the exit of the station. The analysis of the rejected waters of the station were accomplished on the basis of a composite sample proportional to the flow rate measured over 24 h at the entrance (raw wastewater before treatment), and the exit of station (after treatment).

The pollutants quantification is made according to the Algerian standards, which are similar to AFNOR. The analysis techniques advocated by Rodier [4], are also used as supplements.

Parameters such as BOD₅, COD, (SS), are carried out in the laboratory of valorization and promotion of Saharian resources (VPSR). Kasdi Merbah university Ouargla. The BOD₅ was determined by instrumental method with the aid of a BOD surrounding wall meter (Aqualitic Din



Fig. 2. Map of station location.

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