Solar-powered algal production on tomato processing industry wastewater

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Life Algaecan Technology

The LIFE ALGAECAN project proposed a sustainable treatment model of effluents with high organic load that combined cost-effective heterotrophic microalgae cultivation with spray drying of the collected microalgae to obtain a product of commercial interest as raw material to produce biofertilisers, animal feed, bioplastics, etc. The technology applied in the project is an innovative concept for wastewater treatment, its reuse and resource recovery to obtain a high-quality water stream. The prototype (Figure 1) was powered by renewable energy (solar energy supported by biomass), which minimized the carbon footprint and operating costs of the process. The final effluent quality was very high, allowing reuse for equipment cleaning or irrigation purposes. In the context of promoting circular economy and innovative technologies, this study aims to replicate the demonstrated prototype and treatment schemes in a tomato processing industry.

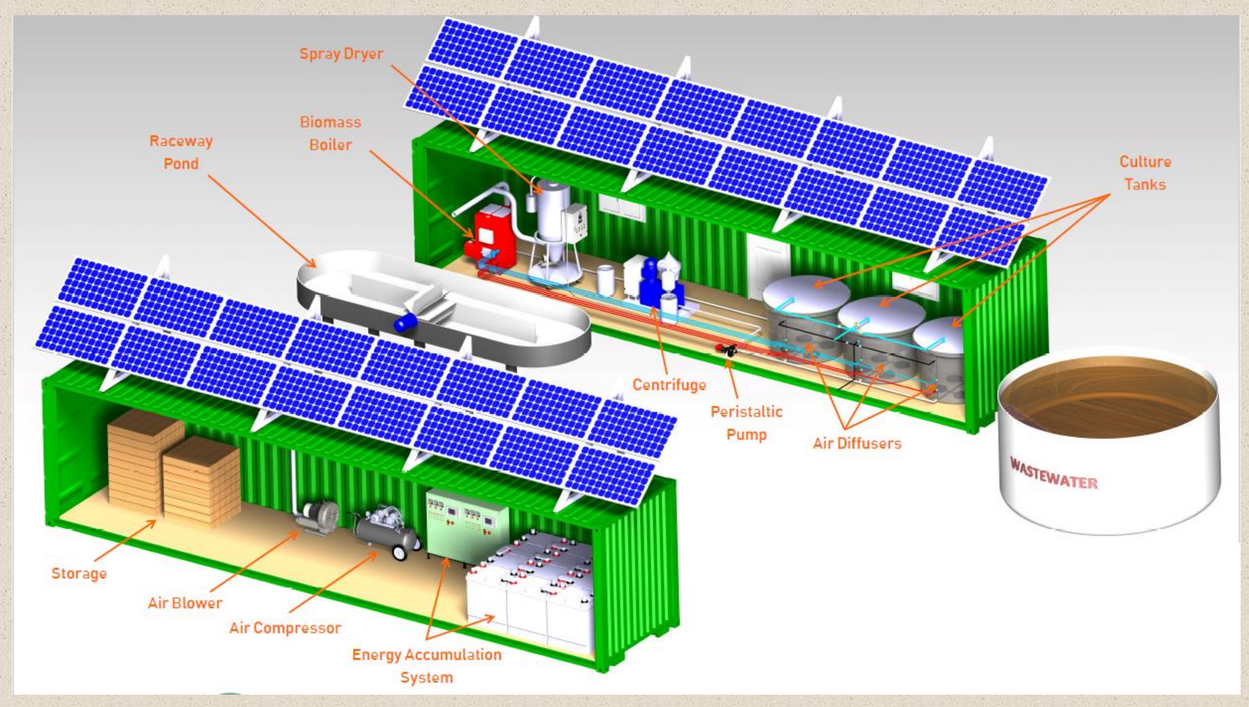

Figure 1. Life Algaecan Demo plant.

Tomato processing industry - Case Study

The tomato processing industry that stands as the case study in the present work includes **3 different production lines:**

- the production process of tomato pulp,
- the production process of diced tomatoes and
- the production of diced peeled tomato in aseptic packaging.

Seasonal operation: end of July till the end of September
Processing capacity: 3500tn fresh tomatoes/d
Fresh water needs: 4m^3/tn fresh tomatoes
Additives: 50tn/y citric acid and 10tn/y calcium chloride

Wastewater
Flow rate: 300 m^3/h
Characteristics: COD: 500mg/L, BOD_5: 300mg/L, SS: 100 mg/L , TN: 20mg/L
Current treatment: Activated sludge treatment plant

Solid waste
Flow rate: 105tn/d (~3% of the incoming raw material)
Current treatment:

- tomato peels and spores used as animal feed in nearby farms
- defect tomatoes and plant residues are led to a privately owned landfill

Sustainable tomato processing wastewater valorisation scheme

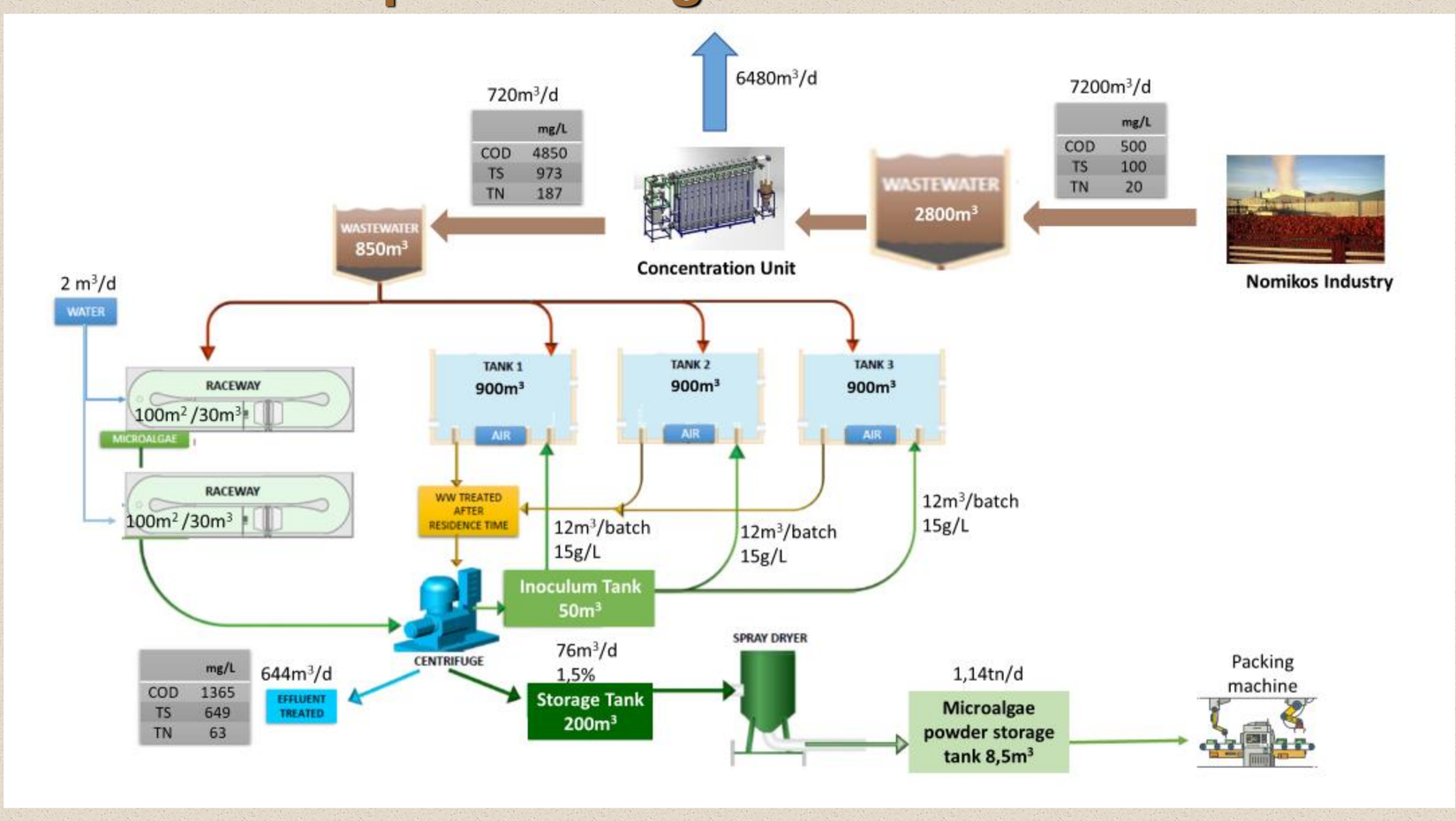

Figure 2. Flow diagram of full-scale replication of ALGAECAN system in tomato processing industry.

End-products potential uses

The **water effluent** from the ultrafiltration unit is of high hydraulic load (6480m^3/d). Its pollution load could be considered very low and free of suspended solids. In this context, this stream could be reused within the industry.

The **microalgae** produced are expected to be used as fertiliser or as animal feed. Through the ultimate analysis of the produced algae of the demo system, it was evident that the produced algae could be commercialized as a solid NPK organic fertilizer being in line with the respective EU legislation framework. As far as the animal feed perspective is concerned, the algal end-product could be efficiently incorporated into the feed for a variety of animals, substituting a significant part of the animal feed required.

Conclusively, the proposed system could promote sustainability in tomato processing industries.

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