

EOLI

Efficient Operation of Urban Wastewater Treatment Plants

Work Package 1

UNAM (Partner No. 6)

Second year report

November 2003- October 2004

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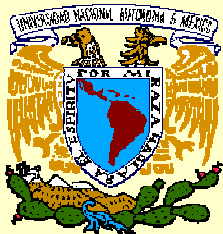
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Contract Number ICA4-CT-2002-10012



Introduction

- This report presents the activities of the partner 6 (UNAM) concerning the WP1 of the EOLI project realized during the period November 2003-October 2004
- **Experiments conducted**
 - Experiment 1. Replicates of the model experiments
 - Experiment 2. Fault detection experiments (for WP7)
 - **Experiment 3. Evaluation of the influence of shock loads on the reactor stability for both optimal and non optimal strategies**
 - Experiment 4. Exploratory experiments in the pilot reactor for the degradation of a mixture of municipal wastewater and phenol

Methodology

Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

The evaluation of the process improvement with the application of the ED-TOC strategy by the comparison with a non optimal (FTC) strategy in front of shock loads was conducted comparing the necessary time to degrade four quantities of 4CP (1.4, 12, 20, 28 g)

Experiment 4. Exploratory experiments in the pilot reactor for the degradation of a mixture of municipal wastewater and phenol

The industrial pilot plant will operate with this wastewater.

A mixture of municipal wastewater and phenol were used.

Different problems and solution were found for the settling phase and the consumption of DO

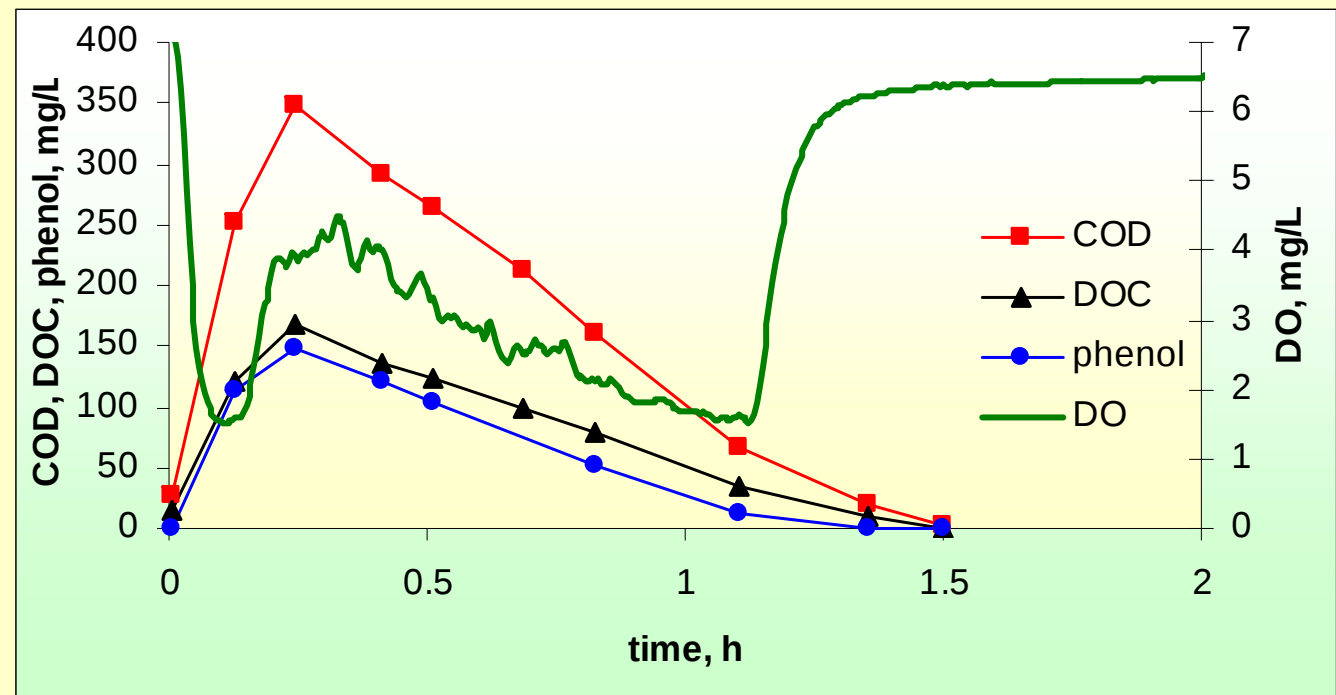
Experimental Results

Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

Degradation of 4CP by FTC strategy

The reactor operating under the FTC strategy degraded 1.4 g of 4CP (Si in the influent of 350 mg/L) in 1 cycle of 4h.

Behavior of the substrate concentration, measured as 4CP, COD, and DOC during the degradation of 1.4g 4CP using the FTC strategy



Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

Degradation of higher quantity of 4CP by the FTC strategy

Several cycles of the SBR are required, due to the fact that the influent need to be diluted

Thus, the necessary time to degrade the amounts of 4CP by the FTC strategy are the following ones:

1.4 g of 4CP = 4 hours (1 cycle) standard condition

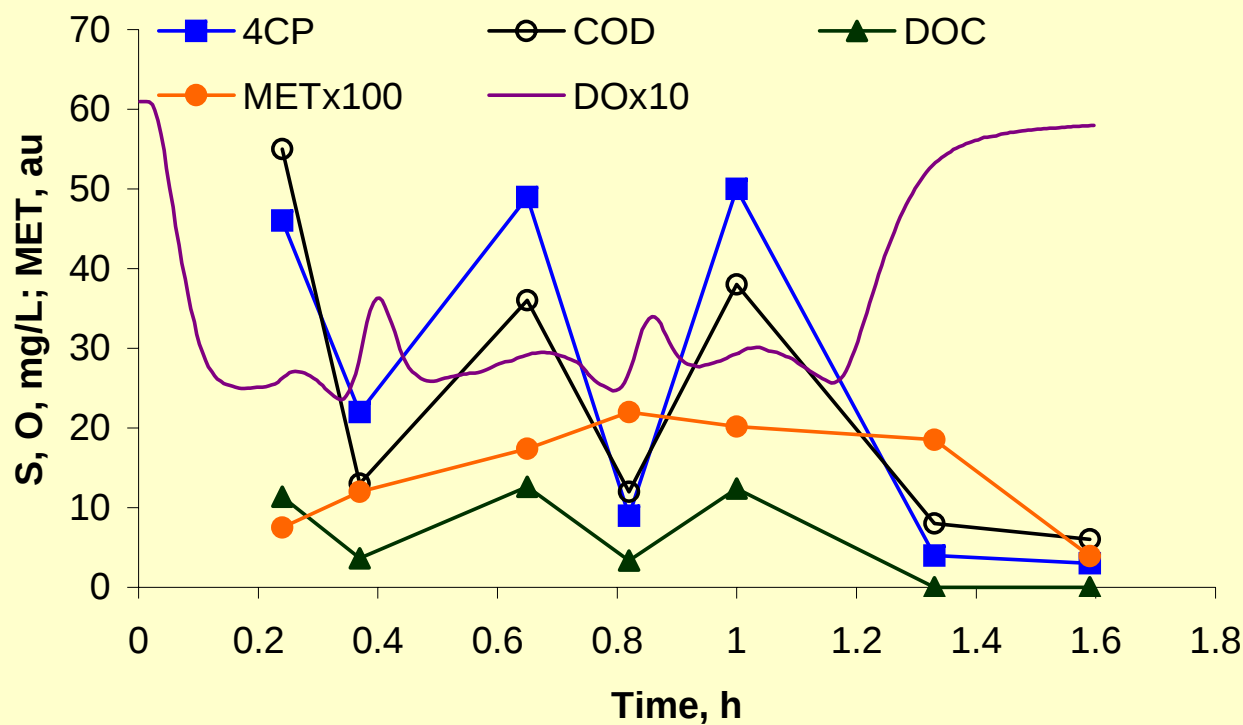
12 g of 4CP = 36 hours (9 cycles)

20 g of 4CP = 60 hours (15 cycles)

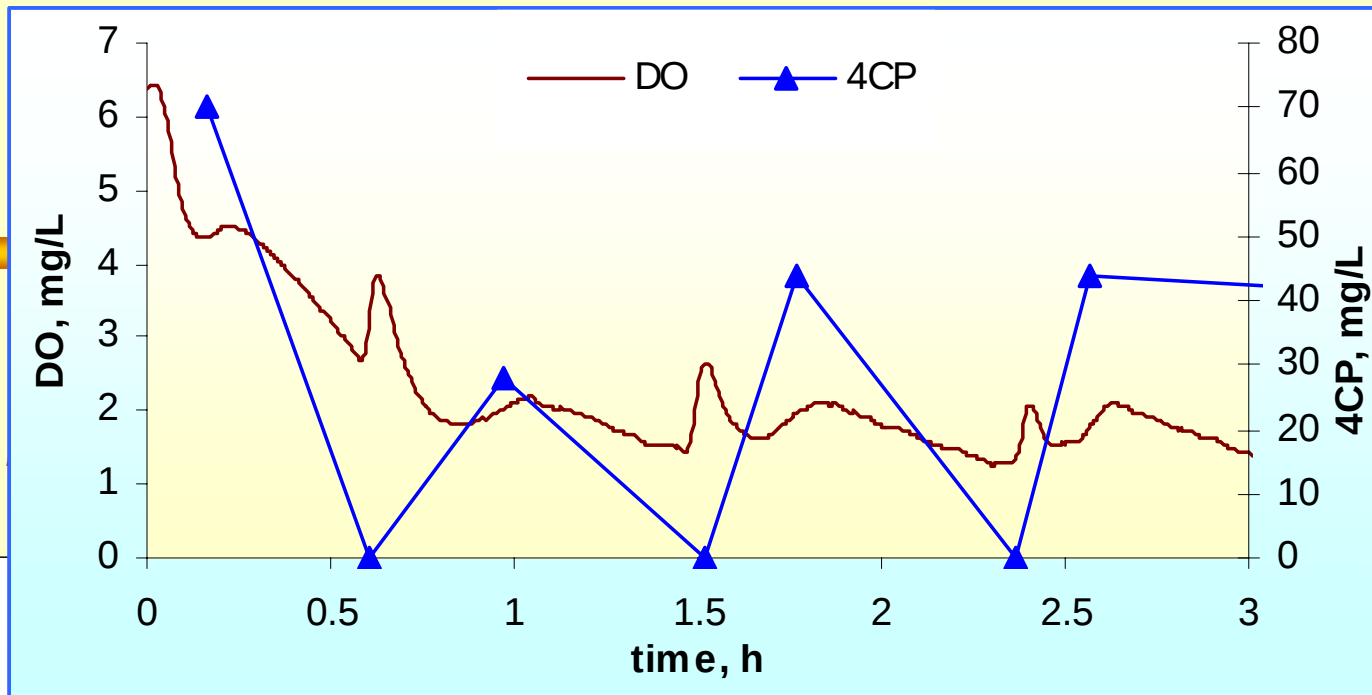
28 g of 4CP = 80 hours (20 cycles)

Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

Degradation of 1.4 g 4CP by the ED-TOC strategy (standard condition)

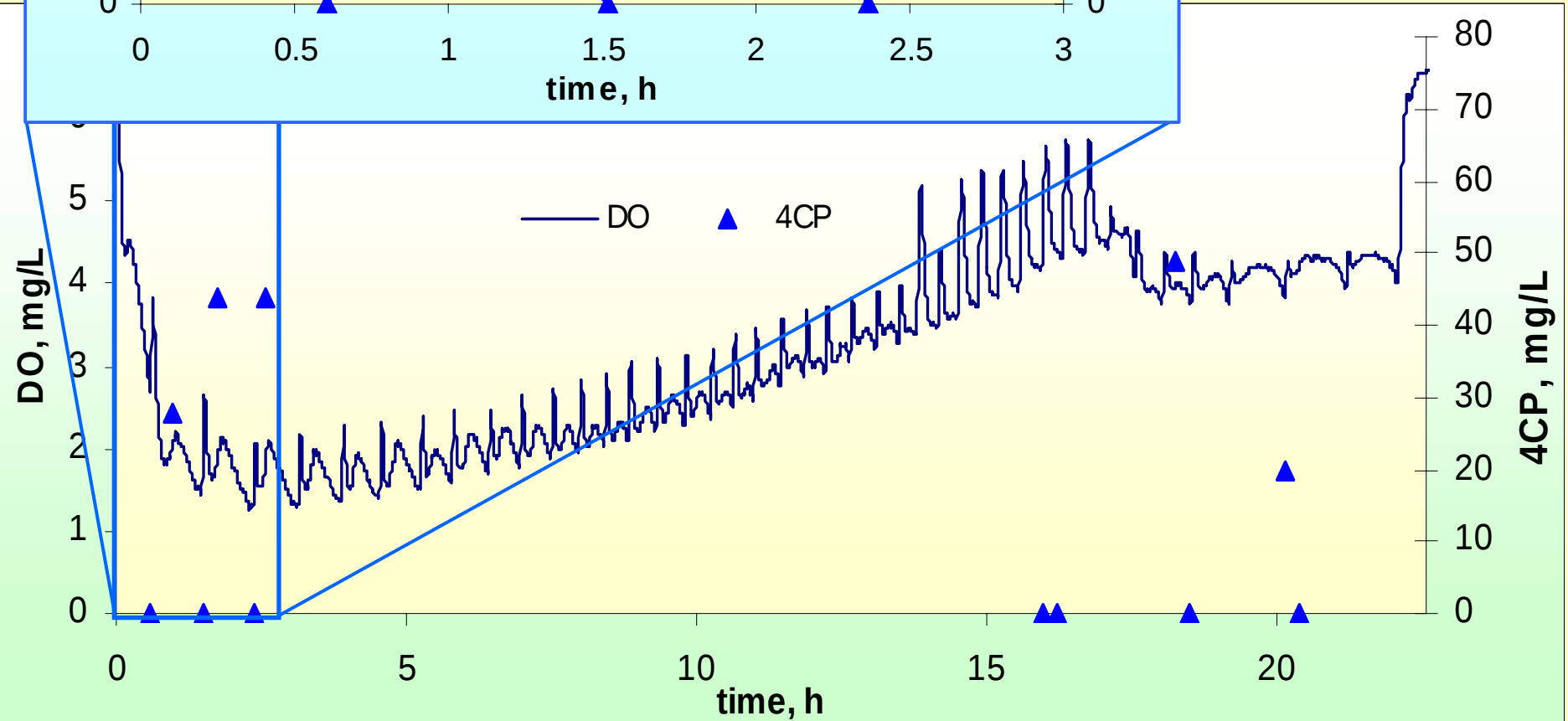


Behavior of the substrate concentration, measured as 4CP, COD, and DOC during the degradation of 1.4g 4CP using the ED-TOC strategy



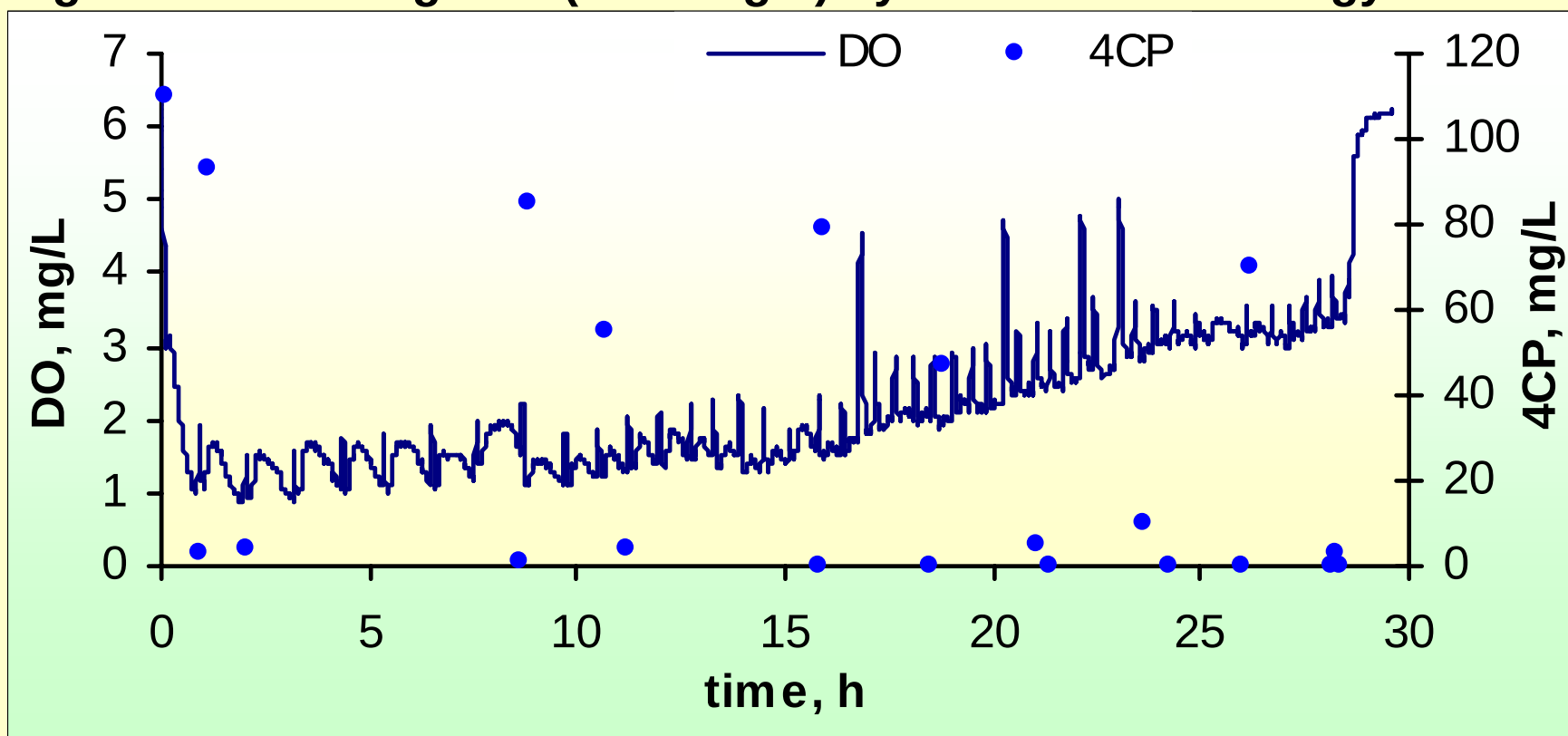
ies under

e degradation of 12g



Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

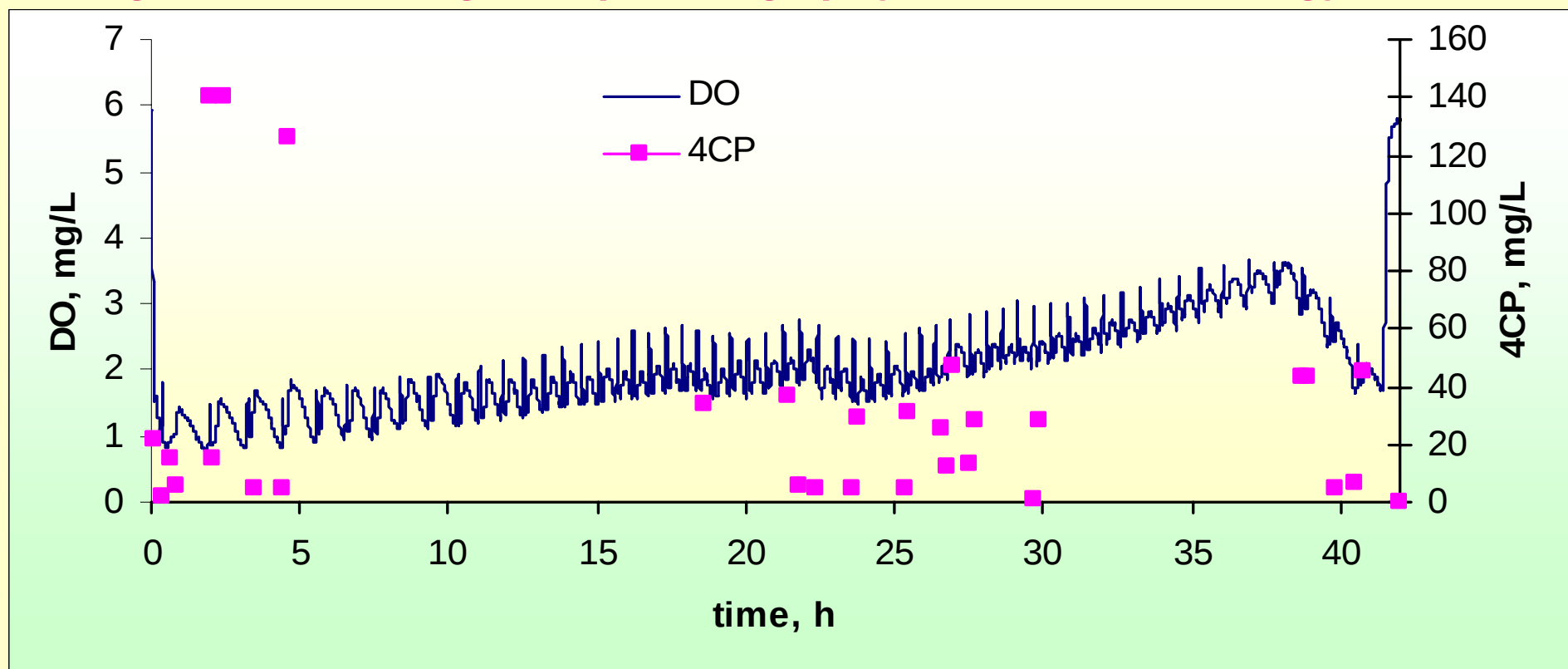
Degradation of 20 g 4CP (5000 mg/L) by the ED-TOC strategy



Behavior of the substrate concentration, measured as 4CP during the degradation of 20g 4CP using the ED-TOC strategy

Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

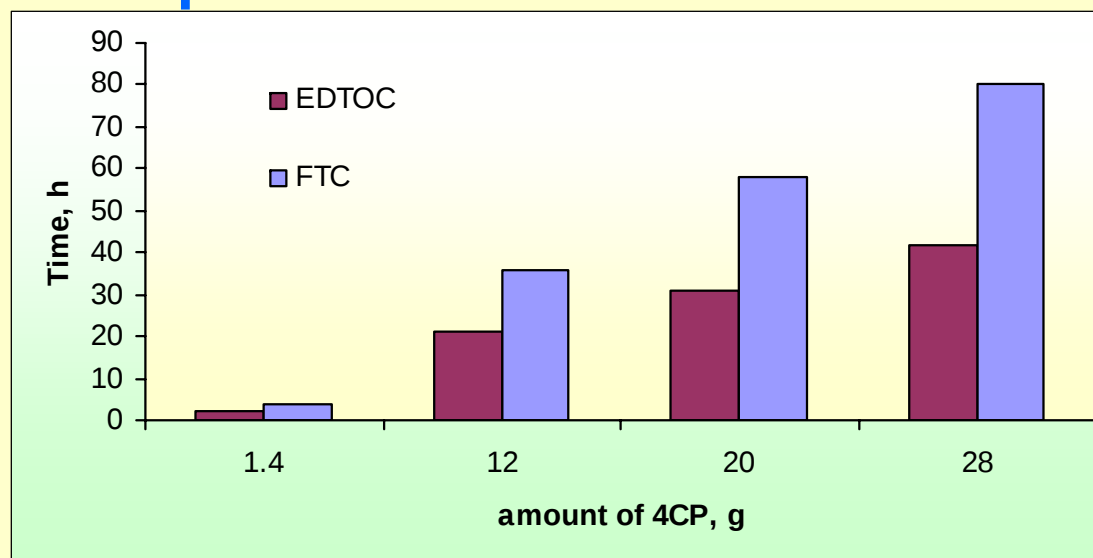
Degradation of 28 g 4CP (7000 mg/L) by the ED-TOC strategy



Behavior of the substrate concentration, measured as 4CP during the degradation of 28g 4CP using the ED-TOC strategy

Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

Comparison of FTC and ED-TOC strategies



Comparison of the time necessary for degrading the same quantity of 4CP by the FTC and ED-TOC strategies

	4CP, g	applied load (kgCOD/m ³ .d)	
		FTC (for each cycle)	ED-TOC
<i>Applied load degrade by the different strategies</i>	12		4.11
	20	2.52	4.80
	28		4.80

Experiment 4. Experiments of degradation of a mixture of municipal wastewater and phenol

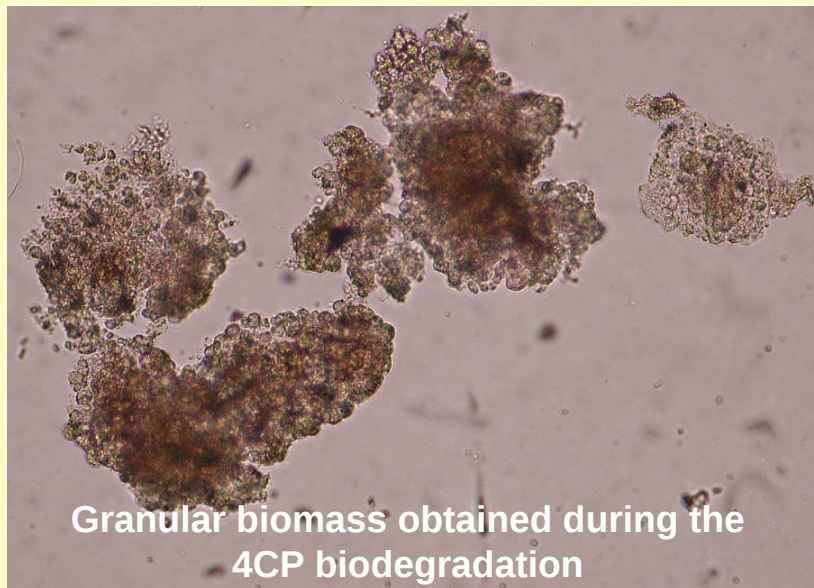
Experiments were carried out to investigate the behavior of the ED-TOC strategy with the degradation of a mixture of municipal wastewater and phenol, i.e., a mixture of an easily and a toxic substrates

These exploratory experiments will used to anticipate the behavior of the industrial pilot plant of 1m³, which will be used in next year

Experiment 4. Experiments of degradation of a mixture of municipal wastewater and phenol

Problems and solutions for settling

- SVI was between 450 and 350 mL/g
- Filamentous bacteria that caused a lost of biomass during the drawing

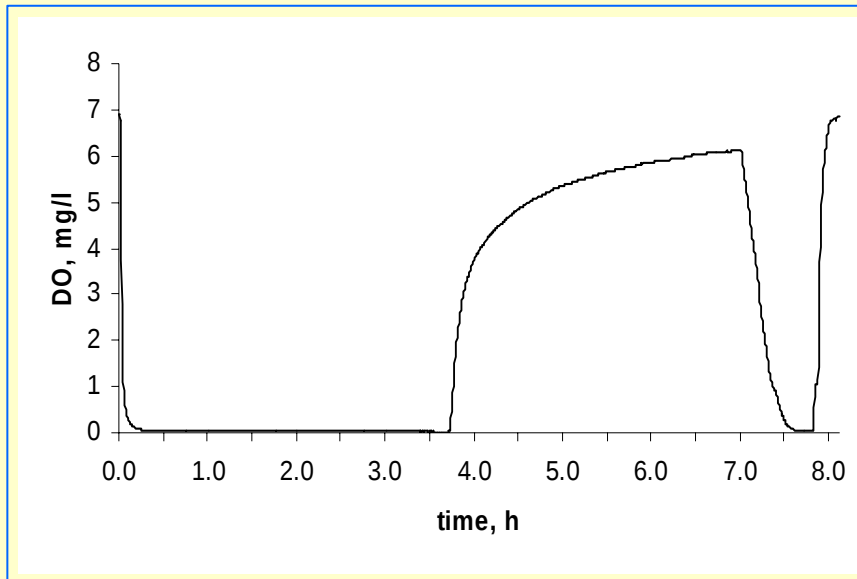


In order to solve this problem the settling phase was extended from to 2-3h.
With this procedure the biomass was maintained in the reactor, and the SVI was lower than 160 mL/g

Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

Problems and solutions for DO

- Due to the high organic load in the influent (between 3 to 4 KgCOD/m³/d) the biomass increased the consumption of DO.



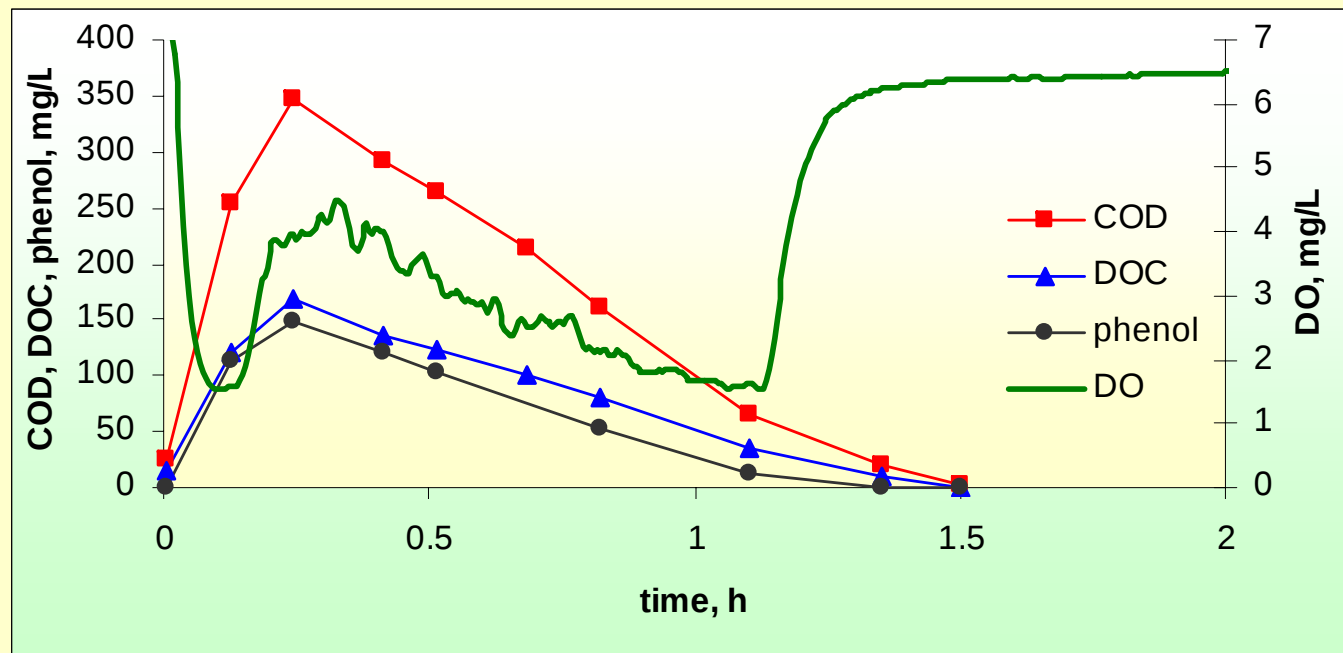
- Thus, problems due to the limitation of oxygen in the system appeared when the DO was inferior to 2mg/L

- With this problem the utilization of the ED-TOC strategy is difficult, since the DO is the principal variable used to control

Experiment 3. Comparison of FTC and ED-TOC strategies under shock loads of 4CP

Solutions for DO

- The biomass was reduced to 500 mg/L
- The cellular retention time was fixed in 5d and the duration of the cycle was increased to 24 h, i.e., to have a lower organic load (0.8 KgCOD/m³/d)



- When this strategy was implemented the DO was always superior to 2 mg/L

Summary

- A better performance of the reactor operated with the ED-TOC strategy was observed when it was compared to the response obtained with the reactor operated under FTC strategy
- The ED-TOC strategy was able to manage increments of toxic concentrations in the influent up to 7000 mg 4CP/L (28g of 4CP) without any problem
- It was shown that not only higher concentrations of toxic could be treated with the ED-TOC strategy, but also a reduction in degradation time was obtained (around 52%)
- The exploratory experiments for the degradation of a mixture of municipal wastewater and phenol were started.
- These exploratory experiments will be used to anticipate the behavior of the industrial pilot plant of 1m³, which will be used in next year
- Some problems identified with the aeration and settling were solved.

Future experiments

Third year (November 2004-October 2005)

- **Experiment 1.** Evaluation of the ED-TOC strategies degrading a mixture of municipal wastewater and phenol in lab scale
- **Experiment 2.** Evaluation of the long-term stability of the system by the application of the ED-TOC strategy
- **Experiment 3.** Start-up of the field scale reactor

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End of the presentation



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