



Reducing the pressure of fish canneries on the marine environment with novel effluent treatment and ecosystem monitoring

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CETAQUA GALICIA

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World

- Market: USD 21 500 million (18 500 M€)
- Growing at 3.2% per year
- Asia Pacific main producer

Spain

- Main producer in Europe
- 353 000 tonnes/year
- 1 600 M€

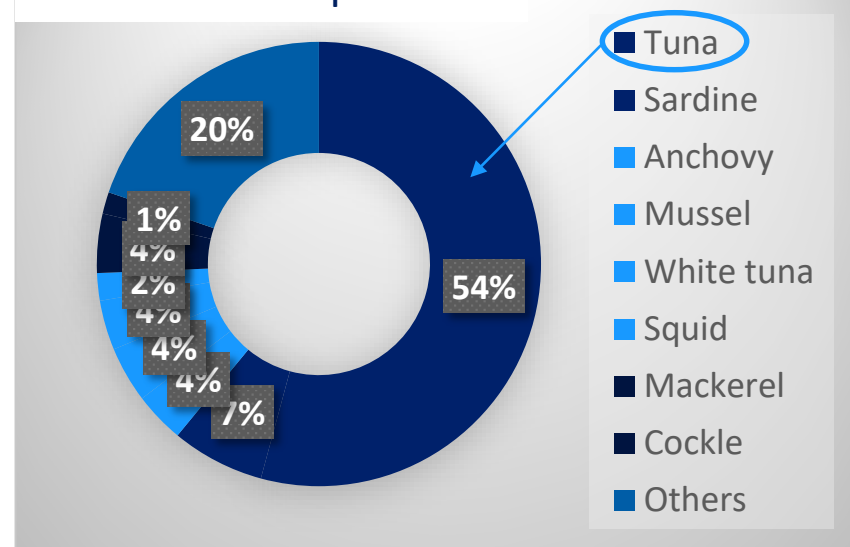
Galicia

- 86% of the Spanish sector
- 2nd largest canned tuna producer in the World (1st Thailand)

3% PIB Galicia

Growing market and important sector
for the economy

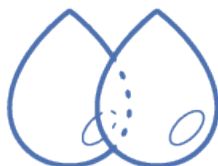
Production in Spain



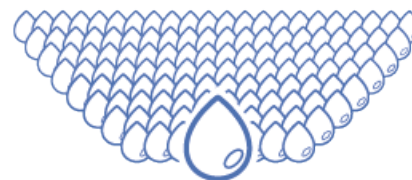
Spain



4.300 million
of cans



2 l /can



8.6 million m³ water

=



3.440 Olympic
swimming pools



High generation of complex wastewater

550 km coast affected
455 ha coast affected
800.000 people affected



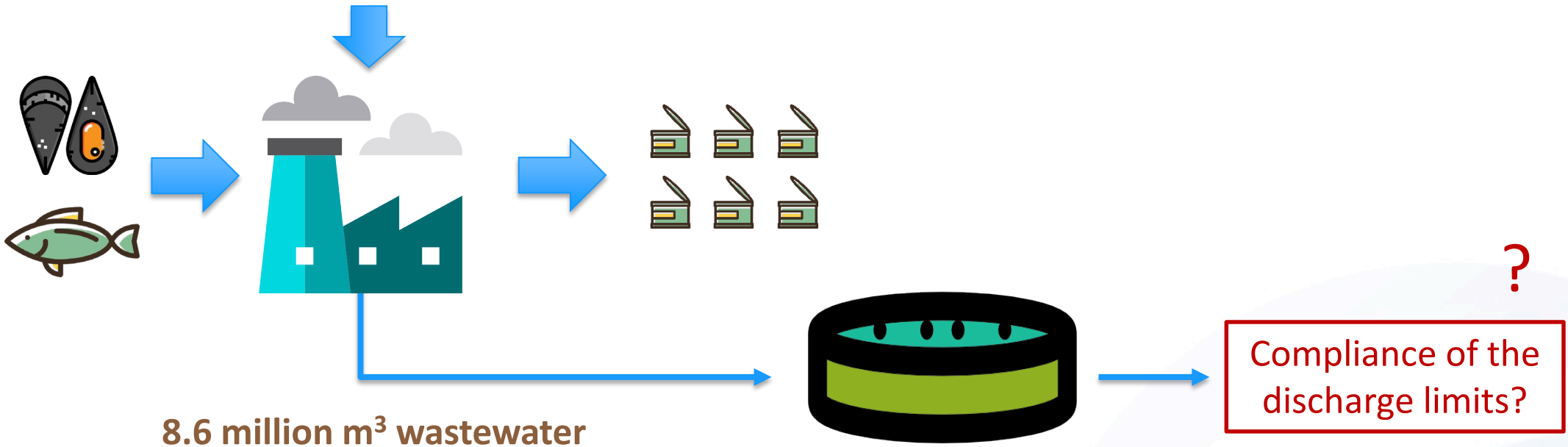
- Damage of marine environment and aquatic ecosystems
- Destruction of jobs and local economy

Las rías gallegas soportan 864 puntos de vertido, la mitad son contaminantes



Los ecologistas llevaron la situación de la ría de O Burgo (A Coruña) a la UE. | Efe

8.6 million m³ water



8.6 million m³ wastewater

Complex wastewater

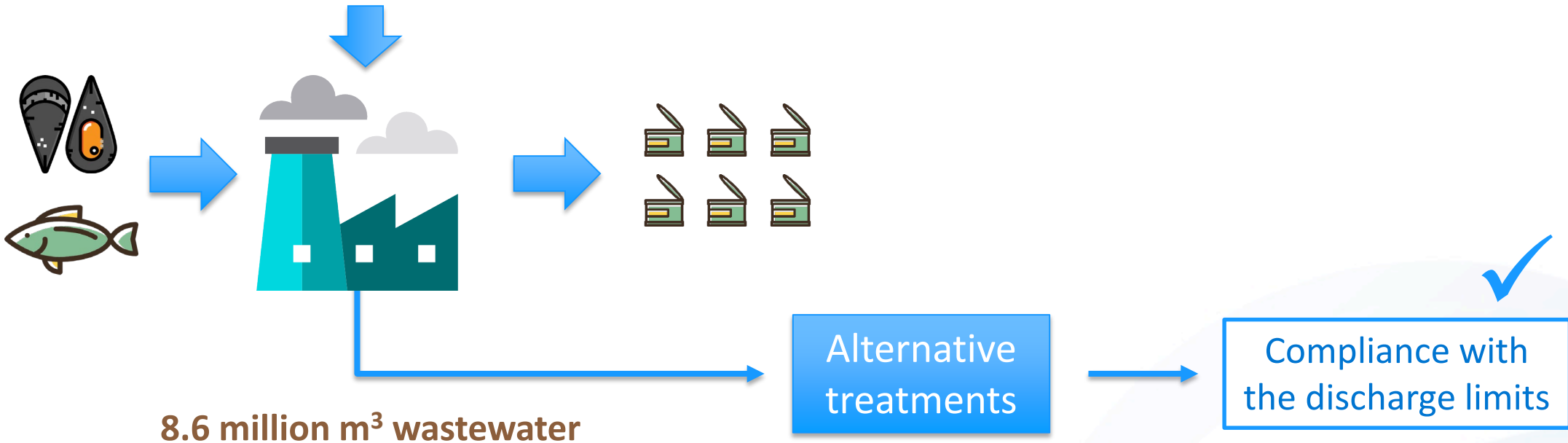
- ✗ High COD and N strength wastewater
- ✗ High salinity
- ✗ Content of fats and proteins

Current treatments

- ✗ High energy demand
- ✗ High chemical consumption
- ✗ High space required
- ✗ High sludge production

Current treatments of fish canning industry wastewater are not optimized

8.6 million m³ water



8.6 million m³ wastewater

Complex wastewater

- ✗ High COD and N strength wastewater
- ✗ High salinity
- ✗ Content of fats and proteins

- ✓ Low energy demand
- ✓ Low space required
- ✓ Low sludge production

Alternative treatments needed

Reducing the pressure of fish canneries on the marine environment with novel effluent treatment and ecosystem monitoring

Timing: 09/2015 – 10/2019

Main objectives

- Reduce the impact of industrial activity on the marine ecosystem
- Demonstrate the feasibility of biofilm-based technologies for the treatment of fish cannery wastewater
- Evaluate the benthonic ecosystem affected by the industry activity

Partners

CETAQUA
GALICIA
(Coordinator)

CETAQUA
BARCELONA



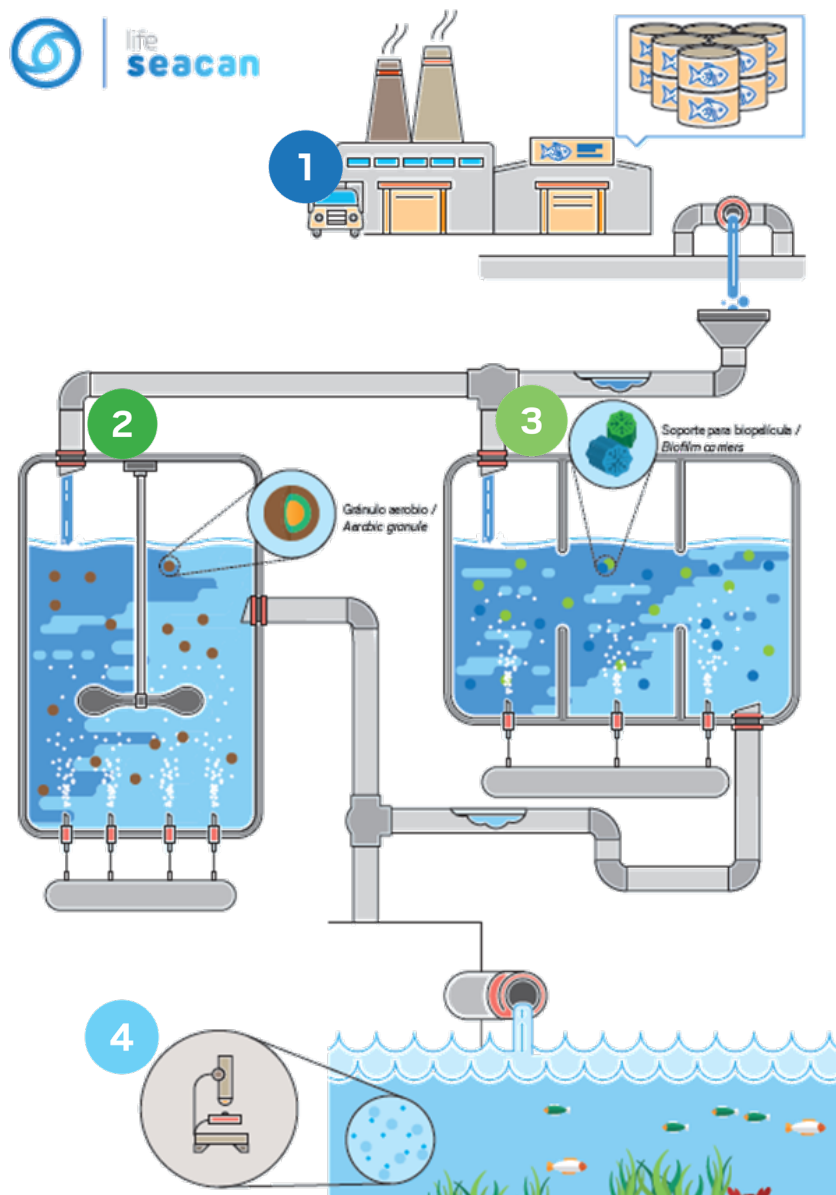
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1 Canning industry

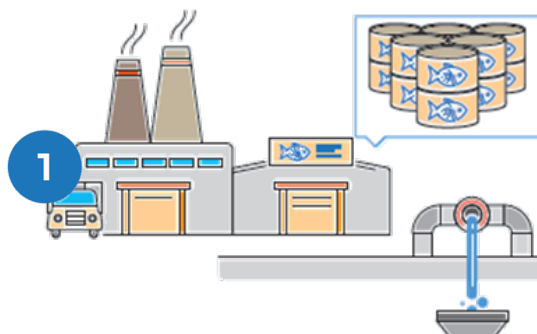
BIOFILM-BASED TECHNOLOGIES

2 Aerobic Granular Sludge prototype (AGS)

3 Moving Bed Biofilm Reactor prototype (MBBR)

4 Effect on the benthonic ecosystem

Galicia



1 Canning industry

↑↑ Sludge production
↑↑ Chemicals

Medium strength wastewater

1200 m³/d

↑↑ COD
↑↑ Salinity

From washing steps and conditioning the fish

+

High strength wastewater:

From fish cookers and liquid by-products such as oil and grease

mg/l	tCOD	sCOD	TSS	TN	Cl ⁻	Fats
Medium strength wastewater	1,235	698	428	89	5,370	386
High strength wastewater	12,730	9,210	1,567	942	5,375	761

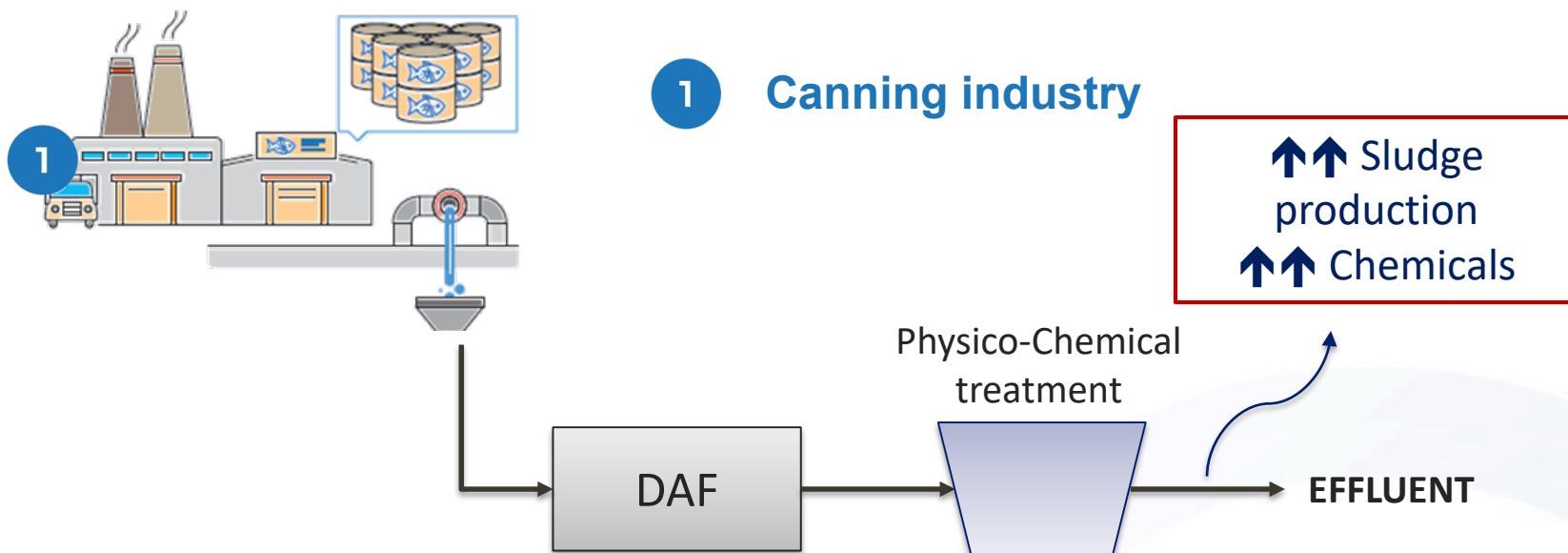
Physico-Chemical treatment

DAF

EFFLUENT

PARAMETER	LIMIT
Suspended solids (mg/L)	125
COD (mg/L)	350
BOD ₅ (mg/L)	150
Total phosphorus (mg/L)	12.5
Ammonia nitrogen (mg/L)	25
Total nitrogen (mg/L)	57.5

Galicia



Conventional treatments

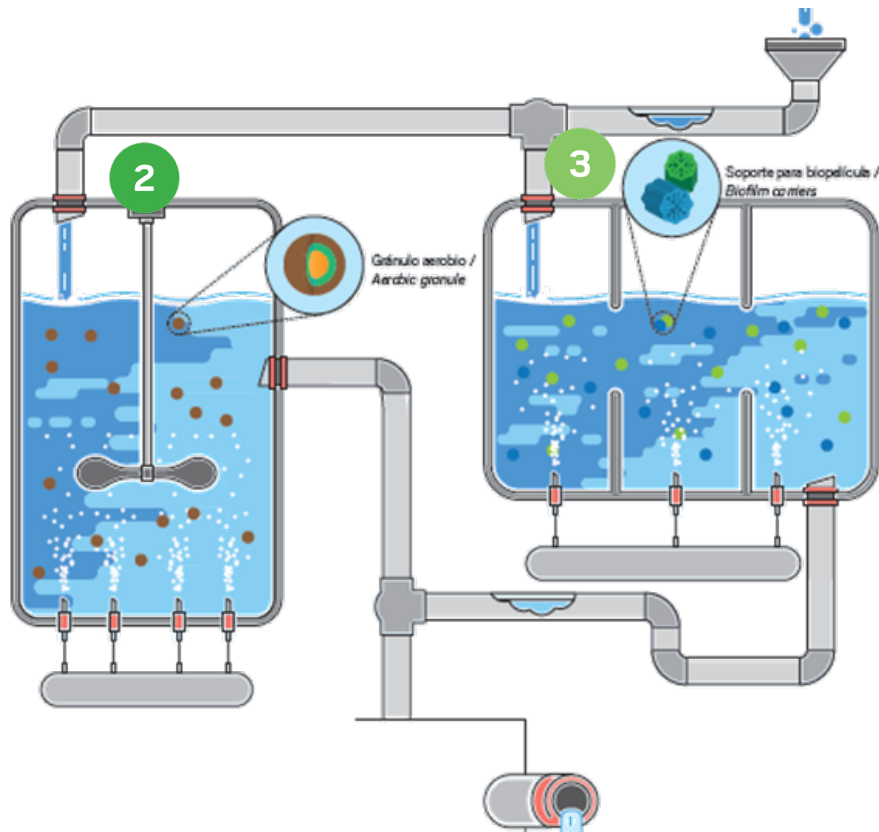
- ✓ Energy savings (up to 30%)
- ✓ Lower footprint (up to 75%)
- ✓ Less sludge production (up to 30%)

Biofilm-based technologies



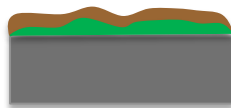
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BIOFILM-BASED TECHNOLOGIES



3 Moving Bed Biofilm Reactor prototype (MBBR)

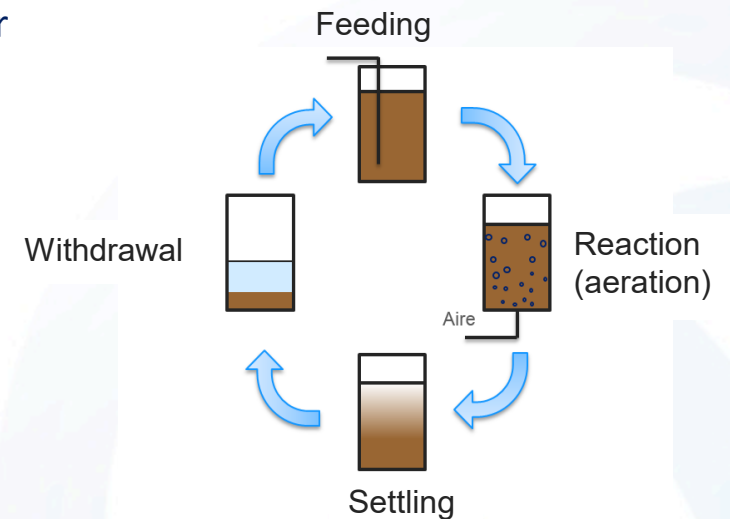
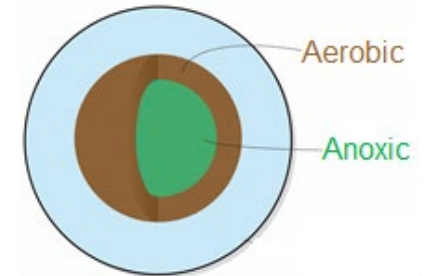
- The biomass grows on the surface of carrier material



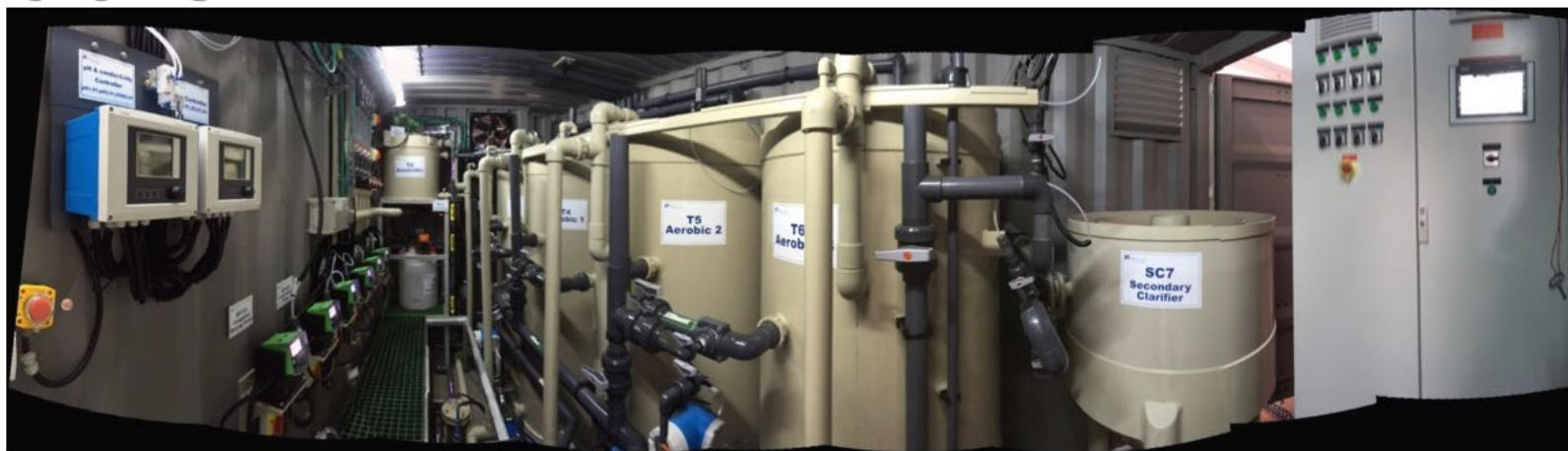
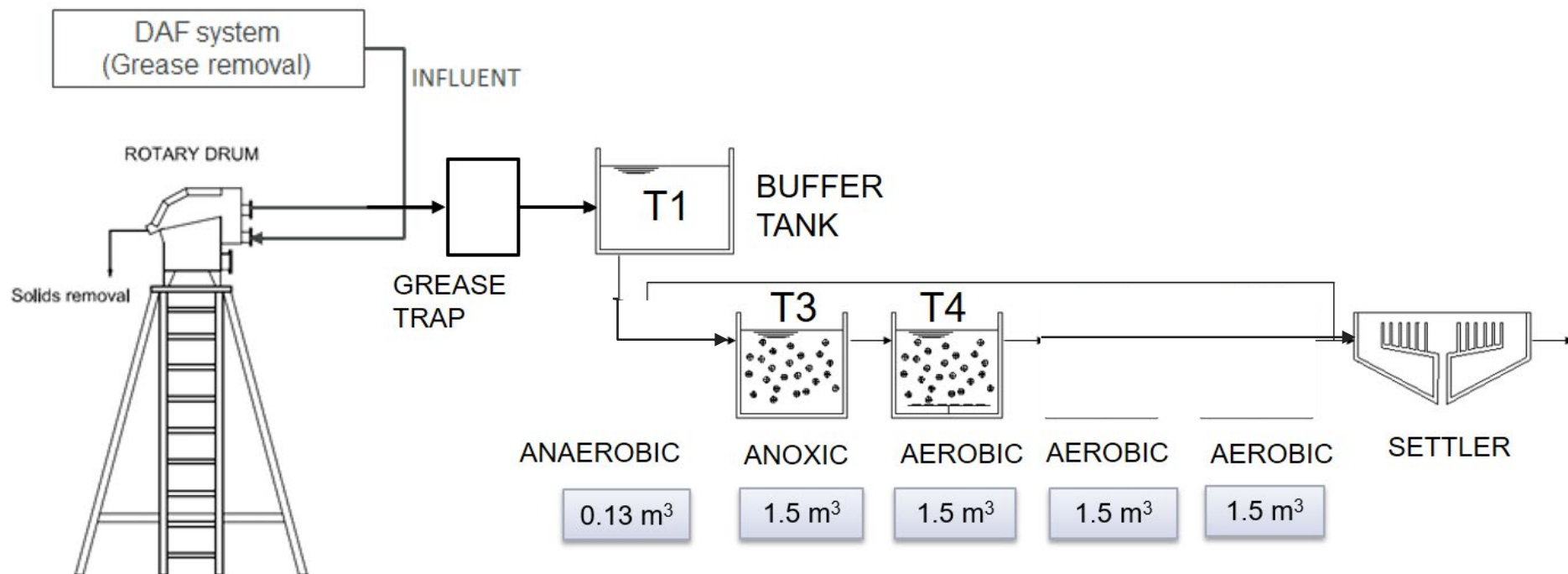
- Different units to achieve the aerobic and anoxic environments
- Continuous operation

2 Aerobic Granular Sludge prototype (AGS)

- The biomass grows in the form of compact aggregates called granules.
- One single reactor
- Sequencing batch operation



MBBR prototype



Results

Medium strength wastewater

Useful volumen = 3 m³

HRT = 8 h

Organic loading rate applied: 1 – 3 kg

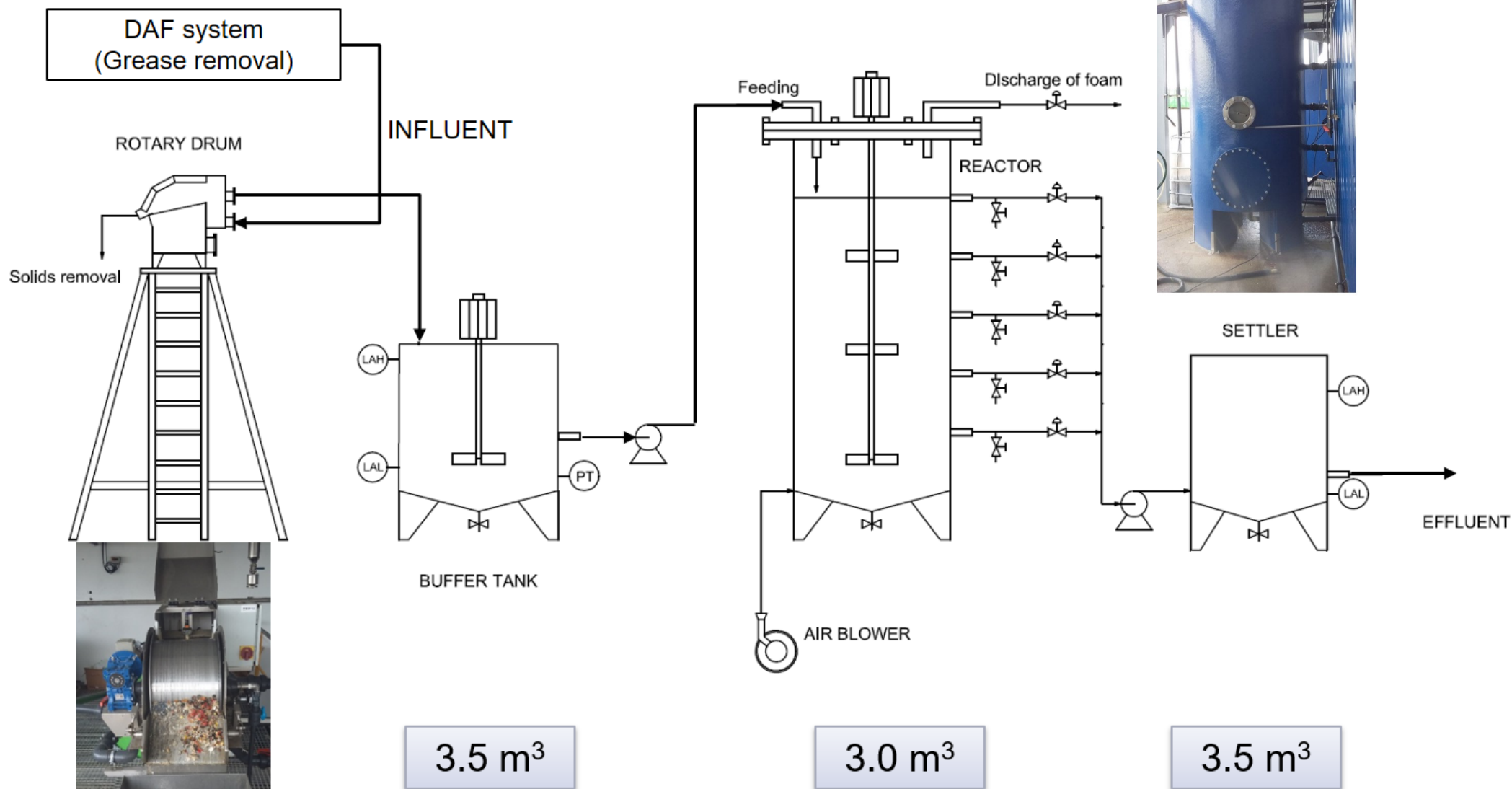
COD/m³/d)

DO setpoint T3 = 2 mg O₂/l



	Discharge limit	Average MBBR	
SS (mg/l)	125	114	✓
COD (mg/l)	350	147	✓
BOD ₅ (mg/l)	150	92	✓
TP (mg/l)	12.5	2.5	✓
TN (mg N/l)	57.5	14	✓
NH ₄ ⁺ -N (mg N/l)	25	5.0	✓

AGS prototype



Results

Medium strength wastewater

Cycles of 3 h

Useful volumen = 3 m³

Exchange volume ratio = 50%

HRT = 6 h

Organic loading rate applied = 1.5 – 3 kg
sCOD/m³/d)



	Discharge limit	Average AGS	
SS (mg/l)	125	86	✓
COD (mg/l)	350	188	✓
BOD ₅ (mg/l)	150	107	✓
TP (mg/l)	12.5	2.1	✓
TN (mg N/l)	57.5	4.2	✓
NH ₄ ⁺ -N (mg N/l)	25	2.9	✓

Ongoing → October 2019

High strength wastewater with AGS technology

Objectives:

Granulation high strength wastewater	Stable
COD and N removal (%)	80-95%
Solids in the effluent (mg TSS/l)	70
Organic loading rate (kg COD/m ³ /d)	9

Facing the new limits for industrial wastewater (BREF)

- More strict limits for the food, drink and milk industries
- Need of innovative technologies

AGS technology?

Parameter	BAT – associated emission level
COD (mg/l)	25-125
TSS (mg/l)	4-50
TN (mg/l)	2-20
TP (mg/l)	0,2-2



Improvement of industrial wastewater treatment with the **development of efficient and effective technologies:**

- Effective pollutant removal (current and future discharge limits)
- Low CAPEX (10-20% less than conventional treatments)
- Low footprint (compact)
- Robust (facing high salinity)



Waste and wastewater valorization?

Obtaining high added value products from industrial wastewater (**fish canning** and dairy sectors) and municipal waste



<http://www.umcigat.es/>

THANK YOU



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