

Case Study

SEC's microalgae project

A step forward towards securing the supply of food and establishing resilient, sustainable agri-food systems

Singapore-ETH Centre (SEC) and Swiss Bühler Group announce the deployment of Bühler's state-of-the-art Stellar Gemini system at SEC's Urban Microalgae Protein project laboratory in Singapore.

The Stellar technology, a world first developed by Bühler, is based on nanosecond pulsed electric fields.

It will be used to increase the efficiency of microalgae processing. With its installation, the Urban Microalgae Protein project reaches a new milestone.

The SEC's Urban Microalgae Protein project aims to develop a sustainable, urban single-cell protein production platform and microalgae-based food concepts with taste and nutrition profiles that meet consumer preferences.

This three-year project is based in Singapore, and is supported by the National Research Foundation Singapore (NRF) under its Campus for Research Excellence and Technological Enterprise (CREATE) program.

Delivering industry relevant results

"The Stellar technology will enable us to deliver industry relevant results to improve the eco-efficiency and productivity of microalgae supply chains by establishing a pulsed electric field (PEF)-based biorefinery as part of the Urban Microalgae Protein project," says Dr Iris Haberkorn, project lead and senior scientist at SEC.

The first of its kind, Stellar technology uses

nanosecond pulsed electric field processing to grow single-cell cultures, like microalgae, at a faster rate without biologically altering them. Stellar Gemini is the name of the device that enables the application of these pulses.

"The installed Stellar Gemini system enables application development and initial scale-up to pilot scale on a flexible and easy-to-use platform. Operators have access to Bühler's extensive know-how while having full flexibility for independent application development, ensuring maximum efficiency in process development," says Dr Leandro Buchmann, Project Manager Bioprocessing at Bühler.

"Nanosecond pulsed electric field processing can have a tremendous impact on the bio-based domain and the alternative protein sector focusing on single-cell-based value chains".

"Our research delivers the fundamentals to further leverage the technology," says Dr Iris Haberkorn. "This is a step forward towards securing the supply of food and establishing resilient, sustainable agri-food systems".

The deployment of the Stellar technology system is a result of the strong longstanding collaboration between the Bühler Group and ETH Zurich, which supports the SEC Microalgae project with know-how, experience, and expertise.

"Not only is the Stellar technology an outstanding example of technology transfer from academia into industry, it is also a great success story", says Professor Alexander Mathys, lead Principal Investigator of the Urban Microalgae Protein project.

"We are proud that the scientific fundamentals developed



at the ETH Zurich Sustainable Food Processing Laboratory led to the development of a first industrial prototype system within only two years through the tremendous effort of a great team at Bühler, enabling us to deliver industry-relevant results in the project.”

An ambitious target

The project itself aims to enhance Singapore's food security by establishing resilient, sustainable and cost-effective agri-food systems using microalgae-based food products.

In Singapore, the ambitious '30 by 30' target calls for an increase in capability and capacity to grow 30 per cent of total food needs locally and sustainably by 2030. Given the constraints of its urban environment, meeting this goal through traditional agri-food production methods will be challenging.

As single cell production systems such as microalgae require little arable land, they could play a major role in achieving this goal. The Stellar Gemini system is a strategic element in achieving this ambition as it improves microalgae cultivation and thus can enable microalgae to become a viable source of macro- and micronutrients in future.

Advantages of the Stellar technology

Time: Increased process efficiency by up to 30 percent, by either increasing the capacity of the installed base or reducing resource requirements.

Flexible: Ability to process different organisms/strains from lab to an industrially relevant pilot scale.

Natural: A natural physical process in addition to or as an alternative to feedstock optimisation.