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## MICROALGAE TO VALORISE WASTE HEAT AND INDUSTRIAL CO<sub>2</sub>

#bioremediation #industrial ecology #microalgae #joint project #bioprocesses #industrial waste treatment

As part of an industrial ecology initiative aimed at mitigating waste heat and industrial effluents rich in CO<sub>2</sub> that are produced by cement plants, ADEME (French Agency for Environment and Energy Management) funded the project "CIMENTALGUE". This consortium includes the GEPEA and GeM laboratories, as well as Capacités and AlgoSource. Developed by GEPEA and Capacités, the project is centered on the development and comprehension of the process for the bioremediation of industrial smokes through the cultivation of microalgae. Ultimately, this could mean that the recovery of CO<sub>2</sub> emitted by a cement plant would become a new value-added activity, and an added value.

### DEVELOPMENT OF A VALORISATION PROCESS FOR WASTE GASES VIA MICROALGAE CULTIVATION

GEPEA laboratory and CAPACITÉS developed a process whereby the CO<sub>2</sub> emitted by a cement plant is used to feed the microalgae, and the waste heat is used to heat the culture tanks. The design and optimisation of this process, which has since been patented, were carried out at laboratory scale. Studies aimed at optimising the transfer of CO<sub>2</sub> to the liquid phase and were carried out in order to maximise the availability of dissolved inorganic carbon during culture. Several strategies geared towards the carbonation of the growth medium were tested before injecting it into the microalgae tank. The effects of this system on microalgal growth and culture stability were measured in order to select the most favourable environmental conditions. The process automatically adjusts the nutrient requirements of the microalgae and the pH of the tank

in response to these changing conditions.

Subsequently, this process was scaled up to a 1 m<sup>3</sup> pilot raceway in the greenhouse of the AlgoSolis R&D platform. This transition to a semi-industrial scale made it possible to demonstrate the viability of the system and to obtain a sufficient amount of representative data in order to roll out a demonstrator at semi-industrial scale in a second phase. This second phase is ongoing with Total, AlgoSource and the GEPEA laboratory.

To successfully complete this project, the Capacités'experts benefited from support and technical equipment from the GEPEA, joint research unit of the Université de Nantes, Oniris, IMT Atlantique and CNRS (The French National Centre for Scientific Research). ■



#### Expertises:

- Microalgae
- Bioprocess engineering

#### CAPACITÉS

Created in 2005, Capacités is the private engineering and research valorisation subsidiary of the University of Nantes. It employs 90 employees, mainly engineers and PhDs, who work directly with scientists in the research laboratories.

