# ASSESSMENT OF pH AND O.D (*IN SITU*) ON WASTE STABILIZATION POND (WSP) OF PONTA NEGRA, NATAL, RIO GRANDE DO NORTE – BRAZIL.

A. E. Marcon[1], H. W. Pearson[2] and H. N. de Souza Melo[3]

[1] Center of Sciences of the Health, Federal University of Rio Grande do Norte, Natal, RN, Brazil.
[2] Environmental Sanitation Group, Department of Chemistry, State University of Paraiba, Campina Grande, PB, Brazil.
[3] Dept. of Chemical Engineering, Federal University of Rio Grande do Norte, Natal, RN, Brazil.
[1] endresbio@yahoo.com.br; [2] howard_william@uol.com.br; [3] henio@eq.ufrn.edu.br.

**ABSTRACT**
Waste stabilization ponds are an efficient sewage treatment technique particularly appropriate when the effluents could reuse because the effluent produced is of good microbiological quality without the necessity for chemical disinfection. The wastewater treatment plant at the tourist resort of Ponta Negra, in the Natal city comprises three ponds (primary facultative pond, followed by maturation ponds I and II). During the study period the average effluent flow was 28 L/s. *In situ* analyses of the effluents for pH, conductivity (S/cm), turbidity (NTU), O.D (mg/L), temperature ($^0$C), and salinity (%) were made weekly during the period 01/07/2004 to 03/11/2004. The effluents of three ponds demonstrate standard for electrical conductivity of 0.57 S/cm, salinity of 0.02%, temperature of 28 ± 1 $^0$C and high turbidity. High pH and OD are key components in the natural disinfection process on WSPs. But, obtained date of pH and OD in these effluents remained consistently low, varying from only 6.92 to 7.6 and 0.53 to 5.56 mg/L, respectively. These relatively low values correlated with poor FC removal in these tree ponds giving an atypical final effluent with concentration of 7.6 x $10^4$ FC/100ml. Unrestricted reuse of these effluents could thus represent a public health risk.

**Keywords** oxigen dissolved; pH; *in situ* analyses; WSP of Ponta Negra

## INTRODUCTION

The Waste Stabilization Ponds (WSPs) are usually constituted by anaerobic ponds (responsible for the reduction of the content of solids and stabilization organic matter during the sludge accumulation), facultative ponds (responsible for the reduction of organic matter and nutrients) and maturation ponds (responsible for the removal of pathogenic microorganisms) according to Pearson *et al.* (1987 a;b), Grau (1991) and Mara; Pearson (1999).

The efficiency in the removal of pathogenic microorganisms in these systems of treatments of sewers is usually dear for the capacity of reduction of the density of indicators of faecal contamination (FC) and indirectly for some environmental factors, such as, intensity of the solar irradiation, pH index, concentration of dissolved oxygen, density and diversity of algae, etc, and the concentration of dissolved oxygen (OD) and the increase of the pH values is directly related to the concentration of algae in the ponds, and are excellent indicative of the capacity of disinfection of the systems (Pearson *et al*., 1987 (a;b); Curtis *et al*., 1992; Rangeby *et al*., 1996; Von Sperling, 1996; Davies-Colley *et al*., 1999).

The reuse of those effluents became mainly common in zones arid, semi-arid and in places with supply insufficient to assist to high demands; those waters represent benefits so much in the water provides and nutrient recycle.

These reutilization able and safe of those effluents is indispensable a study of WSP behavior in a long time (Shuval, 1997).

This work was accomplished on WSP of Ponta Negra/RN, that constituted of tree ponds in series (without anaerobic pond) and located in the south zone of the Natal city ($5^0$ 47'42" S and $35^0$ 12'43" W), Rio Grande do Norte province, Brazil.
The aim of this work was to characterize *in situ* the variations in the pH and OD values in the effluents of WSP of Ponta Negra, during 07/01/2004 to 11/03/2004.

## MATERIAL AND METHOD

Water samples analyses *in situ* were accomplish in effluents by triplicates in each pond of the WSP system (Figure 1) with HORIBA multi-parameter meters (Water Quality Checker / U-10) during 07/01/2004 to 11/03/2004 period, between 10:00 to 12:00. All the sampling stages were accomplished according to APHA (2005).

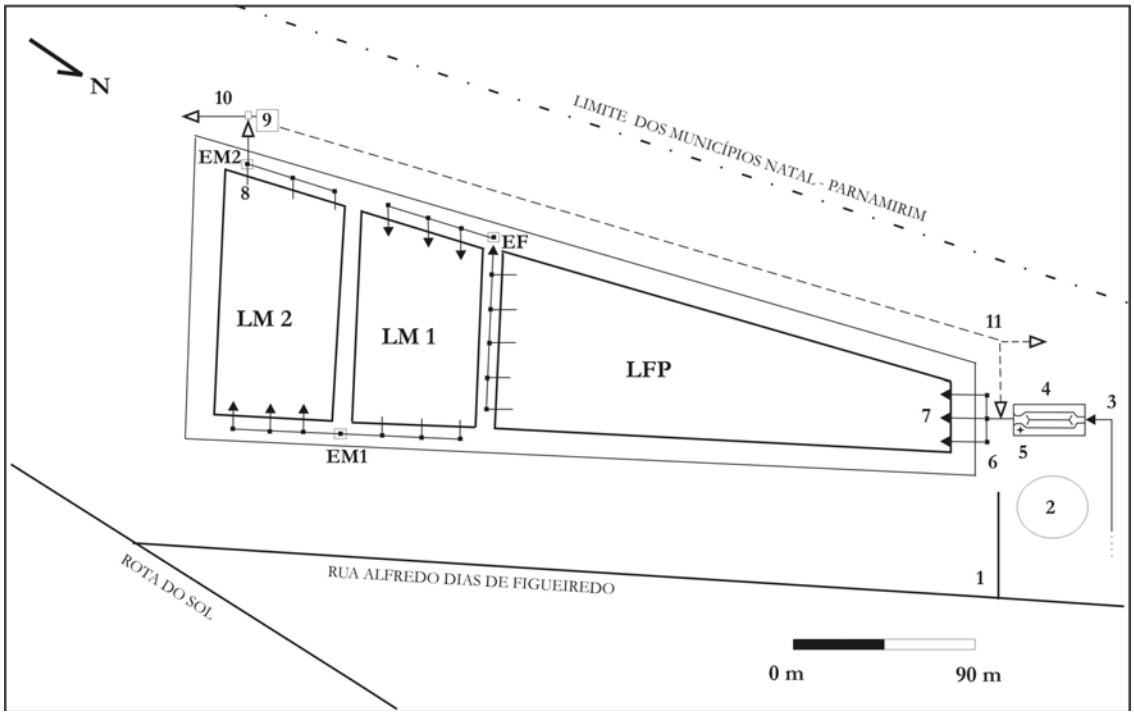


**Figure 1 – Representation of the Waste Stabilization Pond (WSP) of Ponta Negra, Natal/RN - Brazil.**

**RESULTS**

Figure 2 represented date of pH index obtained on WSP (*in situ*) of Ponta Negra/Brazil with HORIBA® multi-parameter.

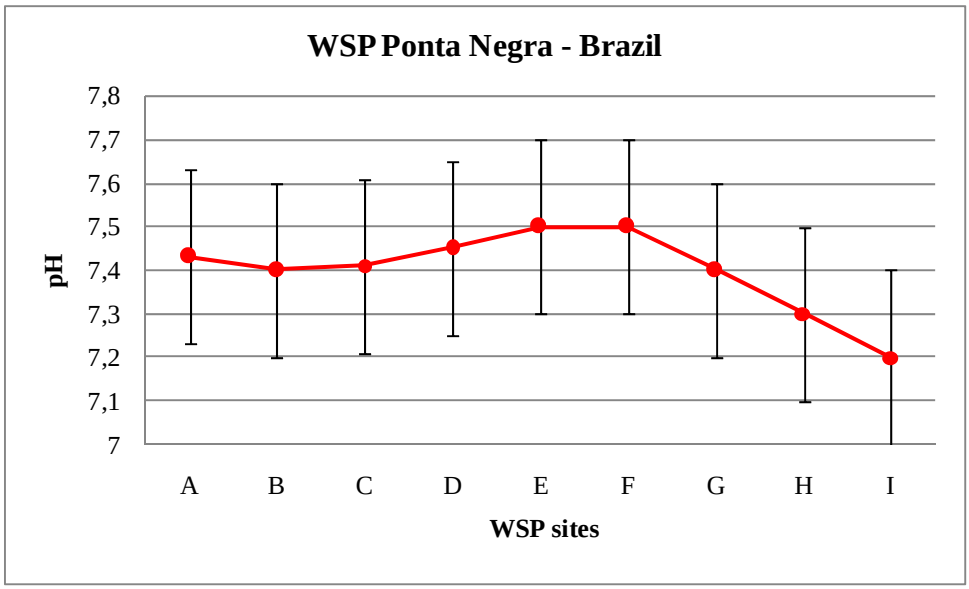


**Figure 2 – Date of pH variation on WSP of Ponta Negra/RN – Brazil with large standard error (S.E) represented, during study period in 2004 year.**

Figure 3 represented date of OD concentration obtained on WSP (*in situ*) of Ponta Negra/Brazil with HORIBA® multi-parameter.

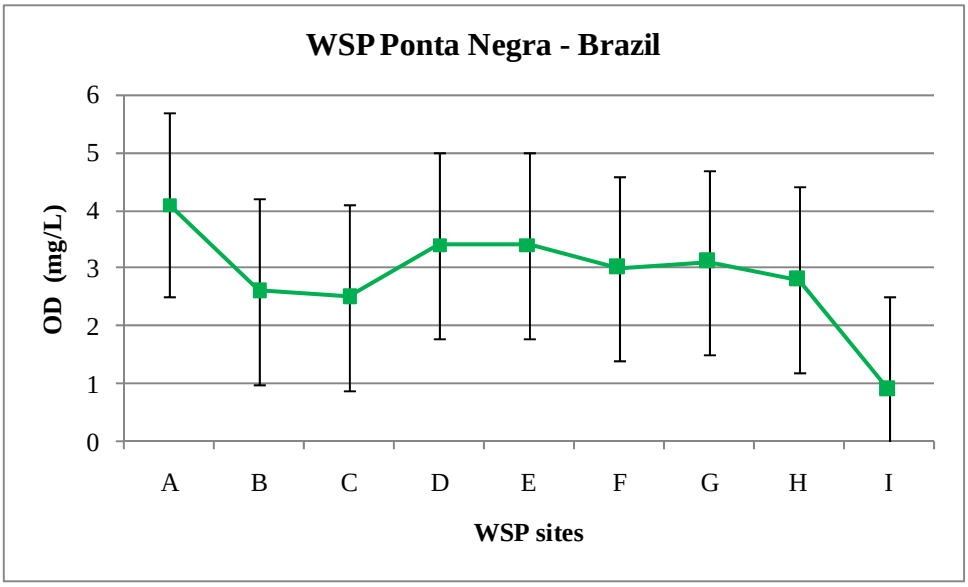


**Figure 3 – Date of OD concentration on WSP of Ponta Negra/RN – Brazil with large standard error (S.E) represented, during study period in 2004 year.**

Figure 4 represented the relation between OD concentration and pH values obtained on WSP (*in situ*) of Ponta Negra/Brazil with HORIBA® multi-parameter.

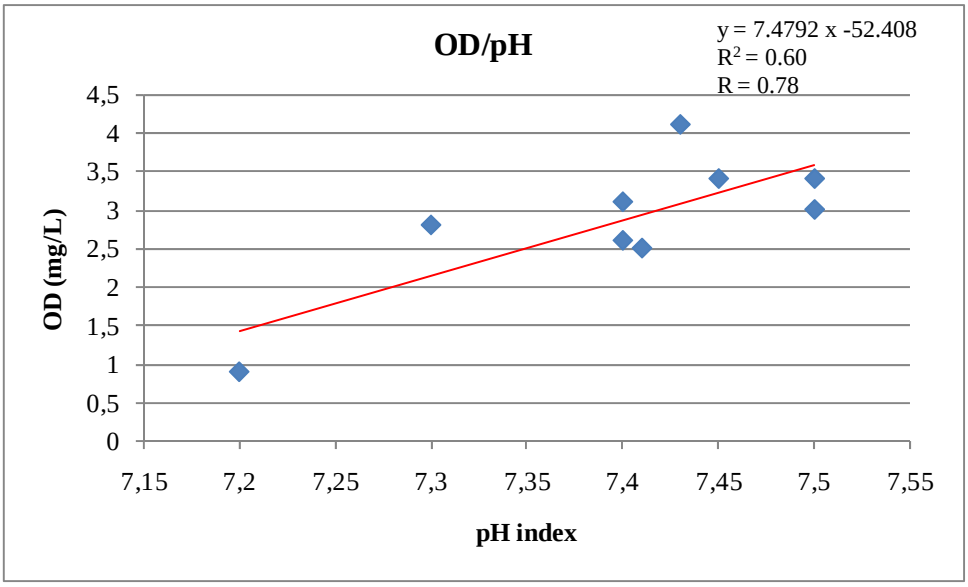


**Figure 4 – Co-relation between OD concentration and pH values obtained in the WSP of Ponta Negra/RN – Brazil, during study period (2004).**

Conform date represented in Table 1 below, the effluents in three ponds had an average electrical conductivity of 0.57 S/cm, a salinity of 0.02%, a temperature of 28 ± 1 $^{0}$C and high turbidity. High pH and OD (caused by efficient algal photosynthesis) are key components in the natural disinfection process on waste stabilization ponds (WSPs) but the pH and OD in these ponds remained consistently low, varying from only 6.92 to 7.6 and 0.53 to 5.56 mg/L, respectively.

**TABLE 1: Date obtained *in situ* by HORIBA® multi-parameter in WSP of Ponta Negra, Natal/RN - Brazil.**

| Pond | sites | pH | CE (S/cm) | Turbidity (NTU) | OD (mg/L) | T ($^{0}$C) | Salinity (%) |
|---|---|---|---|---|---|---|---|
| LFP | A | 7.43 ±0.2 | 0.573 ±0.03 | 999±0.00 | 4.1 ±0.6 | 28.0 ±0.2 | 0.02 ±0.00 |
| LFP | B | 7.40 ±0.2 | 0.572 ±0.02 | 999±0.00 | 2.6 ±0.7 | 27.9 ±0.1 | 0.02 ±0.00 |
| LFP | C | 7.41 ±0.2 | 0.565 ±0.02 | 999±0.00 | 2.5 ±1.0 | 27.9 ±0.1 | 0.02 ±0.00 |
| LM1 | D | 7.45 ±0.1 | 0.588 ±0.02 | 852.11±84.1 | 3.4 ±1.1 | 28.3 ±0.2 | 0.02 ±0.00 |
| LM1 | E | 7.50 ±0.1 | 0.589 ±0.02 | 854.22±87.3 | 3.4 ±1.3 | 28.2 ±0.1 | 0.02 ±0.00 |
| LM1 | F | 7.50 ±0.1 | 0.589 ±0.02 | 867.16±94.4 | 3.0 ±1.6 | 28.3 ±0.1 | 0.02 ±0.00 |
| LM2 | G | 7.40 ±0.1 | 0.579 ±0.04 | 683.89±101.1 | 3.1 ±1.0 | 28.4 ±0.4 | 0.02 ±0.00 |
| LM2 | H | 7.30 ±0.1 | 0.582 ±0.04 | 653.16±101.8 | 2.8 ±0.7 | 28.2 ±0.4 | 0.02 ±0.00 |
| LM2 | I | 7.20 ±0.1 | 0.582 ±0.04 | 663.61±133.2 | 0.9 ±0.4 | 28.2 ±0.4 | 0.02 ±0.00 |

**Representative triplicate data of sixteen independent analyses (n=16) with representation of the largest standard deviations (±) observed in the period for $p<0.05$ (ANOVA - only factor).**

The variations observed in that study period demonstrate that the high values of pH and OD are not being maintained, that are essential to the good efficiency of the system (Pearson *et al*., 1987 a;b; Rangeby *et al*., 1996; Von Sperling, 1996).
These variations possibly can be caused by the discharge organic load in the system, due to the lack of sedimentation pond, preceding the primary facultative pond. Too stratification absence in water column and elevate sediments concentration of the pond contents, variations in organic load ($KgDBO_5$/ha.dia) and low algal concentrations in the final effluent are the possible causes of poor effluent quality and treatment efficiency on this WSP system. These elevation organic masses cause a probable lower in the density of algae in the surface of the maturation ponds, which generates low concentration of OD and reduction in the pH index in the column of water of the system in consequence of the decrease in the photosynthetic rates (Silva, 1982; Ayers., Westcot, 1991; Curtis., Mara., Silva, 1992).

## CONCLUSION

These low values of OD and neutral pH can indicate low efficiency in pond series of this WSP system. The unrestricted reuse of these effluents will be able to represent risk (AWWA, 1983; WHO, 1989).

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