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# Treatment of industrial leachate through stabilization ponds

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# Introduction

Studies on the ways of treating industrial leachate are scarce, or practically non existent, justifying the conducting of this research on leachate from the landfill of a textile industry, located in Joinville, SC, Brazil.

The company has an wastewater treatment plant (WTP), where the effluents from the productive process, sanitary and leachate from the landfill are treated.

At the end of the WTP process the liquid fraction is separated from the solid, which is pressed into cakes and added to the industrial landfill, into ditches of about 3,000m² , a depth of 20m, with waterproofed bottom and sides, and drains from the bottom to take the leachate to the storage ponds.

This liquid is transported daily to the WTP, about 5Km away, as there is no electricity supply at the landfill for building a conventional treatment system (eg Activated Sludge).

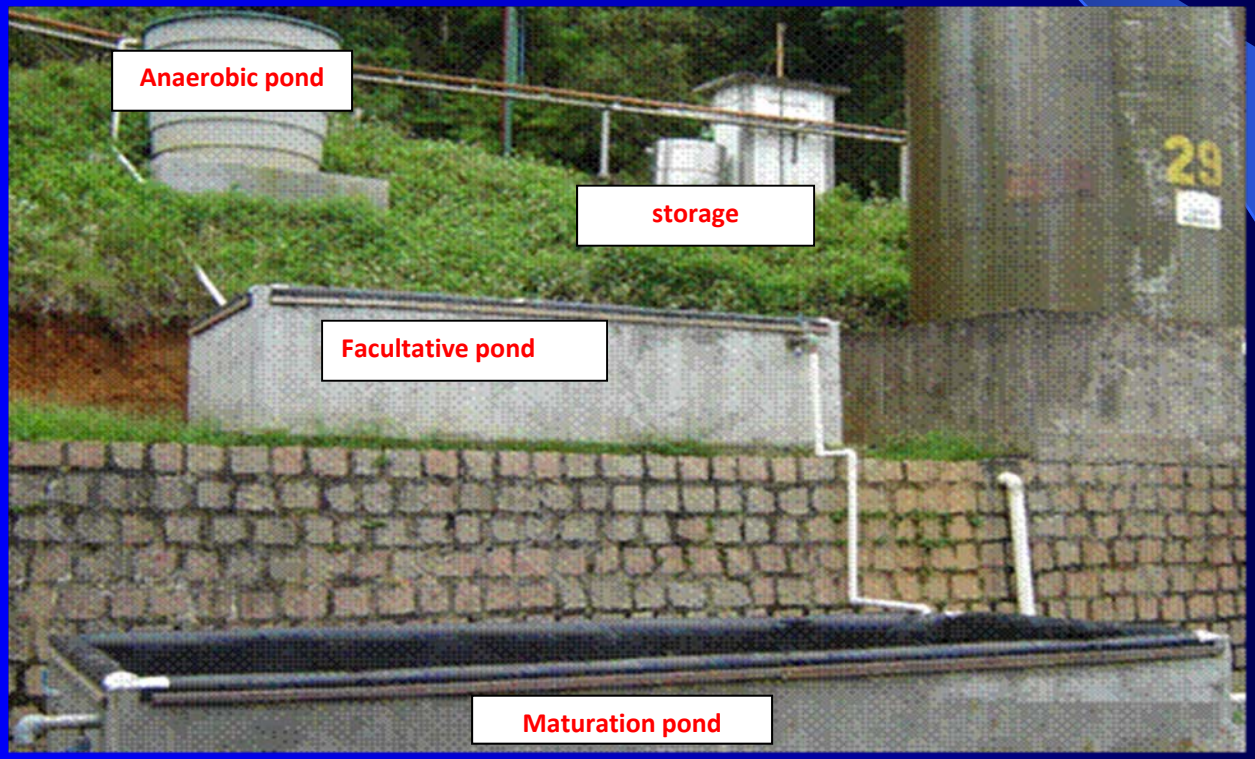
# Objective

This study aimed to analyzing the performance of ponds in the treatment of industrial leachate from a textile industrial landfill.

The system to be used does not require electrical power, as it simulates the running of natural ponds.

# Methods

The treatment system was built with one storage tank and 3 in series ponds, consisting of one anaerobic pond (2 m deep round) and two rectangular, facultative and maturation, ponds.



## Table 1. Pond dimensions

| Dimensions | Anaerobic pond | Facultative pond | Maturation pond |
|---|---|---|---|
| Length (m) | - | 3.5 | 3.5 |
| Width (m) | - | 2.14 | 2.86 |
| Height (m) | 2.1 | 1.0 | 0.8 |
| Water Depth | 2.0 | 0.8 | 0.6 |
| Volume ($m^3$) | 5.0 | 6.0 | 6.0 |
| HDT (days) | 25 | 30 | 30 |

$Q_{in}$ = 200 L/day

## *Samples and Monitoring:*

The samples were collected every 7 days, at morning (9:00 am), into the experimental units.

Measured in situ- HANNA Probes:

pH; Dissolved Oxygen (DO);Temperature; conductivity

Measured in laboratory - Standard Methods (APHA, 1998):

Total and Ammoniacal Nitrogen (TN, Am N); Nitrite and Nitrate

Total Phosphorus (TP)

Chemical Oxygen Demand (COD)

Color; Turbidity

Total Solids (TS); Chlorophyll *a*

# Results

## Table 2: Mean values, standard deviation and system efficiency (n= 10)

| Parameters | Point | | | | Efficiency (%) |
|---|---|---|---|---|---|
| | P1 | P2 | P3 | P4 | |
| T (ºC) | 20.87 ±4.89 | 21.47 ±4.15 | 21.41 ±4.37 | 21.54 ±4.24 | - |
| DO (mg/L) | 0.40 ±1.88 | 0.65 ±1.88 | 7.87 ±1.33 | 7.59 ±0.8 | - |
| pH | 7.98 ±0.28 | 8.01 ±0.23 | 8.29 ±0.25 | 8.51 ±0.25 | - |
| Conductivity (µs/cm) | 4075±633 | 3050±533 | 1154 ±359 | 430±222 | 90 |
| TN (mg/L) | 265±14 | 227 ±31 | 86 ±66 | 35 ±20 | 87 |
| Am N(mg/L) | 242±53 | 181 ±29 | 56±20 | 19 ±10 | 92 |
| Nitrite (mg/L) | 35±19 | 64±20 | 22±7 | 8 ±5 | 76 |
| Nitrate (mg/L) | 56±34 | 63 ±41 | 95 ±50 | 51±35 | 9 |
| TP (mg/L) | 3 ±0.42 | 2.27 ±0.29 | 1.16 ±0.26 | 0.91 ±0.22 | 69 |
| COD (mg/L) | 534±73 | 441±75 | 148±54 | 60 ±24 | 89 |
| Color (ADMI) | 591 ±277 | 394±169 | 160±96 | 74±37 | 87 |
| Chlorophyll *a*(µg/L) | - | - | 150± 115 | 58± 67 | - |
| Turbidity (NTU) | 43± 29 | 21±6 | 13±5 | 5 ±2 | 79 |
| TS (mg/L) | 5415±3195 | 4662±4063 | 3806±2388 | 3130 ±3114 | 42 |

# Principal components analysis (PCA) showed the preliminary performance of ponds

In the AP 3 artificial factors together explain 82% of the system:

- factor 1 (7.15) having strong correlation with COD
- factor 2 (2.47) with the nitrite
- factor 3 (1.90) with the DO

- indicating a predominance of the organic/inorganic material factor.

- In the FP there was predominance of the aerobicity factor, correlated to the positive balance of DO with factor 1 (8.47), the TS parameter correlated with factor 2 (2.63) and the pH with factor 3 (1.86), resulting in a surplus of oxygen in the reactor. The three together explained 92% of the system.

- In MP the conductivity factor predominated, associated to factor 1(7.39), the DO related to factor 2 (3.00) and the TP related to factor 3 (1.44), indicating the predominance of aerobicity factor.

# Conclusions

- After 2 ½ months, the system attained good removal efficiencies, such as: TN (87%), Am N(92%), COD (89%), Color (87%) and Turbidity (79%).
- The ACP results showed that the ponds realized efficient treatment, presenting the artificial factors expected in each type of pond.
- It’s necessary more studies to verify the stability of the system.