AEROBIC PILOT-SCALE BIOFILM-BASED TECHNOLOGIES FOR THE TREATMENT OF HIGH STRENGTH SALINE WASTEWATER

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THE PROBLEM OF FISH CANNING INDUSTRY

The region of Galicia (northwest of Spain) has one of the marine ecosystems with the highest biodiversity in the world, from which several economic activities benefit.

Galicia is the **first producer of canned fish in Europe** and the second one in the world.

The production process of canned fish is characterized by **high consumption of water** and the generation of large amounts of high strength wastewater with:

- High COD concentrations (1-20 g COD L^{-1})
- High nutrient concentrations (0.1-3 g TKN L^{-1})
- High salinity (ca. 20 g Cl^- L^{-1})

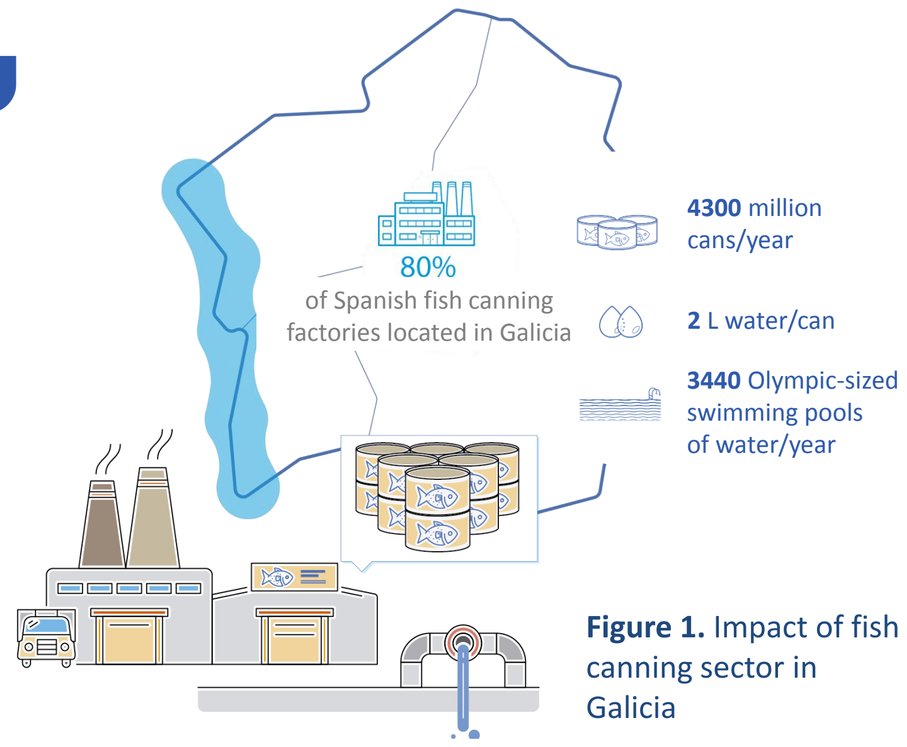


Figure 1. Impact of fish canning sector in Galicia

OBJECTIVE

The objective of the project LIFE SEACAN is to reduce the impact of effluents from fish canning industries into the marine ecosystems by applying biofilm-based technologies for wastewater treatment

AEROBIC GRANULAR SLUDGE SYSTEM DESIGN

Sequencing batch operation

Design:
- Organic loading rate applied = **6 kg COD m^{-3} d^{-1}**
- Settling velocity imposed for the biomass = 6 m h^{-1}
- Cycles per day ≤ 6; Maximum volume exchange ratio = 60%

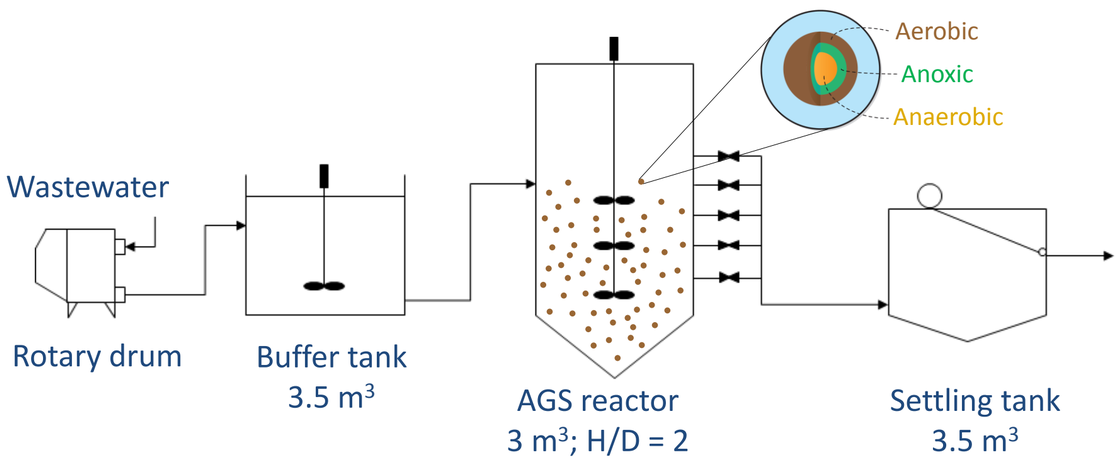


Figure 2. Aerobic granular sludge system

MOVING BED BIOFILM REACTOR SYSTEM DESIGN

Continuous operation

Design:
- Organic loading rate applied = **6 kg COD m^{-3} d^{-1}**
- Flexible operation with 4 aerobic tanks

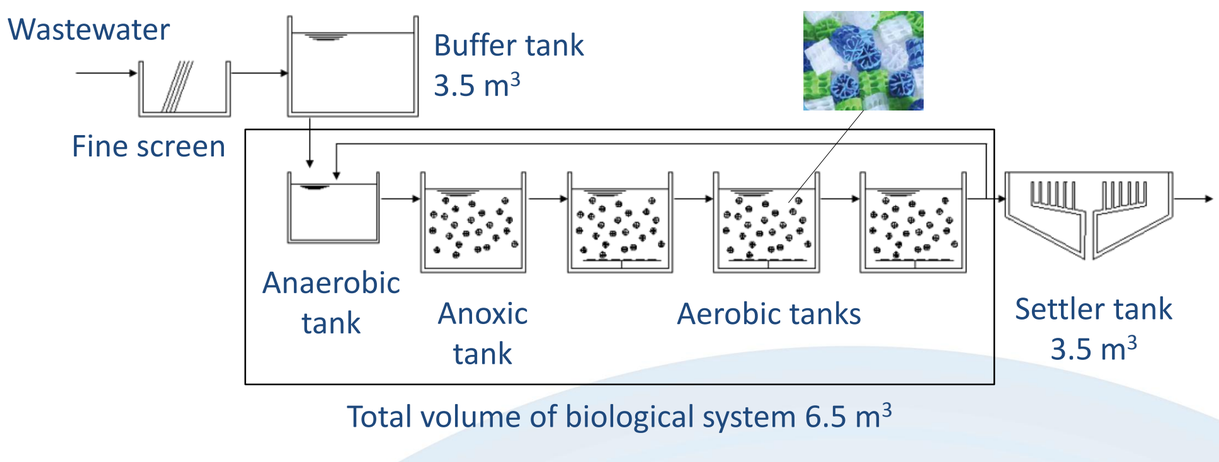
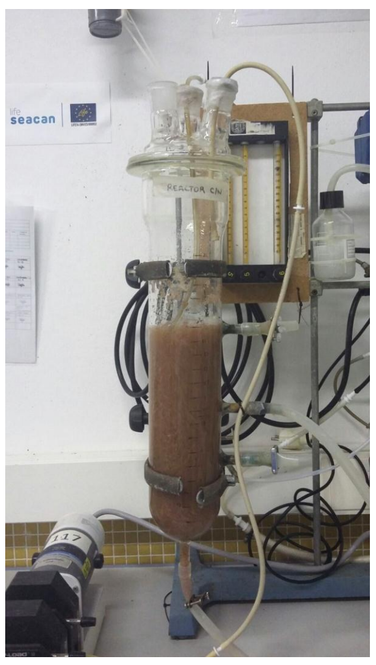


Figure 3. Moving bed biofilm reactor system

DEMONSTRATION AT LAB-SCALE



- Lab-scale demonstration of aerobic granular sludge technology for the treatment of **real wastewater** from canned fish industry
- Wastewater composition:

1.6 g COD L^{-1}, 79 mg NH_4^+-N mg N L^{-1}; 10 g NaCl L^{-1}

- Stable granulation of biomass obtained (90 days)

Figure 4. Lab-scale aerobic granular sludge reactor

MULTICRITERIA ANALYSIS FOR CANNERY SELECTION

Several canneries were evaluated for obtaining the wastewater for the project, following the a multicriteria analysis:

Table 1. Criteria analysis for the selection of the cannery and example of 3 canneries evaluated

Criteria	Cannery 1	Cannery 2	Cannery 3
Discharge into the sea	✓	✓	✓
Small size	400 m^3 d^{-1}	200 m^3 d^{-1}	1200 m^3 d^{-1}
Continuous production → constant flow	✓	×	✓
Without biological treatment → need for a new treatment	No biological treatment	Biological treatment	No biological treatment

CONCLUDING REMARKS

Biofilm-based systems at a representative scale will be applied to treat high strength and saline wastewater from canneries. This entails a step towards the improvement of conventional wastewater treatment methods not only in terms of pollutant removal efficiency and energy savings, but also concerning economic aspects, monitoring and control of biological treatment systems.

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