

Subitec GmbH develops and manufactures microalgae cultivation systems

## **A high-tech habitat for optimum cultivation**

**(Stuttgart) – Subitec GmbH in Stuttgart is setting new standards in the industrial production of microalgae with the series manufacture of standardised cultivation modules. It was a similar story 20 years ago with the market launch of the Fraunhofer Institute spin-off's ground-breaking process technologies for microalgae cultivation. These systems from the STERN BioRegion can now be found in research laboratories and production departments worldwide. The recently developed CM180 cultivation module represents the next chapter in the history of this pioneer in microalgae breeding. It is also cementing the company's position in this key biotech sector, which is seeing a growing demand for production systems that can meet the exacting requirements relating to consistently high-quality microalgae in predictable quantities. Two of these modules have already been sold and are on their way to a customer in Tunisia.**

Microalgae perform photosynthesis in the same way as trees and are evolutionary marvels. Around 2.4 billion years ago, the predecessors of these microorganisms helped create our planet's oxygen-rich atmosphere. And even today, microalgae have a key function in the Earth's oxygen and carbon cycle. According to estimates, they account for around half of global biological carbon fixation and thus play a key role in regulating the climate on Earth. The huge potential of these microscopically small living organisms has also been recognised in industry and research circles. Their valuable constituents make them suitable for a wide range of applications – from food supplements and cosmetics to pharmaceuticals and wastewater treatment.

In Gregor Weber's opinion, however, breeding microalgae isn't rocket science. The Managing Director of Subitec is being a little overly modest, though, given

the impressive structure standing behind him. The newly developed CM180 cultivation module, which is roughly the size of two minibuses stacked on top of each other, incorporates a huge amount of know-how and engineering skill. At its heart is the flat-panel airlift (FPA) photobioreactor that Subitec developed over 20 years ago in collaboration with the Stuttgart-based Fraunhofer Institute for Interfacial Engineering and Biotechnology IGB. Made from transparent plastic, the FPA photobioreactor offers all the prerequisites to optimise the proliferation of microalgae. The indoor system benefits from plenty of light and a constant flow of circulating water. This is achieved thanks to specially developed grow light LEDs that help create the ideal, individually adjustable light conditions, while tiny air bubbles ensure the uniform introduction of CO<sub>2</sub> into the culture solution and optimum mixing. “We have arranged 30 FPA photobioreactors side by side in our CM180 module. This has an effect similar to cutting five cubic metres of water into slices that are illuminated from both sides. As a result, we have maximised the photosynthetic surface area with a footprint of just 16 square metres,” says Weber, explaining the technical innovation. “This provides an ideal cultivation environment for the efficient production of virtually any microalga in a compact space,” he adds.

The first order was placed while the module was still being developed, and two CM180 cultivation modules were assembled in Subitec’s production department for a customer in Tunisia. Boasting a photosynthetic surface area of 285 square metres each, they will be able to produce around four metric tons of biomass per year once they are installed at their future destination. The required high-value substances will then be obtained from this biomass. The microalga that the Tunisian biotech company Water Spirit intends to cultivate in the modules is called *Haematococcus pluvialis*. When subjected to stress – in this case, light with a high proportion of red – it starts producing astaxanthin. This natural, reddish-purple pigment gives flamingos their pink colour, for example, and belongs to a group of carotenoids called xanthophylls. “Astaxanthin is rather like a highly potent carrot and is one of the most powerful natural antioxidants. When used as a food supplement, it has an anti-inflammatory effect, and it also

improves eyesight and cardiovascular health,” explains Weber. Little wonder, then, that one kilo of this much sought-after substance costs several thousand dollars – only if the product has been manufactured under the most stringent hygiene conditions, of course, without any kind of contamination and in consistently high quality. Subitec’s production systems satisfy these very requirements. “Our equipment offers the ideal basis for the industrial production of cultures, because the most important thing of all for manufacturers of food supplements is predictability – especially when dealing with biological products,” continues Weber. This also applies to the production of omega-3. Salmon are known to be rich in these unsaturated fatty acids. Just like flamingos, they absorb this valuable health-promoting substance via the microalgae that form part of their diet. Omega-3 fatty acids are extremely important for the metabolism. Producing them with the help of the appropriate microalgae provides an alternative to fish for vegans and also relieves the pressure on overfished stocks.

It is estimated that there are up to a million different species of microalgae – not to be confused with the macroalgae washed up on our beaches. A total of 3,000 are recorded in databases, but fewer than 30 are being cultivated on an industrial scale at present. “Like all other green plants, algae perform photosynthesis. In other words, you need light, CO<sub>2</sub>, nutrients and water,” says Weber, explaining the key production parameters. The genetic characteristics of each microalga are completely different, though, and the requirements for rapid growth very specific. Finding out which microalgae species is suitable for which applications will therefore remain a major field of scientific research. “And we provide an ideal habitat for that – a kind of high-tech aquarium,” sums up Weber. The Subitec portfolio includes lab-scale products that are suitable for research and industry laboratories, with cultivation volumes ranging from 6 and 28 litres through to 4 x 28 litres and 180 litres. Also available is the above-mentioned CM180 cultivation module for industrial use. Further products are currently at the development stage.

The next order for Tunisia has already been confirmed, with four CM180 modules set to be produced for a different customer. “In the future, we are planning to make approximately 50 modules per year. We have already found new, larger premises with sufficient manufacturing space – in Köngen, near Wendlingen. All we need now are production staff,” says Weber. Like so many businesses in the region, Subitec GmbH is currently on the lookout for new skilled workers. “Professionals who are passionate about working in a key sector of the future,” he adds. It is thanks to Weber that Subitec once again has a clear strategic orientation. In 2019, at a time when Subitec needed to find a new direction, he was approached by the High-Tech Gründerfonds venture capital firm to take over the reins. “Subitec used to produce customised plant engineering solutions, including some sizeable projects, but the market has matured and now wants standardised products that are less costly,” says Weber, explaining his reason for the change of strategy that completely repositioned the company. Subitec originally also wanted to produce microalgae itself using its innovative production systems but, as part of its strategic realignment, it started looking to recruit staff with different qualifications. Plant engineering skills are now required rather than lab know-how. “That’s because we’re collaborating with the Fraunhofer IGB and no longer cultivating microalgae ourselves. After all, Dr. Ulrike Schmid-Staiger, the IGB’s Group Manager Algae Biotechnology Development, is one of Subitec’s founders,” he reveals. What’s more, Subitec technology is already found in laboratories worldwide. Thanks to its change of strategy, the company has given itself a new lease of life based on earlier successes and is now one of the top five plant manufacturers for algae technology.

**About BioRegio STERN Management GmbH:**

BioRegio STERN Management GmbH promotes economic development in the life sciences industry, helping to strengthen the region as a business location by supporting innovations and start-up companies in the public interest. It is the main point of contact for company founders and entrepreneurs in the Stuttgart and Neckar-Alb regions, including the cities of Tübingen and Reutlingen. The STERN BioRegion is one of the largest and most successful bioregions in Germany. Its unique selling points include a mix of biotech and medtech companies that is outstanding in Germany and regional clusters in the fields of automation technology and mechanical and plant engineering.

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