

CLOsing the **NIT**rogen **CY**cle from urban landfill leachate by biological removal over nitrite and thermal treatment

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R&D Department Responsible

19 April 2007

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2. Landfill management in CESPAs

3. Leachate treatment

- Chemical characterisation
- Available leachate treatment technologies
- CESPAs's leachate treatment plants
- Selection criteria
- Nitrogen removal
- Salts removal

4. CLONIC project

- Innovative leachate treatment
 - Demonstration lines
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1. CESPAs Overview (I)

CESPA is part of Ferrovial Servicios and has provided Urban services as well as Industrial services for over 35 years

Urban services are mostly provided to Local Authorities and include:

- Street cleansing
- Gardening
- Maintenance of sewage networks
- Municipal waste collection

Industrial services are provided to both public and private clients and include waste management, from collection to final disposal:

- Collection of industrial and hazardous waste
 - Treatment and disposal of municipal, industrial and hazardous waste through the operation of transfer, MBT and composting plants, as well as of landfills
 - Environmental consulting and audit services
 - Industrial cleansing
-

1. CESPAs Overview (II)

- Market leader for Waste management and Gardening services in Spain
 - Top 5 player in all other major areas of activity
 - 792 local authorities served (most through several contracts and services)
 - Over 9,000 commercial and industrial clients, including producers of hazardous waste (hospitals, chemical plants, nuclear plants)
 - 89 treatment plants and landfills in operation, another 9 under development
 - 14.700 employees
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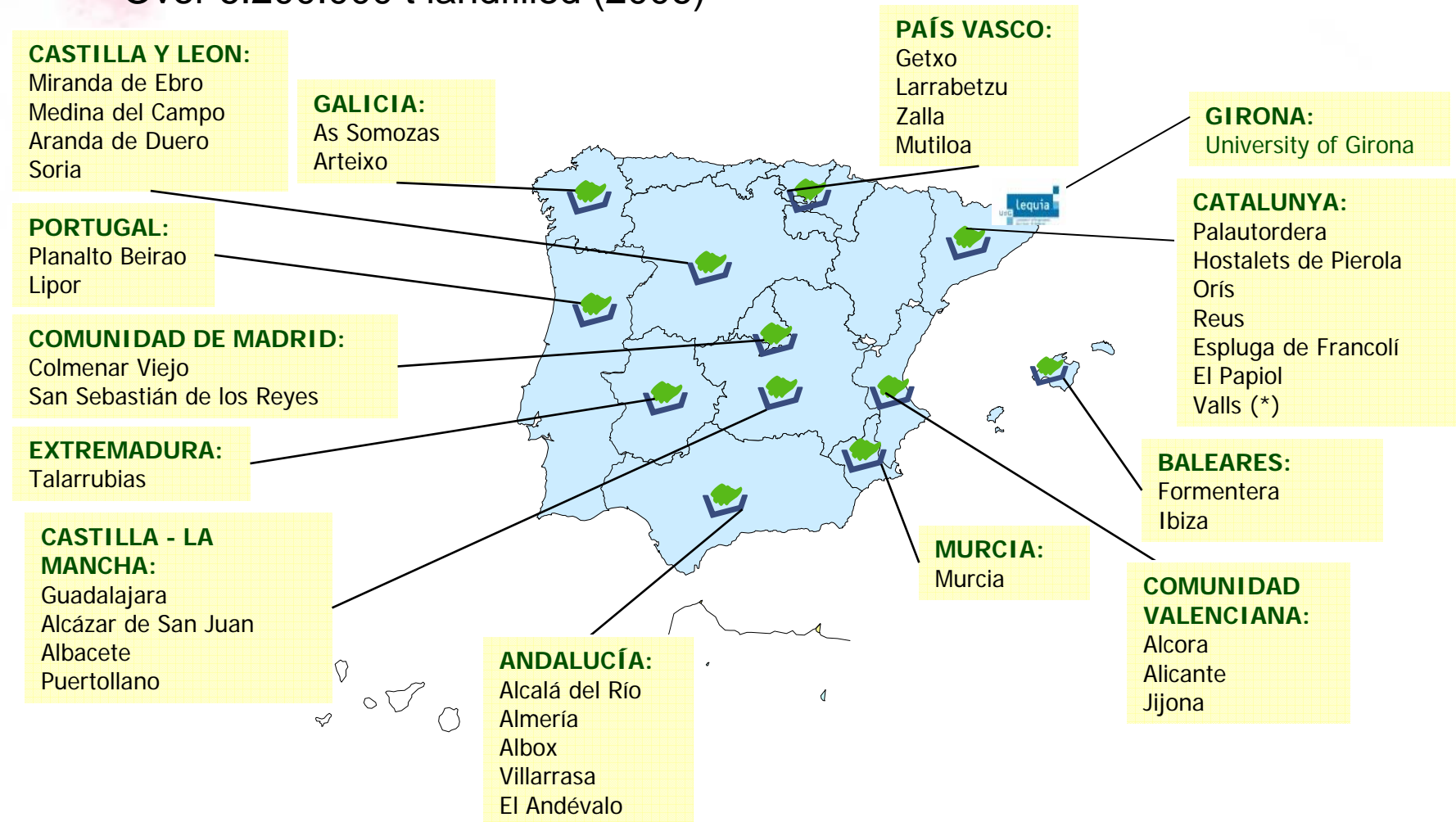
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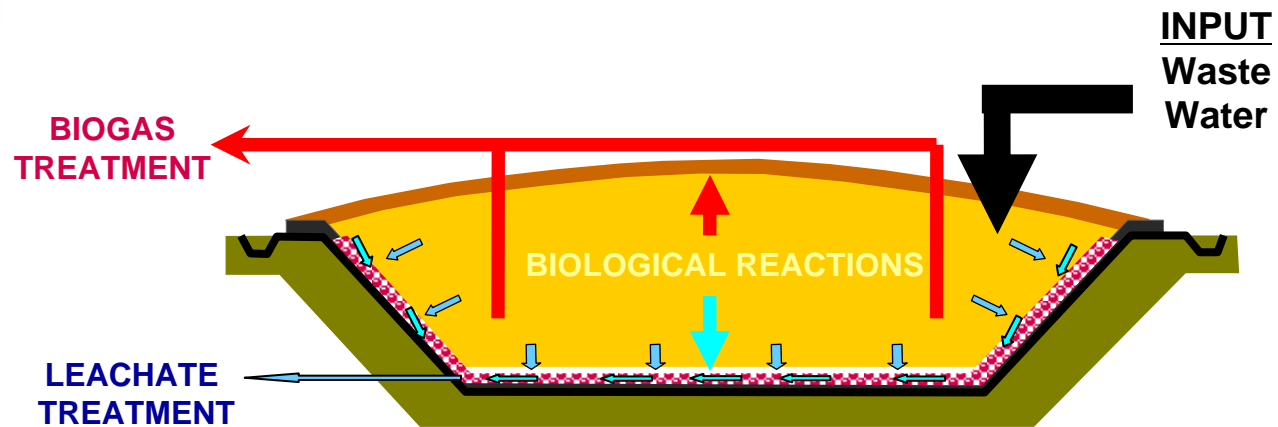
2. Landfill management in CESPAs

CESPA is leader in Spain in landfill management and construction:

- 37 landfills in operation and 1 in construction
- Over 6.200.000 t landfilled (2006)



2. Landfill management: effluents treatment



Leachate: One of the most important environmental problems in landfill management

- Proper Technologies must be applied

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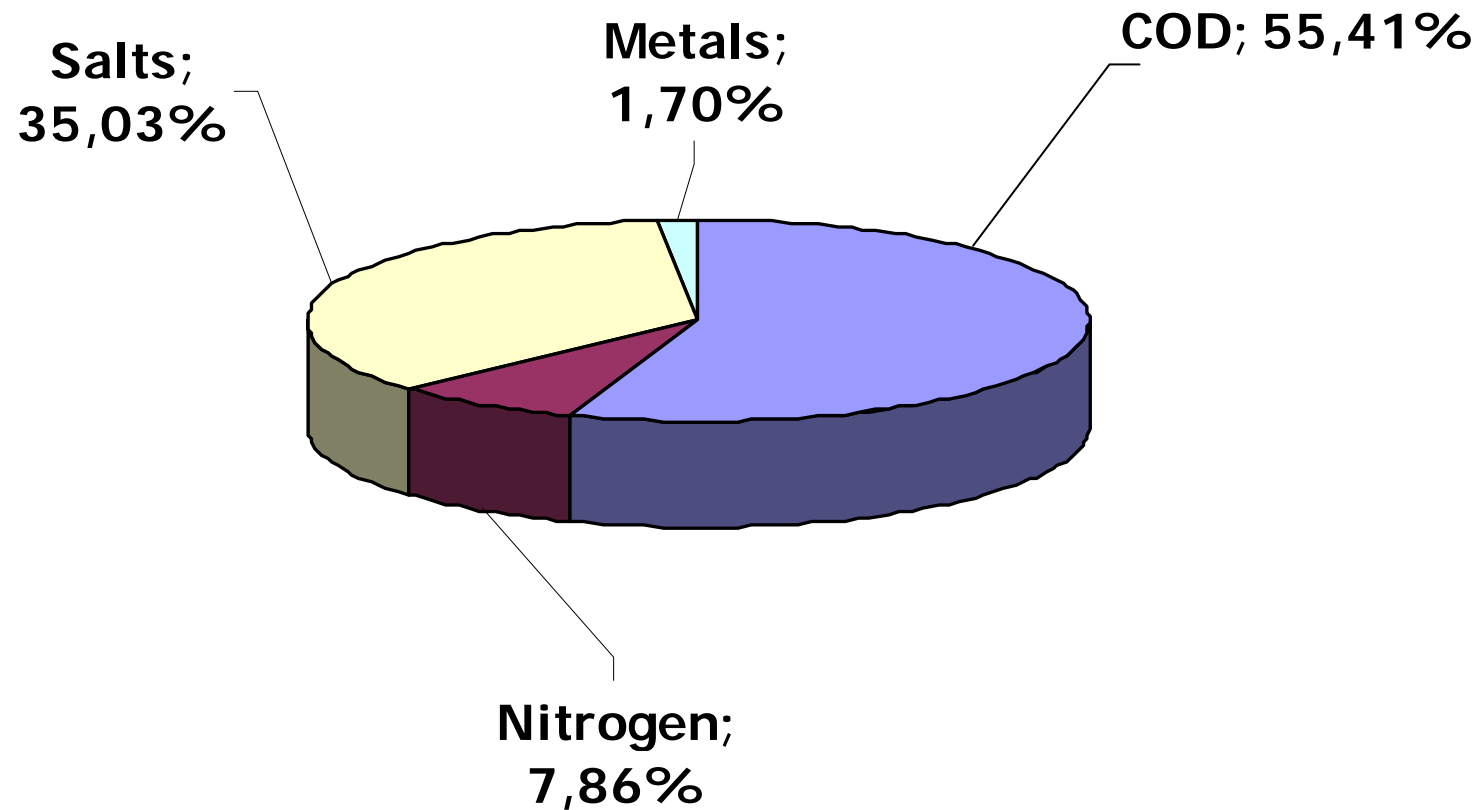
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3. Leachate treatment: chemical characterisation



3. Leachate treatment: Available leachate treatment technologies

	PHYSICOCHEMICAL TREATMENTS	BIOLOGICAL TREATMENTS	HEAT TREATMENTS	MEMBRANE TREATMENTS
NITROGEN	Ammonia stripping	Activated sludge SBR Fixed-bed reactor RBC MBR		
ORGANIC MATTER	Oxidation Ozonation Activated carbon		Evaporation Evapo-condensation Drying	Direct osmosis Reverse osmosis
SALTS				
SOLID-IONS	Precipitation Coagulation-flocculation Electrodialysis			
SS				Filtration Ultrafiltration

3. Leachate treatment: CESPAs Leachate treatment plants

16 Plants in operation

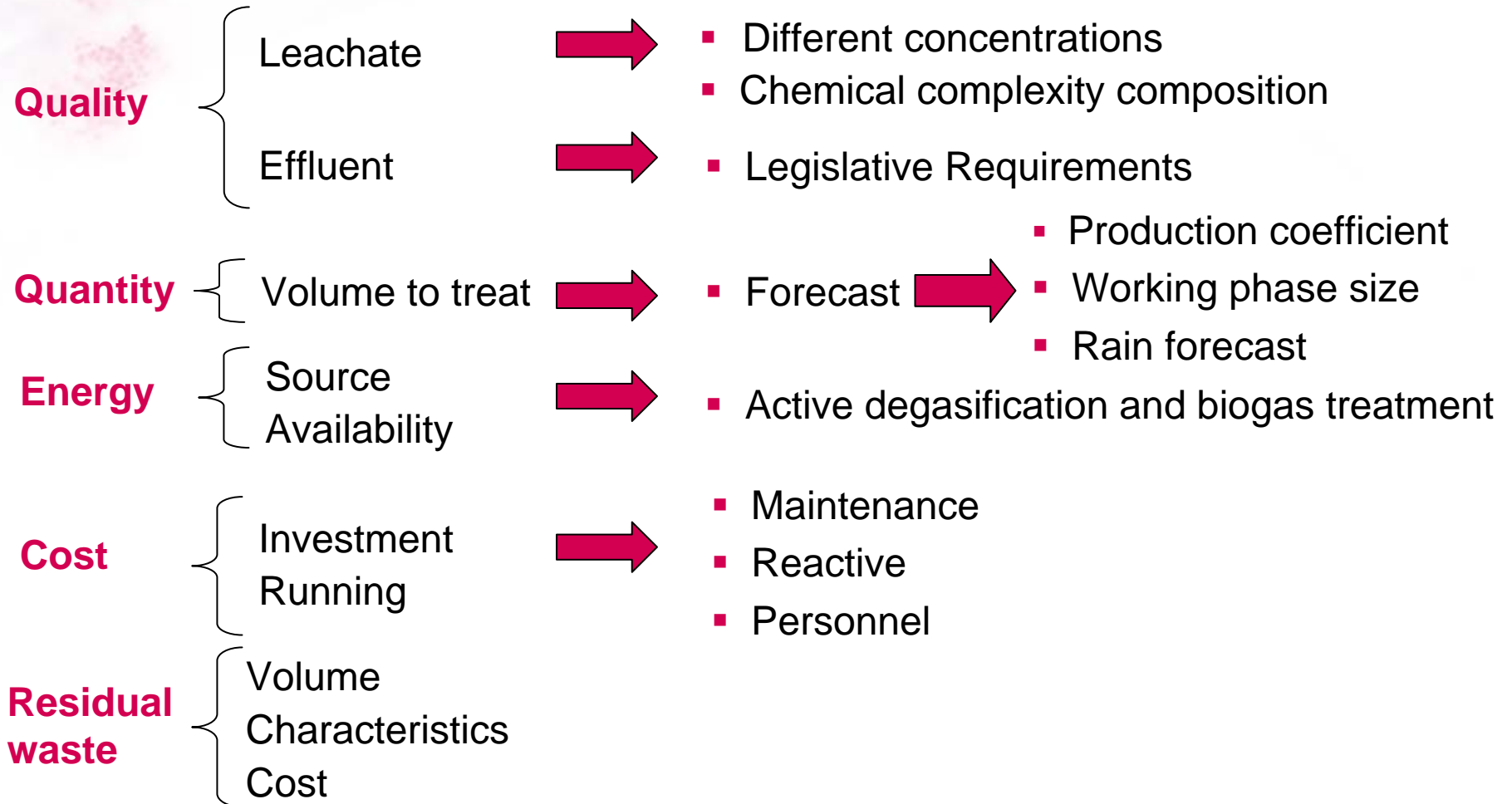
5 Plants in project

Leachate collected and treated (2006) : 324.197 m³

Leachate treatment plants are a combination of selected available technologies

- Activated Sludge
- Mechanized evaporation + Concentrate stabilization
- MBR + Reverse osmosis
- Precipitation-Coagulation-Flocculation+Ammonia stripping+Evapo-condensation
- Humid oxidation by peroxides+F-C+Ammonia stripping
- ...

3. Leachate treatment: Selection criteria



3. Leachate treatment: Nitrogen removal

Treatment problems

Nitrogen contained in leachates is almost all in ammonium form. Treatment problems are caused by:

- **High concentration** of nitrogen compounds
- **Low contents in biodegradable organic matter** necessary in classical nitrification-denitrification treatment
- **High cost of physicochemical treatment.** Problems with the management of residue obtained.

Possible solution proposed by Technical Department of CESPA

SHARON-ANAMMOX could be a good alternative to nitrogen treatment:

- **High efficiency** in nitrogen elimination
- **Low contents in biodegradable organic matter** required
- **Lower remaining residue than in conventional biological treatment**



CESPA NEEDS TO STUDY
TECHNICAL, ECONOMICAL AND
ENVIRONMENTAL VIABILITY OF THE
PROCESS

3. Leachate treatment: Salts removal

Treatment problems: Salt and metals treatment has a high consume of energy and/or chemical additives

Possible solution proposed by Technical Department of CESPA: Thermal dry technology using energy recovery techniques associated with methane thermal oxidation from landfill's biogas could be a good alternative to salts and metals treatment:

- Reduction of energy consume
- Reduction in treatment residue volume



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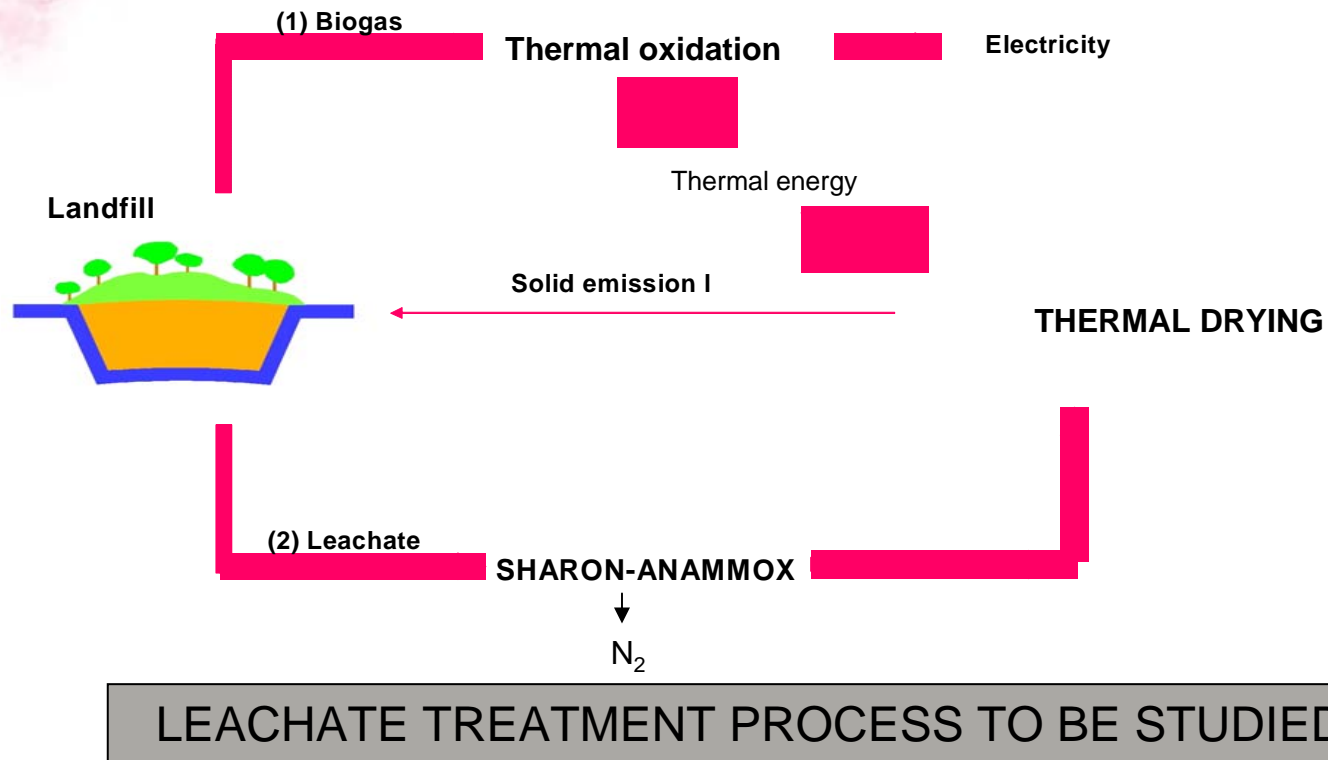
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4. CLONIC Project: Innovative leachate treatment Sharon-Anammox+Thermal drying



4. CLONIC Project: Demonstration lines

SHARON – ANAMMOX for leachate treatment → CESPA + UdG

THERMAL DRY TECHNOLOGY USING
ENERGY RECOVERY TECHNIQUES → CESPA
ASSOCIATED WITH METHANE THERMAL
OXIDATION FROM LANDFILL'S BIOGAS for
leachate treatment

TECHNICAL, ECONOMICAL AND
ENVIRONMENTAL VIABILITY OF THE → CESPA + UdG +
PROCESS AGBAR
FOUNDATION

4. CLONIC Project: Main data

Starting date: August 2003

Final date: June 2007

Total budget: 1.310.931€

LIFE Program financial contribution: 545.371€

Partners:

- CESPÀ
- LEQUIA – University of Girona
- AGBAR Foundation

4. CLONIC Project: Objectives

Main objectives of CLONIC project are:

- To show effectiveness and environmental interest of the leachate treatment by the SHARON-ANAMMOX process + THERMAL DRY treatment
 - To show the economic and technical viability of the process and its interest to landfill management, as well as to show the environmental interest.
-

4. CLONIC Project: Planning

Nombre de tarea	2003		2004		2005		2006		2007		2
	S1	S2	S1	S2	S1	S2	S1	S2	S1	S2	S1
SHARON-ANAMMOX PROCESS											
TASK 1. Bibliographic study											
TASK 2. Sharon Process											
TASK 3. Anammox Process											
TASK 4. Integration of Sharon-Anammox process											
THERMAL DRY PROCESS											
TASK 5. Bibliographic research about technologies based on Thermal dry of liquids											
TASK 6. Initial test with a pilot plant											
TASK 7. Industrial application											
SHARON-ANAMMOX + THERMAL DRY PROCESS INTEGRATION											
TASK 8. Sharon-Anammox+ thermal dry process integration											
GENERAL TASKS											
TASK 9. Management and information to European Commission											
TASK 10. Dissemination of results											

4. CLONIC Project: Conclusions

- Both combined processes, PANI-SBR+ANAMMOX with THERMAL DRYING, represent a technical and economical alternative for leachate treatment with important advantages ahead of present treatments. Application of both processes allows the reduction of the environmental landfill impact.
 - The effectiveness and environmental interest of leachate treatment by PANI-SBR+ANAMMOX processes has been demonstrated.
 - The effectiveness and environmental interest of leachate treatment by Thermal dry technology has been shown.
 - The economic and technical viability of both combined processes as an innovative technology for leachate treatment has been demonstrated as well as the environmental interest.
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**THANK YOU FOR YOUR
ATTENTION**