# Algae to capture CO2

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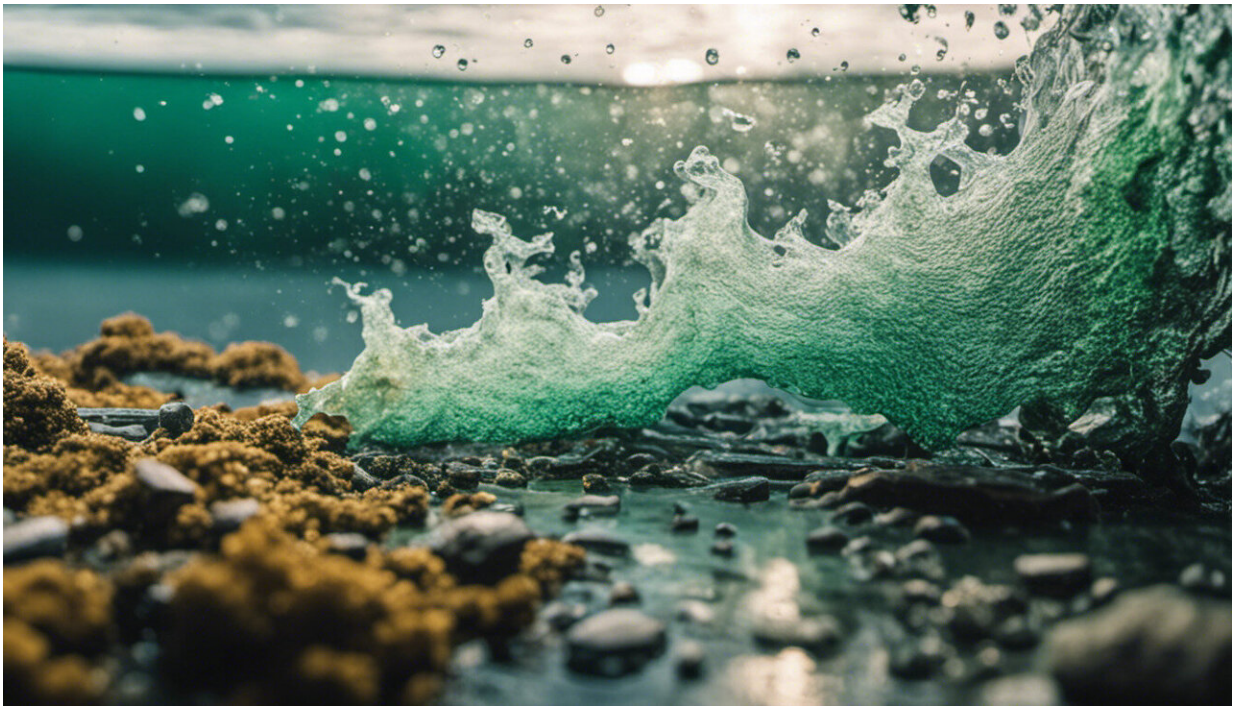

Credit: AI-generated image (disclaimer)

Global warming's effects can be seen worldwide, and many experts believe it's only going to get worse as CO2 emissions continue to rise. Global warming is caused by the emission of greenhouse gases. 72% of the totally emitted greenhouse gases is carbon dioxide (CO2), 18% Methane and 9% Nitrous oxide (NOx). Carbon dioxide emissions therefore are the most important cause of global warming. CO2 is inevitably created by burning fuels like e.g. oil, natural gas, diesel,

organic-diesel, petrol, organic-petrol, ethanol. That's the bad news. The good news is that researchers have found that algae is not only a great source of alternative of natural bio energy but it also has the ability to capture CO2.

Microalgae are generally recognized as the most promising solution for both bio-fuel production and industrial capture of emitted CO2. The ability of these photosynthetic microorganisms to convert carbon dioxide into carbon-rich lipids (only a step or two away from bio-diesel) greatly exceeds that of agricultural oleaginous crops, without competing for arable land.

The potential of microalgae has been investigated by various EU programmes dedicated to reducing CO2 and other greenhouse gas emissions. The number of European and global initiatives has steadily increased in this field since the UN Framework Convention on Climate Change (UNFCCC) was signed in 1992.

With such a focus on the possibilities that microalgae can offer, various industrial methods have been developed for its production. However, most are currently not economically viable, especially on a large scale. Limitations to these systems include: sub-optimal productivity, expensive installation, large footprint (surface area), high water demand and the requirement for a highly trained end-user. The EU-funded ALDADISK project has been set up to meet these challenges by creating a scalable production unit, capable of delivering high value alga-based products and biomass while reducing CO2 emissions.

Current commercial alga technologies use plantonic algae in water solution in Vertical Bioreactors (VB) or algae farms with large ponds. However, there are several disadvantages. The processes need a lot of water during production, CO2 is released through bubbling in the liquid phase and harvesting is difficult, time consuming and inefficient. In

addition, the operation is difficult to scale up and leaves a large foot print.

ALDADISK's proposed process is based on biofilm technology using a Rotating Disk reactor system similar to the state of art rotating reactors used elsewhere in the biological industry. In this system, algae can be grown on indifferent biocompatible surfaces and thus CO2 would be captured either from the gas phase directly or from the liquid phase after bubbling. This method dramatically increases the efficiency and decreases the amount of water necessary for the process. Automatic and continuous harvesting could also be designed and implemented. Scale-up is easy and the foot print would be much smaller than used currently. The ALDADISK project aims to develop a small automatic, biofilm reactor, with low operation and installation costs, which is capable of capturing a considerable amount of CO2, The intended result would be organic products with a sufficiently high yield.

The project aim is to satisfy the need of small scale production units who want to produce algae biomass products but face difficulties in obtaining the technology to achieve this.

In this market, studies undertaken by the project consortium have shown that there is a lack of efficient, universal reactors, and insufficient information about sustainability and feasibility of algae production. They also identified the need for a scalable, economically feasible algae production unit, capable of delivering high value alga-based products (animal and human nutrients, bio-fertilizer) as well as biomass (biodiesel precursors).

Furthermore, those SMEs that are participating in the project consortium are particularly interested in a system that remains profitable with small-scale installations and occupies a minimal amount of space. In addition to the production technology, there is also a need for an

organized and integrated knowledge base. Many of the participants in the project are interested in algae production, but lack the tools necessary to calculate economic feasibility and to determine which system best suits their needs. One aim of the project, therefore, is to bridge the knowledge gap between research activities and end-user needs.

Design software will be provided which, based on user input, will suggest installation parameters, perform cost/benefit analysis to calculate economic feasibility, and make predictions concerning the environmental sustainability of the system. The proposed system will be specifically crafted to meet the needs of SMEs.

Laboratory tests, a pilot scale system, and mechanical and electronic designs are currently being carried out. These will be followed by a prototype reactor system which will be installed at one end-user facility. The intention is for the first ALGADISK reactor to be operated and tested in the summer of 2014.

**More information:** -MFKK Invention and Research Center Services Co. Ltd - www.mfkk.eu/en/node/409

- ALGADISK - www.algadisk.eu/home

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