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By

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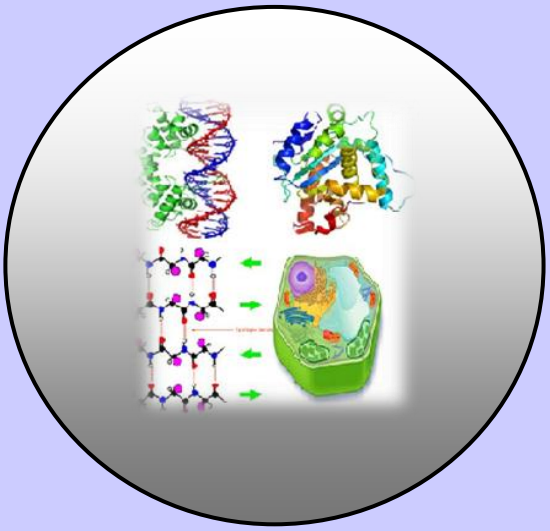

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Evaluation of Urban Wastewater Treatment in Cities: Khenifra, AL Hoceima, M'haya, Al Aroui (MOROCCO) and Study of the Proposed Wastewater Treatment Plant

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ABSTRACT

Our main objective is a comparative study between four stations in Morocco of various treatment types: natural lagooning, aerated lagooning, bacterial bed and activated sludge. The main aim is to recommend an adequate treatment for the city of Sidi Slimane, to reduce the polluting load of urban wastewater in the town of Sidi Slimane and the nuisance that the receiving environment (oued Beht) suffers and to remedy also to the loss of this water source of recoverable materials. The physicochemical characterization of the raw sewage revealed that this liquid discharge is very loaded with organic matter. Despite this wastewater has a high organic load reports COD / BOD_5 varied between 2.05 and 2.17. The review report MES / BOD_5 is high underlines the biodegradability of waste water to which a biological treatment seems entirely appropriate.

Keywords: Wastewater treatment, Natural Lagooning, Aerated Lagooning, Bacterial Bed and Activated Sludge.

INTRODUCTION

The purpose of wastewater treatment is to collect and purify wastewater before it is discharged into the natural environment, in order to remove the pollution from which it is discharged.

There is a diversity of techniques and diversity of stations: Some treatment plants will stick to pre-treatment (primary station) and physicochemical treatments (physicochemical stations), others will supplement these treatments with secondary treatments. The activated sludge stations, bacterial bed stations, natural lagooning and aerated lagooning will be distinguished.

Each wastewater treatment plant sets targets, the quality of the discharged effluent (the discharge water) must meet the requirements set out in a ministerial circular (Wastewater Treatment Standards).

In this chapter we will compare 4 types of treatment most used in Morocco and explore the advantages and disadvantages of each type of treatment studied and provide useful help to determine the choice on the best technical and financial bases possible, Ecological integration and sustainable development. In order to propose a type of treatment that can be applied to the liquid effluent depending on the physicochemical, biological and financial characteristics possible and to protect the natural environment of the city of Sidi Slimane.

MATERIAL AND METHODS

The physico-chemical parameters are determined from monthly sampling (between January and December 2015) at the inlet and outlet of the treatment plant. The conservation of the wastewater samples is carried out according to the general guide for the preservation and handling of samples according to ISO 5667/3 [1994].

RESULT AND DISCUSSION

Investment Costs

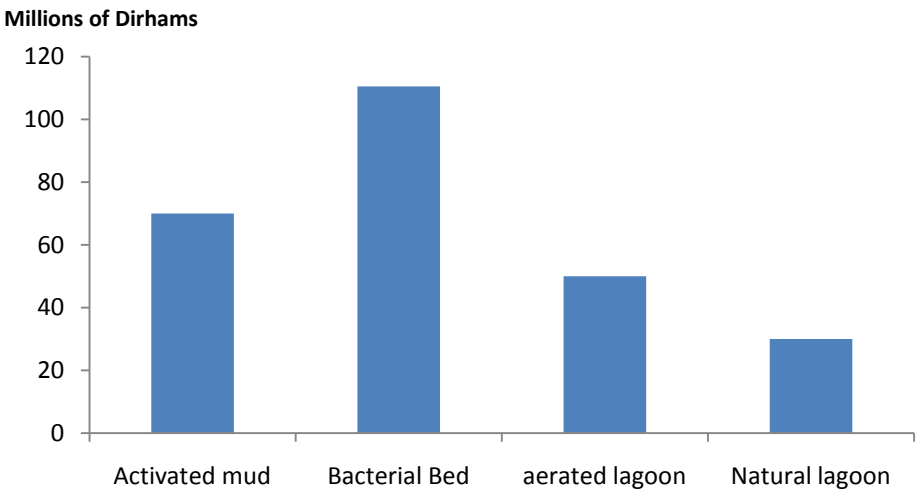

Figure 1. Cost of each type of treatment.

The investment cost of a bacterial bed is very high, more than 20% compared to activated sludge treatment and with low energy consumption (Figure 1). This is consistent with studies by Brix [1998], Cluzel [1993] and Alexandre, Grand d'Esnon [1998].
The activated sludge treatment has a fairly high investment cost, high energy consumption and requires skilled personnel and regular monitoring in relation to aerated lagooning and natural lagooning.
Aerated lagoon treatment is more expensive compared to natural lagoon and it is high energy consumption so this study is confirmed by another study that worked on the natural lagoon treatment type Schetrite [1994] and Collectif [1984].

Daily Treatment Flow

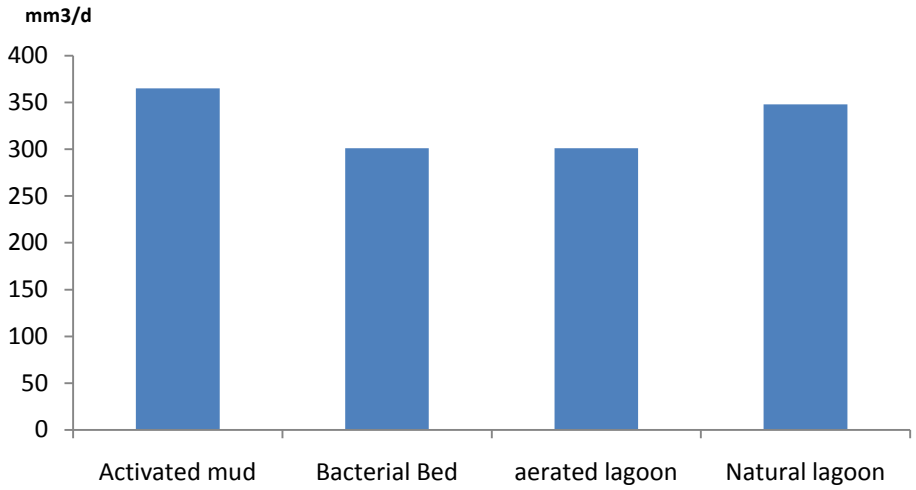

Figure 2. Flow rate of each type of treatment mm^3 / d.

The activated sludge treatment receives a higher pollution rate compared to the other treatment and according to this result it can be deduced that the activated sludge treatment is adapted to a large community size (FIG. 2).

Biodegradability coefficients at the entry of STEPs

The table below shows the biodegradability coefficients of the input effluents for the various wastewater treatment plants (Table: 1).

Table 1. COD / BOD ratio.

	Activated Mud	Bacterial Bed	Aerated Lagoon	Natural Lagoon
	al Hoceima	Khenifra	M 'haya	Al Aroui
COD / BOD	2.17	2.12	2.05	2.01

The biodegradability coefficients are calculated by the COD / BOD_5, it depends on the nature and origin of the waste water that can be domestic or industrial, the ratio COD / BOD_5 for raw domestic sewage is generally between 2, 05 and 2.5 and may be more than 10 for industrial waters, which requires different treatments.

This result confirms the absence of industrial waste connected to the domestic sewerage network, it will indicate the mixing and relative biodegradability of the effluents. The results obtained are similar to those found in the waste water of Rabat or the ratio is less than 2.5. and the city of Marrakech [2002].

On the other hand, they disagree with those found by Gebrati [2002] in Marrakech and raw sewage from the urban commune of Saknia (province of Kenitra) observed by EL Gouamri [2006]. Or this ratio was assessed at 3.4 because of textile rejects connected to the grid.

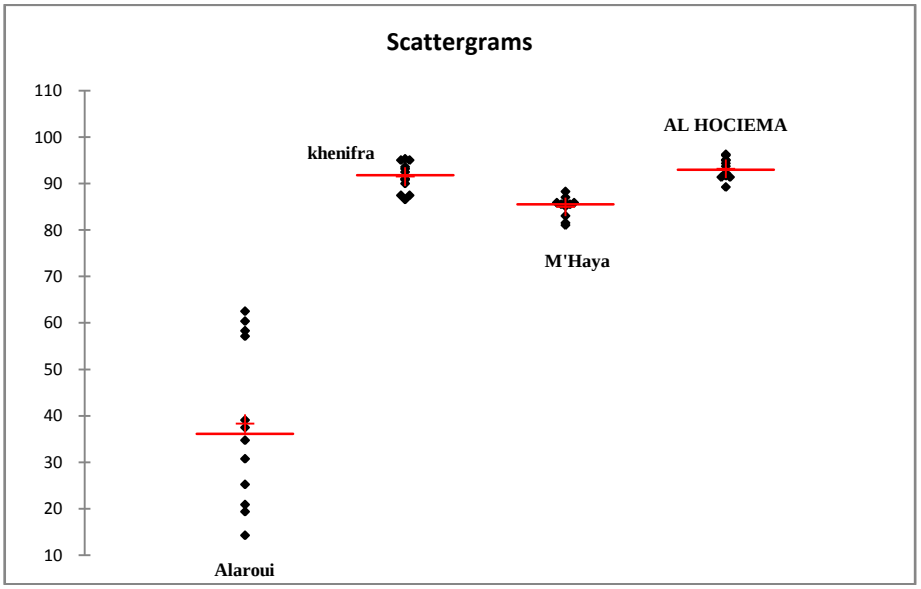

Figure 3. Performance BOD $_5$ study sites.

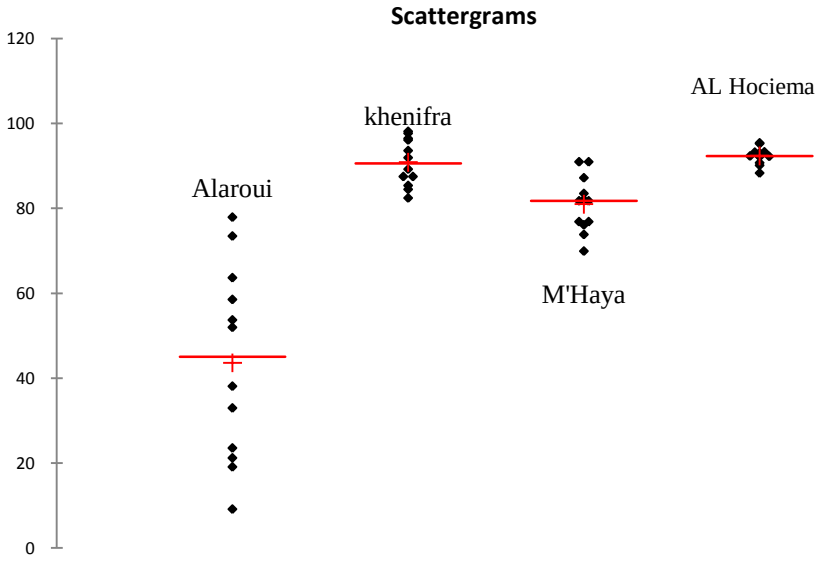

Figure 4. MES performance of the studied stations.

Biodegradability coefficients at the output of STEP

The following table shows the effluent biodegradability coefficients for the various treatment plants in our study (Table 2).

Table 2. Report MES / BOD $_{5.}$

	Activated mud	Bacterial Bed	aerated lagoon	Natural lagoon
	Al Hoceima	Khenifra	M 'haya	Al Aaroui
Report MES / BOD_5	1, 65	0.49	0, 94	1.23

At the treated wastewater by activated sludge, aerated lagoons and stabilization ponds, MES report / BOD $_5$ is high (0.83), which confirms that the waste water drained by the collector are highly loaded with organic matter, which we can deduce that the organic load in the wastewater of this collector is readily biodegradable according Henze et *al.* [1997] against the trickling filter is low lower (0.83) This result is consistent with Kayeye [1991].

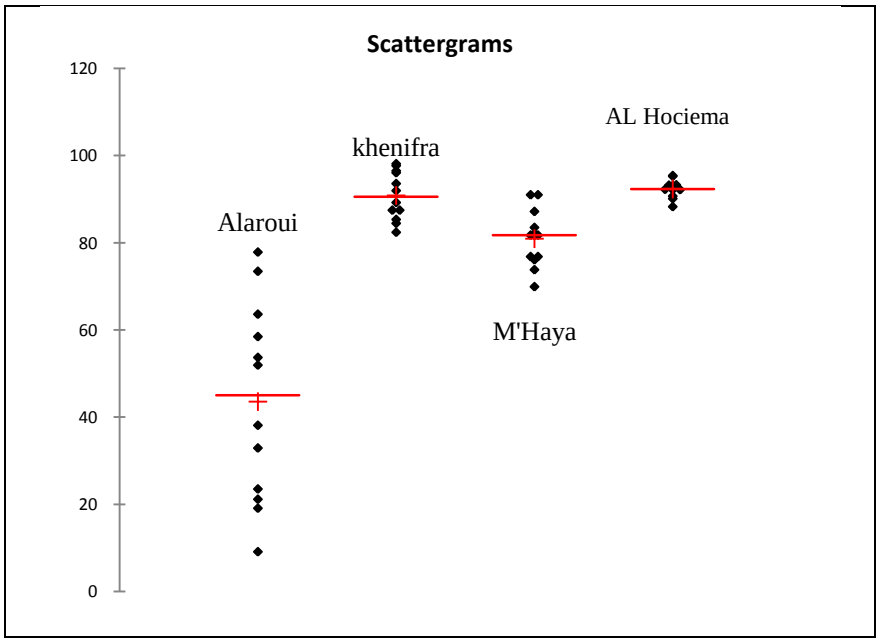

Figure 5. COD performance of the studied stations.

Study of physicochemical parameters

The figures respectively show the evolution of the contents and purification yields in MES, BOD_5, COD of the crude influential at the entrance of the die and of the purified effluent to the output of the four type of treatment (STEP). Al Hoceima yields are the highest with pollution abatement in 2016 followed by 92% for TSS (Figure 4), 92% for BOD5 and 76.6% (Figure 3) For COD (Figure: 5). These values are consistent with those reported by Sachon in France [1986]; Of Tritt and Shuchard in Germany [1992]; of Gnagne Burkina Faso [2003]; Gnagne and Brissaud [2003] and the work of Miranda [2005], Reginatto in Brazil [2003].

Then from this study it can be concluded that the activated sludge method is a good elimination of all the pollution parameters (SS, COD, BOD_5).
Thus, natural lagoon treatment has a lower performance rate than intensive processes on organic matter and control of biological equilibrium, but purification processes are limited, so it can be concluded that it is preferable not to turn to this type of lagoon.

CONCLUSION

As a reminder, the main objective of this work is to study the quality and cost indices in order to advise the managers of wastewater treatment plants, thus comparing the physico-chemical quality of effluents from the four treatment plants studied (Khenifra, AL Hoceima M'haya, Al Aaroui) and the investment cost of the four types of treatment.
In brief the results of comparisons of the treatment stations allow us to complete that for our site of work the treatment of aerated lagoon and the most adapted for our site of work but of the financial constraint the municipality of the city of Sidi Slimane can not Take over all the financial burden of this project for that we predestined to work with the natural lagoon treatment type.

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REFERENCES

ISO 5667/3. (1994). "Quality ed water - ed sampling - Guide for Conservation and e lamanipulation of samples".

Brix, H. (1998). Denmark experiences in Vymazal, J. et al, constructed Wetlands for Wastewater Treatment in Europe. Backhuys Publisher, Leiden.

Cluzel, F. (1993). Diagnosis of system compar ed è sanitation autonomes. Application me to my system è semi-collective, DDASS Loire-Atlantique, National School of Public health ed, Rennes.

Alexander, W. and Grand Esnon (1998). Cout of rural sanitation. Evaluation of couts investment and operating in TSM No. 7/8 – July-August 1998 to 1993.

Schetrite, S. (1994). Study synthicf oot operation of natural lagoon V auciennes (Oise): October 81 July 91, CEMAGREF, SATESE of the Oise, Water Agency Seine-Normandy, Paris.

Collective, (1984). Synthè operation of natural lagoon Vaucien nes (Oise), CEMAGREF SATESE Oise, Water Agency Seine Normandie, Paris.

Merieme Tahri Majdouline Larif Hajar Quabli Mohamed Taky Mahacine Elamrani Azzedine El Midaoui Karima Benazouz M 'hamed Khimani (2015). Study and monitoring the performance of primary and secondary treatment of waste water from the purification station of Marrakech. European Scientific Journal June 2015 edition Vol. 11, No.17 ISSN: 1857-7881 (P e - ISSN 1857- 7431).

Nejmedine Gebrati L. (2002). A. photocatalytic treatment and biod é é gradabilit textile effluents from the city of Marrakech. (330-334 µl). Proceedings of the International Symposium on the water in the basin é é diterran M: Resources and Sustainable Development. Monastir (Tunisia), 1. 80-85.

El Guamri and Belghyti, E. (2006). A study of the physico-chemical quality of é é us are raw water to the urban commune of Saknia, rejection e're in Fouarat Lake (Kenitra, Morocco). African Journal of Science of Environment, No. 1 December.

Henze, P. Harremoes, J.L.C. Jansen and E. Avrin (1997). Wastewater treatment ". 2nd ed. Springerverlag Berlin.

Kayeye, Lecohu, Comoy, Guitard and Brabet (1991). Phytoplankton periodicity in a medium reservoir depth: The Pareloup lake (central solid, France): an example of cyclic succession, *Annls. Limnol,* 27 *(3.):* 197-214.

Sachon, G. (1986). "The waters siduaires r e b e tail of slaughter." Management and Treatment, Tribune Cebedeau 515: 27-45.

Tritt, W.P. and F. Shuchard (1992). "Materials flow and possibilities of Treating andsolid liquid wastes from slaughterhouse in Germany". Biores. Technol. 41: 235-245.

Derraz, Elalami, Atiki and Mhamdi (2003). Biochemical composition of crustacean zooplankton grazing and phytoplankton and ciliates in a recently set water tank (Sahela - Morocco), *Proceedings Biology,* 329: 761-770.

Gnagne, T. and F. Brissaud (2003). "Study of potentialities of epuration of slaughterhouse wastewater seepage on tropical sand." South Science and Technology, No. 11. December.

Miranda, L.A.S., J.A.P. Henriques and L.O. Monteggia (2005). "A full-scale UASB reactor for treatment of pig and cattle slaughterhouse wastewater with a high oil and grease content". Brazilian Journal of Chemical Engineering. Flight. 22, No. 04, p. 601-610, October-December.

Reginatto, V., R.M. Teixeira, F. Pereira, W. Schmidell, A. Furigo, R. Menes, C. Etchebechere and H.M. Soqres (2003). Anaerobic ammonium oxidation in a bioreactor treating slaughterhouse wastewater. Brazilian Journal of Chemical Engineering. Vol.22, No. 04, p. 593,600, October-December 2003.

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