



Title: Comparative study between biological treatment and a physicochemical treatment for the removal of butyl acetate in industrial

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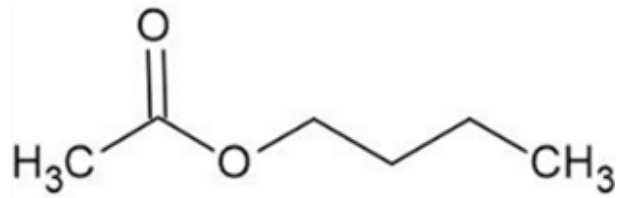
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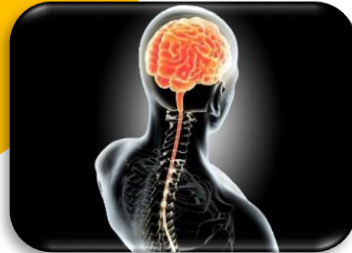
Holdings

Mexico	Colombia	Guatemala
Bolivia	Cameroon	Democratic
Spain	El Salvador	Republic
Ecuador	Taiwan	of Congo
Peru	Paraguay	Nicaragua

Introduction



- Melting point: -78 °C
- Boiling point: 126.1 °C
- Solubility in water: 0.68 g/100 mL

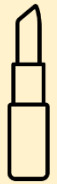
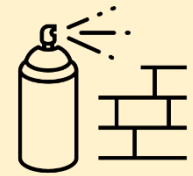


NIOSH: IDLH 1700 ppm
OSHA: PEL 150 ppm

LD₅₀ - rabbit - 17.600 mg/kg
LC₅₀ - fishes - 100 mg/L (24-96 h)
LC₅₀ - rat - 21.0 mg/L <(4 h)

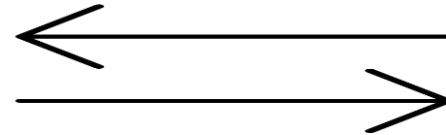
Introduction

Industry



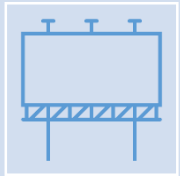
Aeronautical process

**CAUTION
HAZARDOUS
MATERIAL**



Methodology

Biological process development



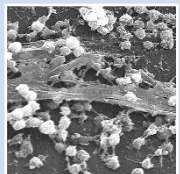
Reactor development

Acrylic tank
Used Volumen 100 L
PET bottle support



Inoculation

6 L activated sludge from a
treatment plant (UAQ)
Feed time 1-6 months



Biofilm establishment

Feed time 150-300 days
every 24 h
Ambient temperature
Aeration by diffuser hoses



Results

Domestic wastewater characterization

Parameter	Value obtained	Maximum allowable limit
Temperature °C	25.5	40 °C
Fats and Oils	25	25 mg/L
Floating Matter	Ausente	Ausente
Settling Solids	3	2 mg/L
Total Suspended Solids	500	60 mg/L
Biochemical Oxygen Demand	600	60 mg/L
Total Nitrogen	50	25 mg/L
Total Phosphorous	20	10 mg/L
Arsenic	N.D.	0.2 mg/L
Cadmium	N.D.	0.2 mg/L
Cianide	N.D.	2.0 mg/L
Copper	N.D.	6.0 mg/L
Chromium	N.D.	1.00 mg/L
Mercury	N.D.	0.01 mg/L
Níckel	N.D.	4.0 mg/L
Lead	N.D.	0.4 mg/l

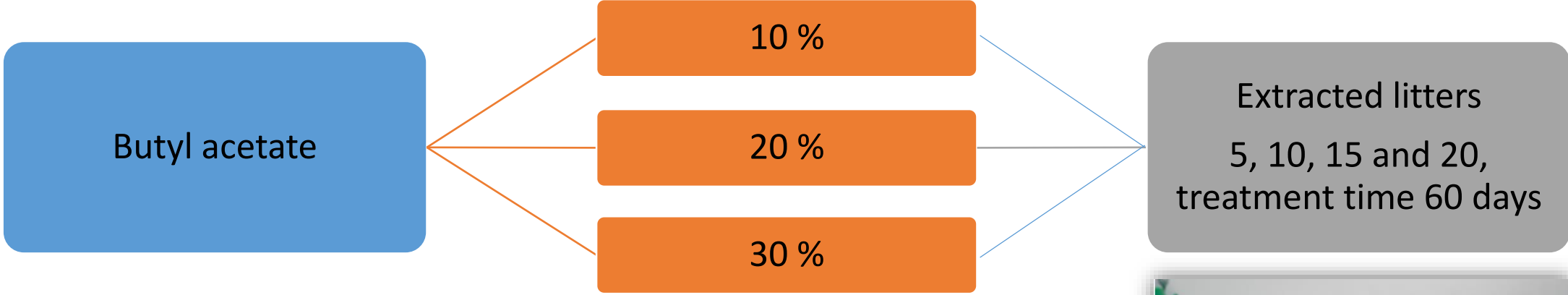
Characterization of NOM-003 SEMARNAT 1997

Parameter	Value	Maximum allowable limit
Fecal coliforms	≥ 2400000 NMP	240 NMP/100 ml
Helmith eggs	≤ 1	≤ 1 (h/1)
Fats and oils	25	15 m/l
BOD ₅	594	20 mg/l
TSS	500	20 mg/l

Results obtained from the biokinetic coefficients of the biological reactor

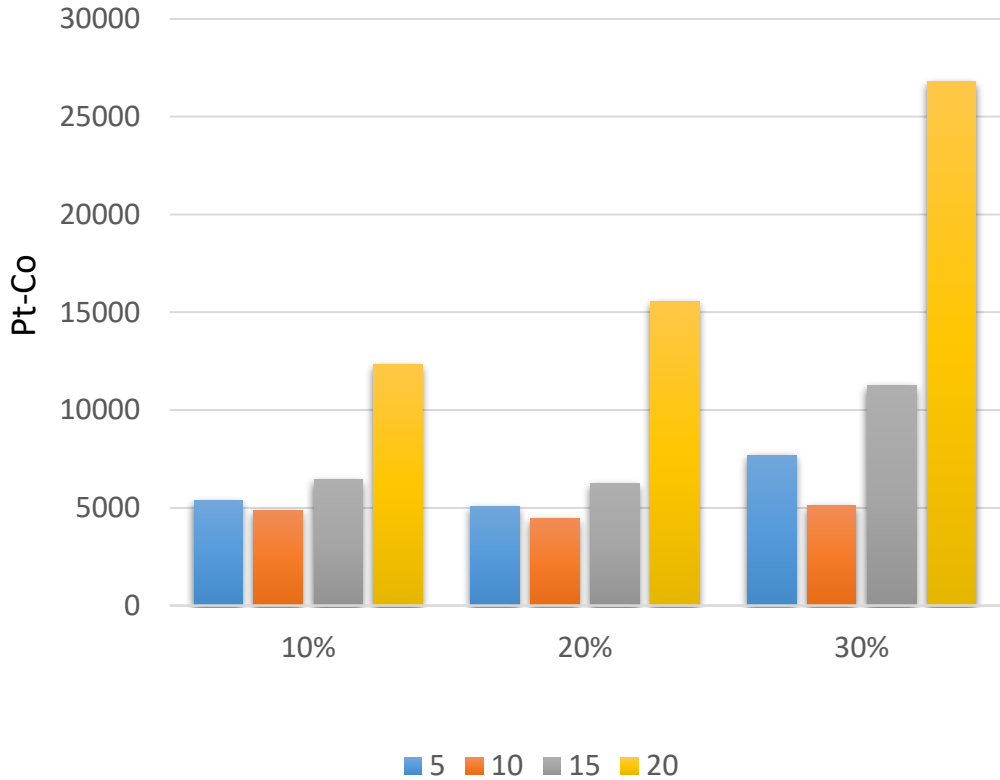
Coefficient	Results
Substrate utilization rate (k) g CODs / gVSS	5.91
Average rate constant (Ks) mg / l CODs	14.78
Maximum cell yield (Y) mg VSS / mg CODs	0.085
Endogenous decay coefficient (kd) g SSV / g VSS	0.025

Biological process with butyl acetate

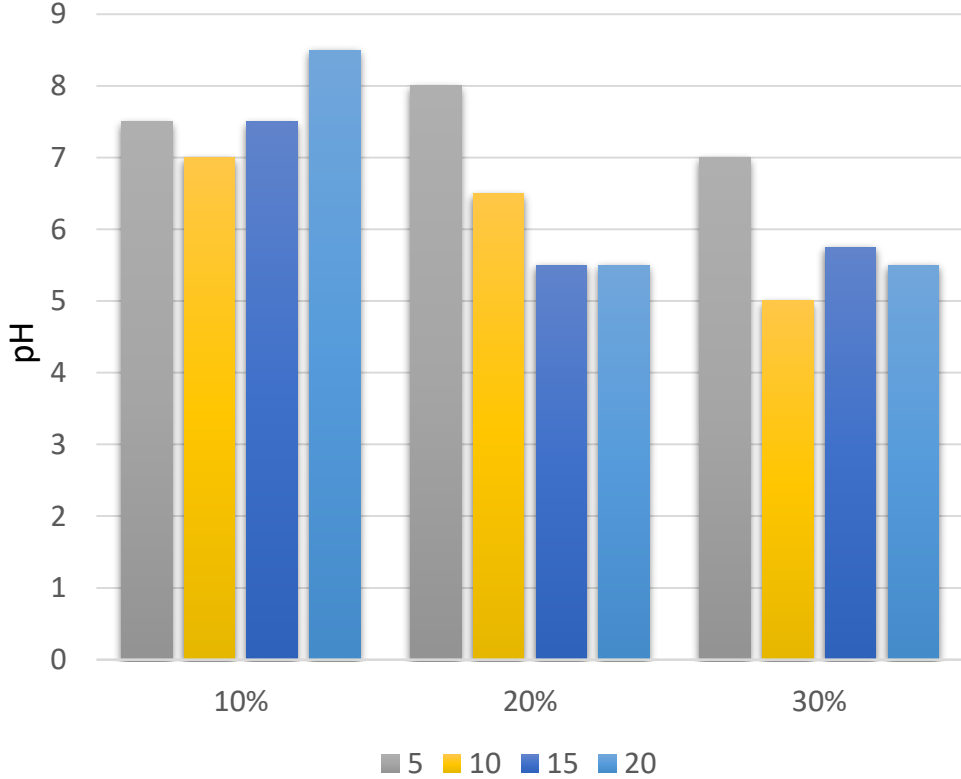


Biological process with butyl acetate

Color



pH



Methodology

Physicochemical process development

pH adjustment 3-2

- 1.8 ml de H₂SO₄ (98%)
- 2 ml metal precipitator Floc PM 929 (1 %)

pH adjustment 2-7

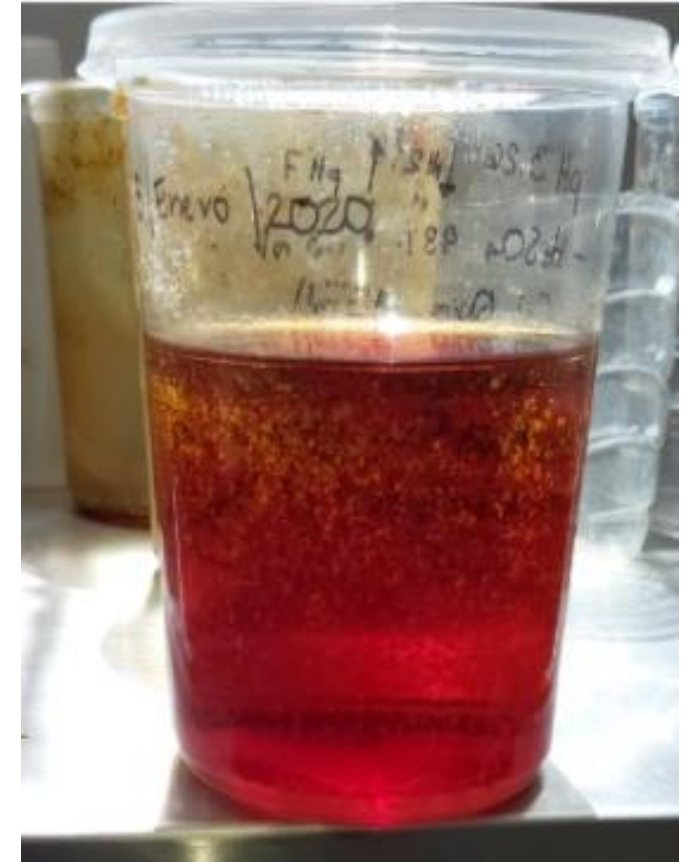
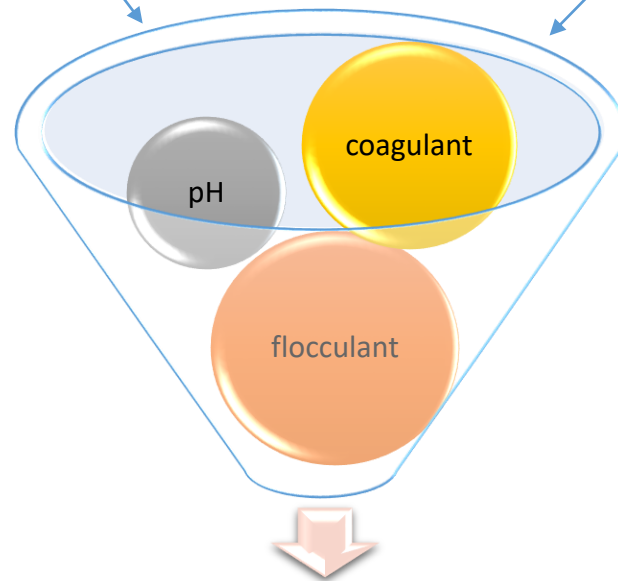
- 45 ml chemical lime (20%)

Coagulation

- 2.5 ml cyqbaflock flocculant 90/10 (10%)

Flocculation

- 1.3 ml cyqbaflock flocculant 70/24 (1%)



Results

Parameter	Unit	Initial result	Final result	% removal
Electric conductivity	μS	13925	7298	47.6
Total suspended solids	mg/L	1390	360	74
Color	Pt-Co	934	432	53.7
Turbidity	NTU	756	340	55.1
COD	mg/L	35720	959	97.3
BOD	mg/L	900	300	66.6
pH	N/A	3.2	7	-

Results

1) Propane

10 %

2) Nitrous oxide 13,000

- 1) Water
- 2) Methyl ester
- 3) 1-chlorine butane
- 4) 1-butanol
- 5) 1-4 Dioxane 6,500,000
- 6) Butyl ester 4,400,000

1) 1-4 Dioxane 25,000

20 %

1) 1-4 Dioxane 200,000

30 %

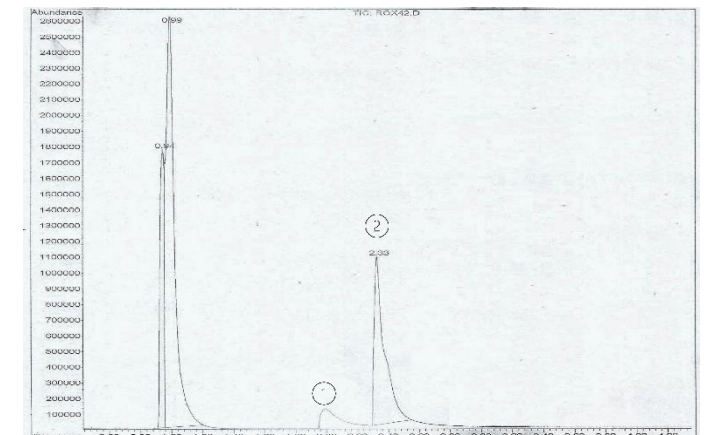
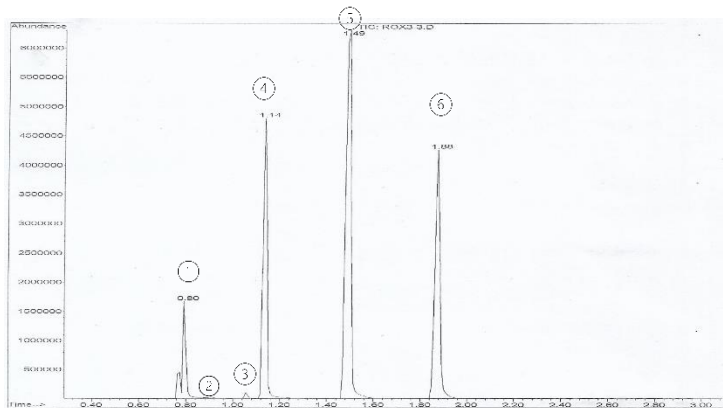
1) 1-Butanol

2) 1-4 Dioxane 1,100,000

Preliminary analyses

biological treatment

physicochemical treatment



Analysis (GC-MS)

Conclusions

Physicochemical treatment

The parameters analyzed after treatment were decreased by 74%, 53.8%, 55%, 97% and 67%, for electrical conductivity, total suspended solids, color, turbidity, COD and BOD respectively, compared to the initial sample.

Biological treatment

The parameters analyzed in the different hydraulic retention times in the experimental part for COD was 99%. As well as they also present the values of BOD 97%, for all the values.

Regarding compliance with NOM 003 SEMARNAT 1997, all retention times comply except for the retention time of 3.2 days for the 30% concentration with wastewater and effluent with butyl acetate

In both treatments there was COD reduction, which indicates that there is a significant removal percentage for butyl acetate.

The comparison of the treatments applied to the effluent showed that the biological treatment presented greater removal of the pollutant before the physicochemical treatment in 2% of COD and 30% of BOD.

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