CONTEXT

Galicia has one of the marine ecosystems with the highest levels of biodiversity in the world, which several economic activities benefit from, accounting for 3% of the regional Gross Domestic Product (European Commission, 2007). In fact, this region has the highest production of transformed sea products in Europe. The process itself is characterised by high water consumption and the subsequent disposal of large quantities of wastewater, which requires an appropriate treatment.

GOALS

- To demonstrate the technical and environmental feasibility of using biofilm-based wastewater treatment systems.
- To optimise the current treatment systems in order to improve effluent quality.
- To assess the impact of the new treatment systems on the diversity of the benthic system.
- To disseminate the main outcomes of the project in order to spread the benefits of this technology, implementing a good practice manual on wastewater treatment in the fish canning industry.

REDUCING THE PRESSURE OF FISH CANNERIES ON THE MARINE ENVIRONMENT WITH NOVEL EFFLUENT TREATMENT AND ECOSYSTEM MONITORING

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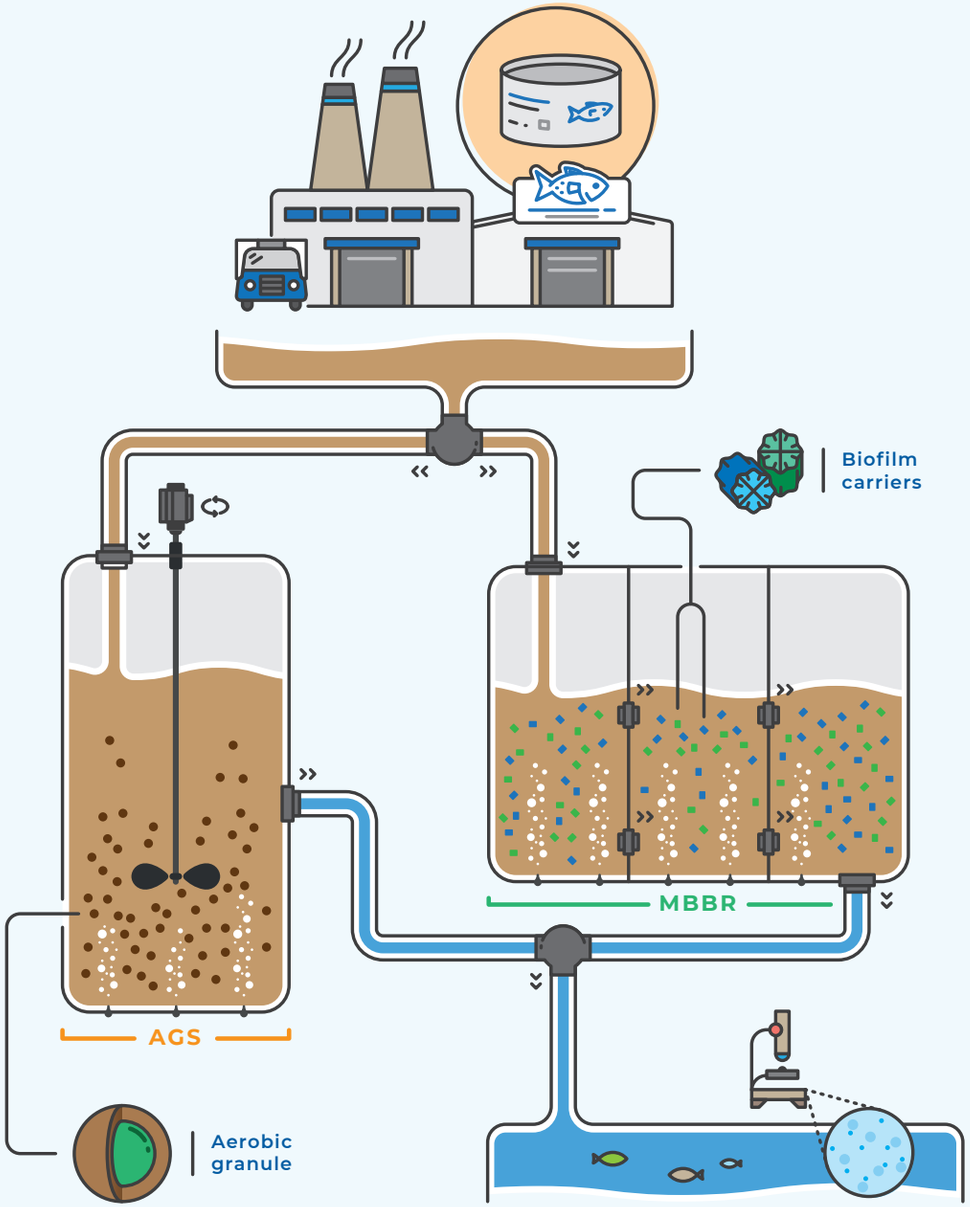

FISH CANNING SECTOR

The 85% of the fish canneries in Spain are located in Galicia. This region is the second largest producer of canned tuna in the world and the leader in Europe. The fish canning sector has a business volume of about **1.600 M€/year in Galicia**, resulting in more than 15.000 jobs.

However, this industrial activity generates about 200.000 m^3 of wastewater/year. This **complex wastewater** has high concentrations of organic matter (4.500 mg COD/l), nitrogen (500 mg N/l), important amounts of fats and greases, and high conductivity due to the high salinity (10-15 mS/cm). All these factors make the treatment of this wastewater very challenging.

MONITORING OF THE BENTHONIC ECOSYSTEM

The monitoring of the benthonic ecosystem near the discharge of the effluents from fish canneries, compared to areas not affected by the discharge of industrial effluents, showed an **impact in the marine ecosystem**. The physico-chemical properties of the sediment and the structure of the benthonic macrofauna are modified, there is a loose of the specific biodiversity and in general, less quality of the ecological and environmental status of the area affected. However, it was found that a high hydrodynamics in the discharge point of the effluents can disperse the negative effects. In conclusion, the **current wastewater treatments need to be improved** to minimize the potential negative impact of the industrial activity in the marine ecosystem.

BIOFILM-BASED TECHNOLOGIES

The Aerobic Granular Sludge (AGS) and the Moving Bed Biofilm Reactor (MBBR) technologies were demonstrated for a representative scale (3 m^3) for the treatment of fish canning wastewater in a factory near the coast of Galicia, in O Grove.

In the **AGS technology**, the microorganisms grow in form of compact aggregates called granules. Anoxic and aerobic conditions are feasible inside and in the outer layer of the granules, allowing the simultaneous removal of organic matter and nitrogen in the same unit. The operation of the system occurs in sequencing batch mode: the reactor is fed with wastewater; then, the reaction takes place under aerobic conditions; in the following step, the aeration is stopped, and the granular biomass is decanted; in the end, the treated effluent is discharged, while the biomass is kept inside the system. The organic loading rate applied in this system was 7 kg COD/m^3/d, with a **removal efficiency of 90% for organic matter and up to 70% for nitrogen**.

In the **MBBR treatment system**, the microorganisms form a biofilm which grows on the surface of external carriers. The system operates in continuous mode, in which the wastewater flows through several tanks operated under aerobic conditions. The reactors are aerated from the bottom, allowing the mixing and suspension of the carriers. For this study, the organic loading rate applied was 2 kg COD/m^3/d, with **removal efficiencies of 80% for both organic matter and nitrogen.**

CONCLUSIONS

The AGS and MBBR are innovative technologies for the **treatment of biodegradable industrial wastewater**, such as the ones from the fish canning sector, winery or dairy industry. Compared to conventional treatments, these systems are more compact (up to **70% less space required** for the implementation) and effective under unfavourable conditions (high salinity). These systems admit higher organic loading rates (**7 kg COD/m^3/d**), while keeping a **high effluent quality** and thus meeting the discharge limits impose by legislation as well as **minimizing the potential impact of the industrial activity in the natural ecosystems.**