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X SIMPOSIO INTERNAZIONALE
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XIII SIMPOSIO ITALO-BRASILIANO
DI INGEGNERIA
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HYDROGEN SULPHIDE REMOVAL IN A BIOLOGICAL MOVING BED REACTOR: MODELLING AND PERFORMANCE

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IN SUPREMÆ DIGNITATIS 1343
UNIVERSITÀ DI PISA

FLORENTINA STUDIORUM UNIVERSITAS
UNIVERSITÀ DEGLI STUDI FIRENZE
DICEA
DIPARTIMENTO DI INGEGNERIA CIVILE E AMBIENTALE

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Roma,
21 Giugno 2016

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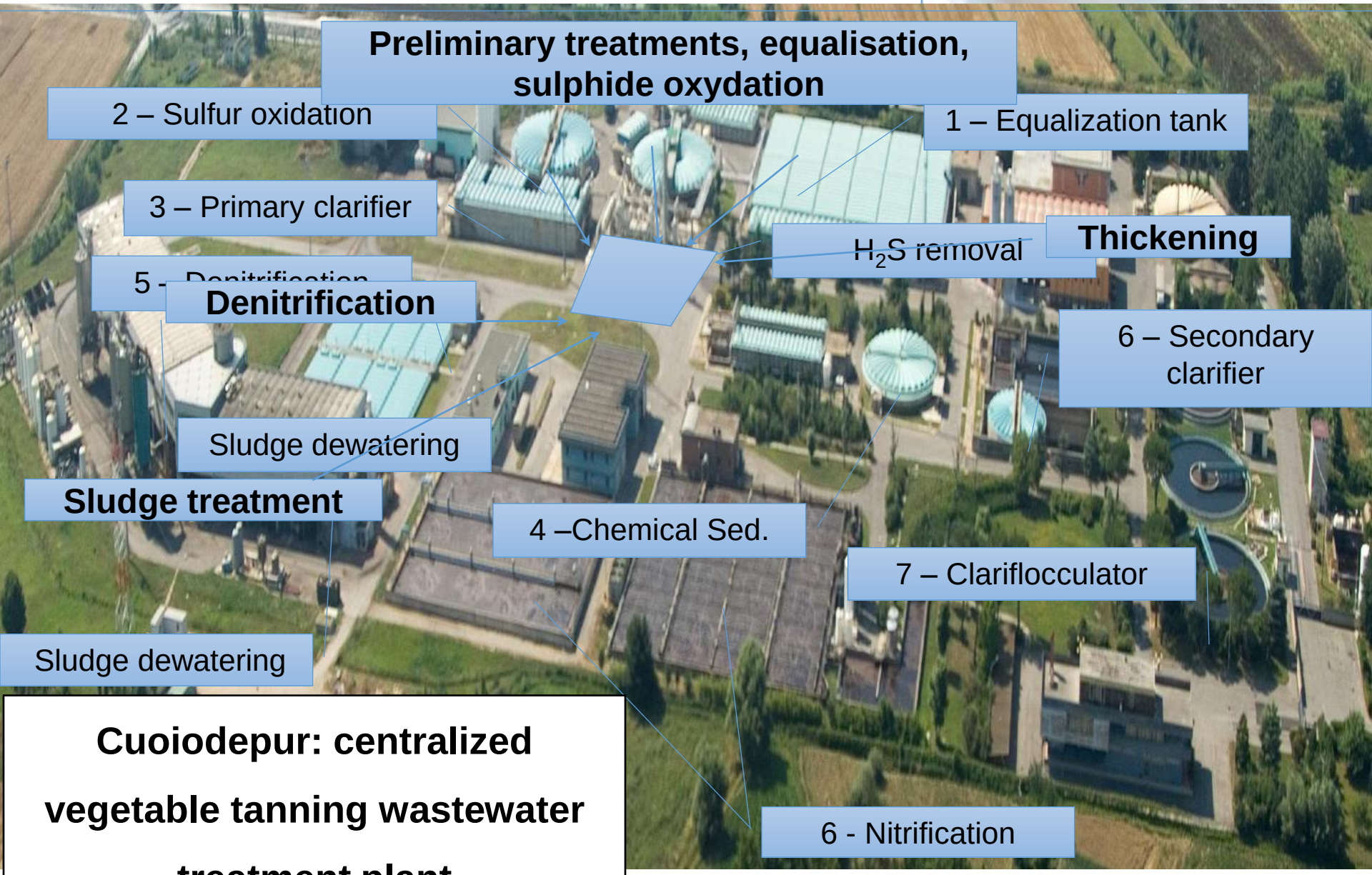

Cuoiodepur: centralized vegetable tanning wastewater treatment plant

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Chemical Scrubber

1) **Reagents (600 t NaOH / year)**
1) **Electricity (600 MWh / year)**

NaOH

Treated gas

Desorbed H_2S

Exhausted scrubbers solution HS^-

Industrial wastewater HS^-

Industrial wastewater SO_4^{--}

Biological and chemical oxydation

O_2

15 ton/d of pure oxygen

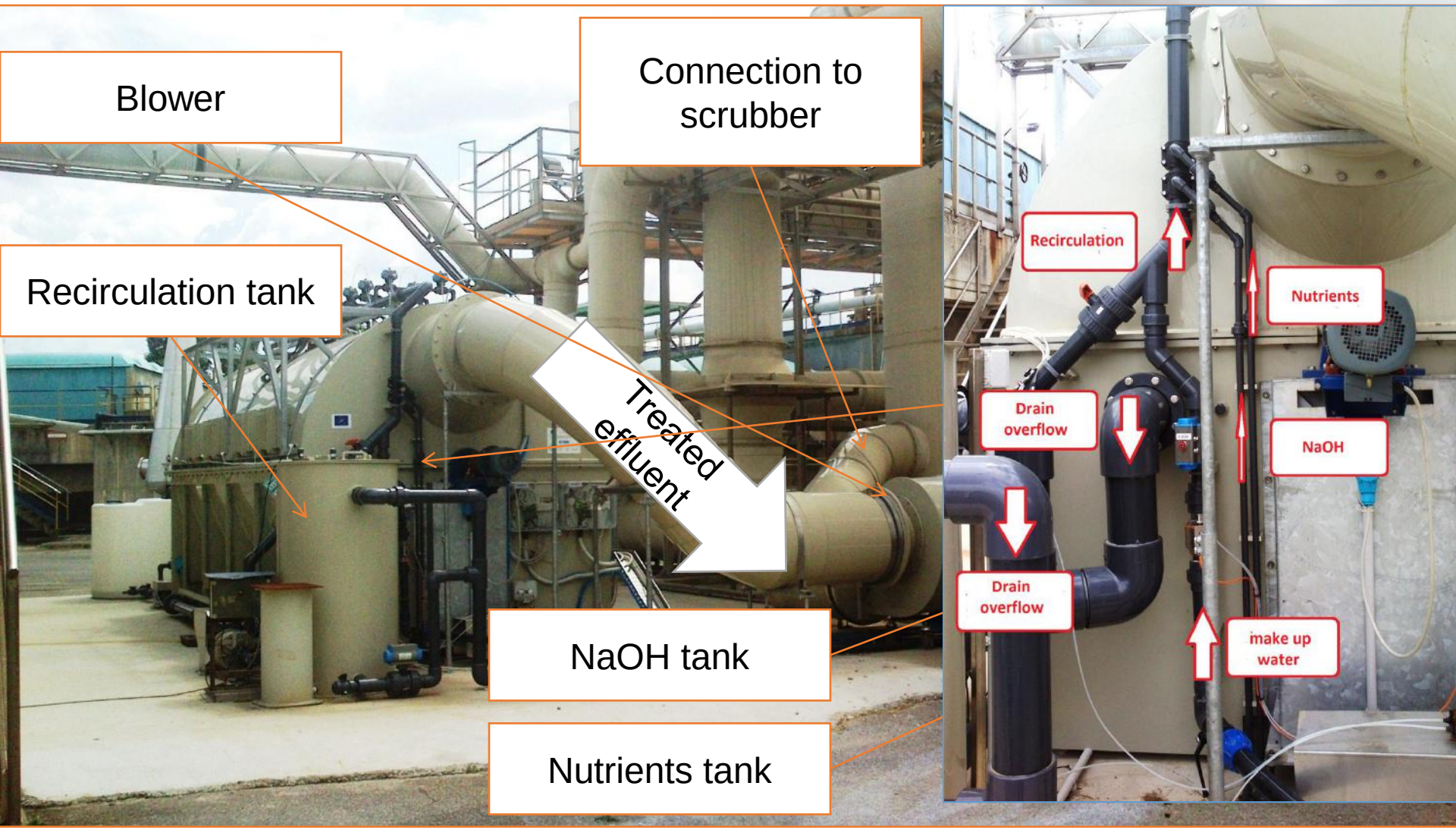
scrubber: 300.000 €/year

Biological systems are a possible alternative, but the static biotrickling filter (BTF), **when operating at high load the pressure loss increase.**

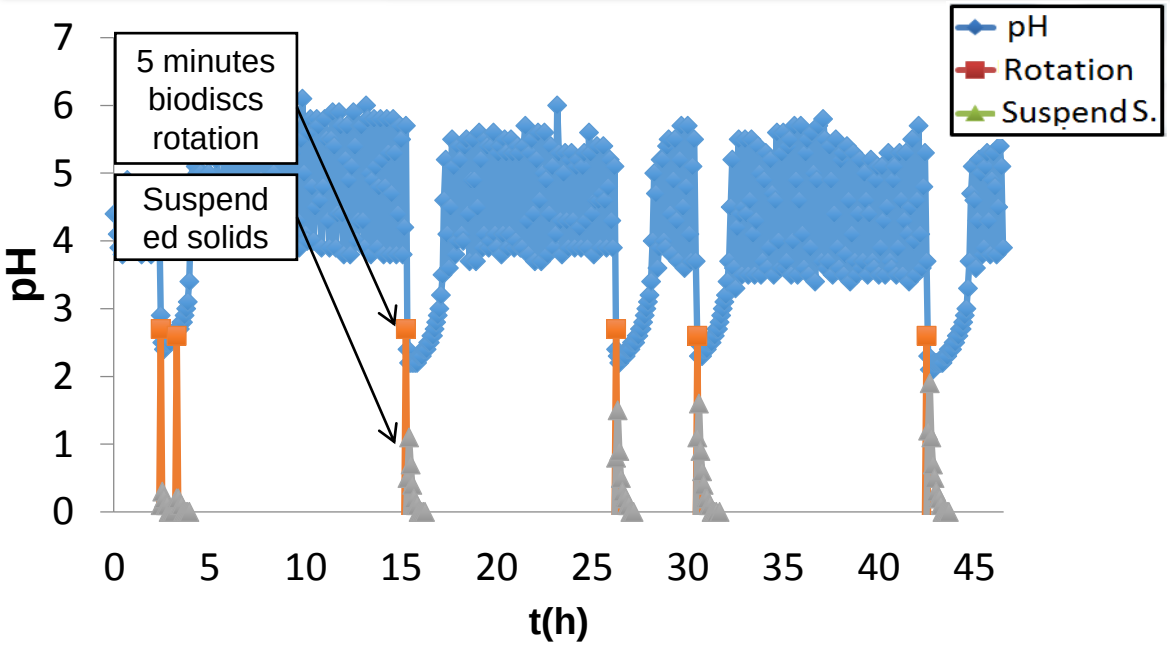
The BTF main critical point is the **high head loss**

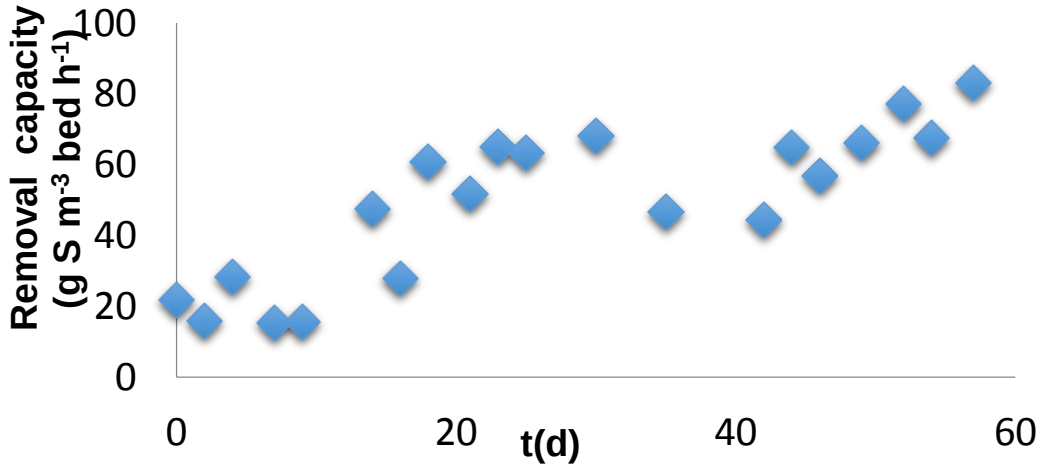
Oxygen: 500.000 €/year

PROTOTYPE BACK VIEW



PROTOTYPE





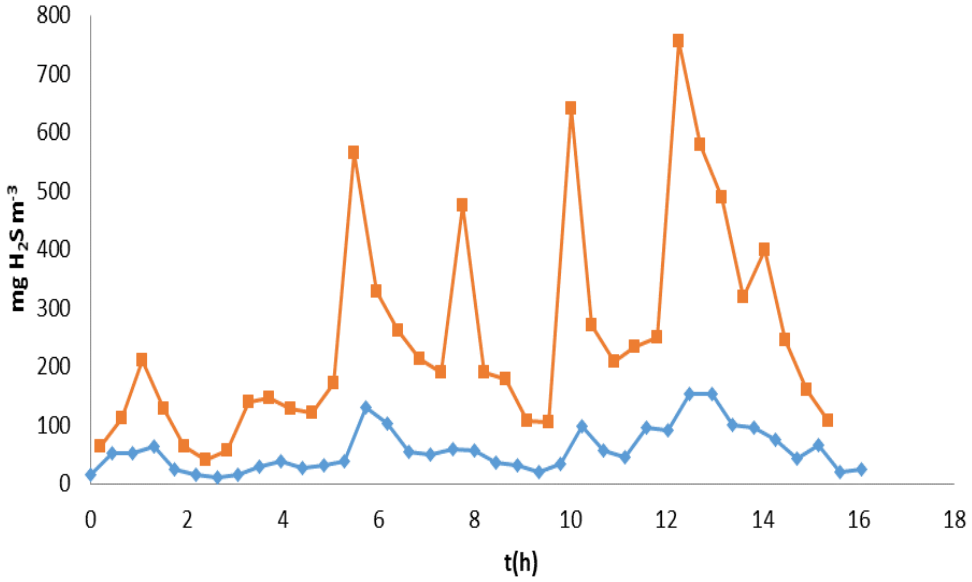
Tested conditions

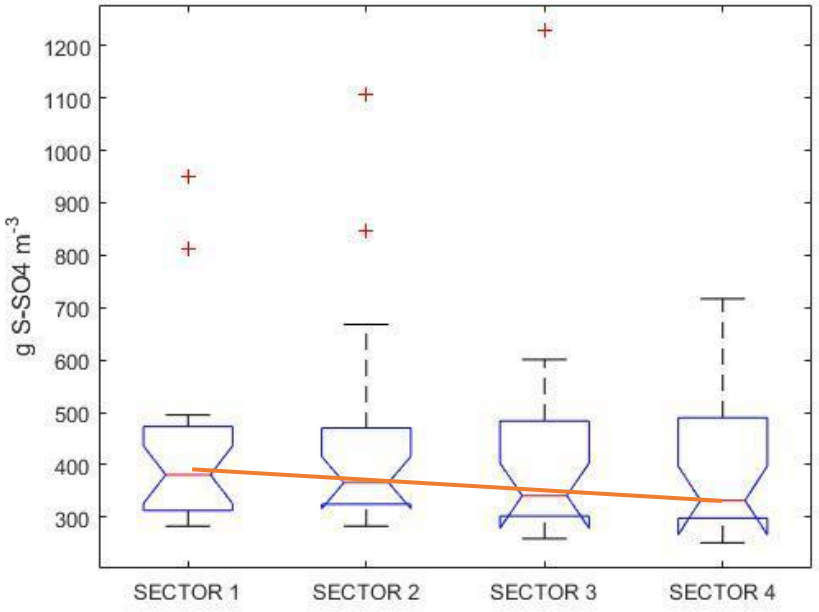
- pH setpoint(3-6.5)
- Recirculation flow rate (3 to 10 m^3 h^{-1})
- Biodisc rotation speed (velocity from 0.1 to 3 rpm)
- Intermittent rotation (Gap time: 1, 5, 15, 60, 90, 180, 240, 720)

- After 1 month the startup was done.
- The rotation was able to remove excess biofilm.
- pH = 3 the prototype consumed 3 m^3 of water (alkalinity 700 mg l^{-1} CaCO3) per kg of S-H_2S removed.

PROTOTYPE

- removal efficiency : average higher than 80% ;
- elimination capacity : average around 90 g H_2S m^{-3} bed h^{-1};
- Pressure drop between inlet and outlet were found to be very low (1-3 mbar) compare to the clean bed condition;
- The sulphate concentrations in recirculation water shown a slighty decrease from the first sector to the last one.





PROTOTYPE VS SCRUBBERS

	Specific removal	Contact time EBRT	NaoH consumption	Operating costs	Energy consumption	Water consumption
U.M.	Kg H_2S d^{-1}	s	Kg NaOH / Kg H_2S removed	€ / Kg H_2S removed	KWh / Kg H_2S removed	m^3 H_2O / Kg H_2S removed
8 Scrubber	60	<4	30	13	30	5
Prototype Biosur (RBBTF)	15	<4	0	3	10	3

CONCLUSIONS AND PERSPECTIVES

- Process modelling and prototype optimization;
- Evaluation of the compounds (other than hydrogen sulphide) removed like ammonia;
- Use respirometric and titrimetic tests to estimate the kinetics coefficients of prototype biomass.
- These results suggest that the limits of the technology have not yet been achieved and so further studies needs to be done