INCOVER technologies are being operated and optimized at three demonstration sites. The main objective of the project is to reduce the overall operation and maintenance cost of conventional wastewater treatment by 50% and alleviate water scarcity.

Total funding: 7.2 millions €
Dates: June 2016 - May 2019
Coordination: AIMEN Technology Centre

Taking into account the current global water scarcity and the high cost of wastewater treatment, INCOVER project is developing innovative and sustainable technologies for a resource recovery-based treatment of wastewater.

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Innovative Eco-Technologies for Resource Recovery from Wastewater

The project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 649242. The dissemination of results herein reflects only the author’s view and the Commission is not responsible for any use that may be made of the information it contains.
Case study 1 - Barcelona, Spain

In Barcelona, wastewater is treated by a 300m³ high rate algae pond (HRAP) and tertiary treatment composed of 250m³ planted filter with natural material for enhancing phosphorus recovery. Irrigation water is finally obtained and reused with a solar anodic oxidation disinfection and smart irrigation system. The biomass obtained is anaerobically digested and biomethane is produced by an Innovative biogas upgrading system.

At the demonstrative plant in Barcelona, a microalgae based system is tested for wastewater treatment and resource recovery. The plant consists of 3 semi-closed horizontal tubular photobioreactors (PBRs) using agricultural runoff and urban wastewater as feedstock. The operational conditions are adjusted in order to select cyanobacteria, microalgae able to accumulate polyhydroxybutyrate, which can be used for bioplastics production. The biomass is harvested and used for biogas production by means of anaerobic co-digestion (AcroJ) with secondary sludge. The biogas is upgraded in an absorption column to increase methane concentration. The digestate from the AcroJ is further stabilized and dewatered in a ‘sludge wetland’ producing a biofertilizer. On the other hand, wastewater is post-treated in a solar driven ultrafiltration and disinfection system, and in nutrients recovery columns filled with an adsorptive material. Eventually, the reclaimed water is applied in an agricultural field to grow crops by means of a smart irrigation system.

Production of biomass 21 gVS/m³/day
94-99% CH4 Biomethane composition

Case study 2 - Chiclana & Almería, Spain

In Chiclana, PHA production is through a two-stage anaerobic phototrophic purple bacteria pond (PFRPonds) system, obtaining up to 25 g PHA/m³/day. Two 500 m³ HRAPs treat wastewater and the algae biomass used is harvested and transformed into biogas through thermal pre-treatment and anaerobic co-digestion. A 250 m³ evaporative system is used for the digestion stabilization and nutrient recovery, with zero liquid discharge.

Production of bioplastics 25 g PHA/m³/day

Case study 3 - Leipzig, Germany

At the demo plant in Leipzig, wastewater and bio-wastes from the food industry are treated by a three-step process:
1) Up to 170 kg/m³ Citric Acid (CA) is produced by the conventional yeast Yarrowia lipolytica under non-sterile condition from waste frying oil as carbon rich source and a kitchen cleaning waste from canteen operation. This yeast based bioprocess is performed in a modified conventional 1 m³ container system. The produced CA solutions will be used for cleaning or descaling purposes. 2) The residual yeast biomass from the CA bioprocess in combination with waste frying oil are the substrates for mesophhic anaerobic co-digestion (AccoJ) to produce biogas in a range of 0.85 - 1.0 m³/kgCAsolids. 3) In the final step anaerobic digestate is treated by hydro-thermal carbonization transforming the AccoJ residues into valuable carbonized products (bio-coal, carbon black, bio-fertilizer) applicable both for fertilizing and energy purposes.

Production of Citric Acid 100-170 kg/m³
Production of biogas 0.85-1.0 m³/kgCitric Acid

35 m³ PBR volume
300 m³/day wastewater reused
High Rate Algae Pond © Aquavia