

COMPANY

ecoduna produktions-GmbH
ecoduna.com

LOCATION

Bruck/Leitha, Austria

SOFTWARE

Autodesk® Inventor®

Algae: The growth of green power

ecoduna has developed and patented the world's first photobioreactor for on-going algae cultivation using Autodesk software

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—**Martin Mohr**
 CEO ecoduna



Image courtesy of ecoduna.

Microalgae are a highly promising renewable material. They form the basis for a great many valuable products, with applications ranging from medicine and nutrition to energy production. Several years ago, two young entrepreneurs, Martin Mohr and Franz Emminger, recognized this potential and founded a company to develop it: ecoduna. Based in the Austrian town of Bruck an der Leitha, ecoduna has developed and patented the world's first photobioreactor for the on-going cultivation of microalgae. "We've been working in this area for about six years now. We founded the company in 2009 purely as a vehicle for developing the photobioreactors," explains Martin Mohr, CEO.

Hangings gardens – putting the green in green energy

The green biotech industry is working hard to develop products for industrial applications from these highly versatile organisms. The use of open ponds for industrial-scale cultivation has always been limited by prohibitive energy costs and the enormous volumes of water required. ecoduna has addressed these problems with its "hanging gardens" concept, a photobioreactor that optimizes the conditions for the industrial production of microalgae. It is an on-going system in which the cultivation process and the entire lifecycle of the microorganisms can be fully managed, and the plant can be serviced without interruption.

The Autodesk Clean Tech Partner Program supports early-stage clean technology companies with design and engineering software they can use to accelerate their development of solutions to the world's most pressing environmental challenges. For more information visit [autodesk.com/cleantech](https://www.autodesk.com/cleantech)

The hanging garden systems consists of several vertical panels, each six meters high, in which the microalgae are circulated in fresh water. These conditions are particularly good for the mass cultivation of algae, as they produce large yields from a relatively small footprint. The nutrient liquid is transported through the entire photobioreactor by means of hydrostatic pressure and the gas lift effect, as a result, no additional energy is required for a pump system. Another important aspect of the hanging gardens' design is the unique geometry of the photobioreactor: the reactor is designed in such a way that the surface hit by sunlight is multiplied. Since algae cannot use all the light which is irradiated, the light is diluted – thereby achieving a higher level of productivity. By diluting the light, the irradiation will never be too high for ideal growth. In short, it provides the optimum conditions that maximize the growth of these micro-organisms.

Organically formed components

"From a technical perspective, our photobioreactor is a total new approach. It is therefore extremely difficult to find off-the-shelf components with which to build our systems. Every steel or plastic component has to be designed and manufactured from scratch," explains Martin Mohr. Many of the plastic components have organic forms that are designed using Autodesk® Inventor®, a digital prototyping package supplied to ecoduna as part of the Autodesk® Clean Tech Partner Program. "There are hydro-mechanical problems that we have to solve so that the liquid can circulate through the reactor with as little resistance as possible. To create the flowing organic forms that enable circulation, you need a software package that not only allows this type of prototyping, but is also specifically designed for this purpose." ecoduna uses Autodesk Inventor to develop components in 3D, which are then directly manufactured.

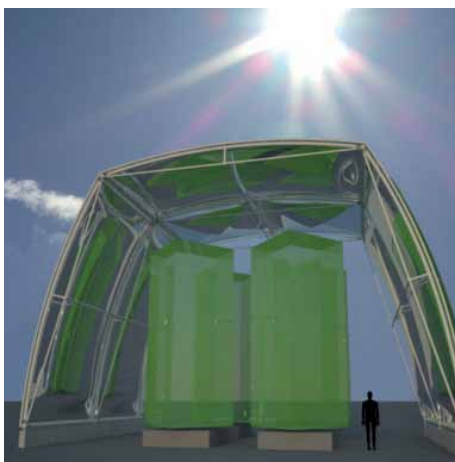


Image courtesy of ecoduna.

Thanks to 3D modeling in Autodesk Inventor, it is possible to identify and eliminate potential flaws at an early stage in the process, thereby saving valuable time. "Our pre-production phase is now much faster and more accurate than it used to be," continues Mohr. "Before, it used to take us about three weeks to design a new component. With Autodesk Inventor, it takes just two and a half days to make the same item. We can reduce the time required to design these complex components by around 60 to 70 percent, just by using Autodesk® Inventor."

Tomorrow's green energy providers

Microalgae are a huge source of energy and amazingly diverse. No other biofuel offers such a high energy yield per unit area. Algal biomass offers the potential for repeated energy production. "In order to cultivate microalgae in water, you need huge amounts of CO₂ – the major greenhouse gas," explains Martin Mohr. The algae absorb the CO₂ from the water and their growth accelerates in the process. "If we cultivate microalgae more efficiently in a nutrient solution, it is possible to capture a much higher volume of carbon dioxide." ecoduna already has a pilot plant in Senftenberg, Germany, which is linked with coal-fired power stations. In addition to energy, algae biomass provides valuable base products for the food industry. "Our plant in Austria is geared specifically towards the production of omega-3 fatty acids, which can be offered, for example, to pregnant women, to children, and as dietary supplements," continues Martin Mohr. ecoduna is currently building 22 modules, each six meters high, at the Energiepark in Bruck an der Leitha. The plant will become home to a microalgae culture in October. Microalgae can also be used as a biofuel or in bioplastics production.

The young entrepreneurs, Martin Mohr and Franz Emminger, have created a technically sophisticated algae culture system that represents a visionary project in clean energy. Essentially, the process takes carbon dioxide and waste water and turns them into oxygen, clean water and biomass. With its innovative algaculture modules, ecoduna is making an important contribution to the search for alternative energy sources.

For more information

To learn more about the Autodesk Clean Tech Partner Program, visit autodesk.com/cleantech.

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