Capturing CO2 from the air for accelerating growth of algae

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The experimental setup with the capture unit on the right and the algae culture unit on the left. Credit: Gijs van Ouwerkerk

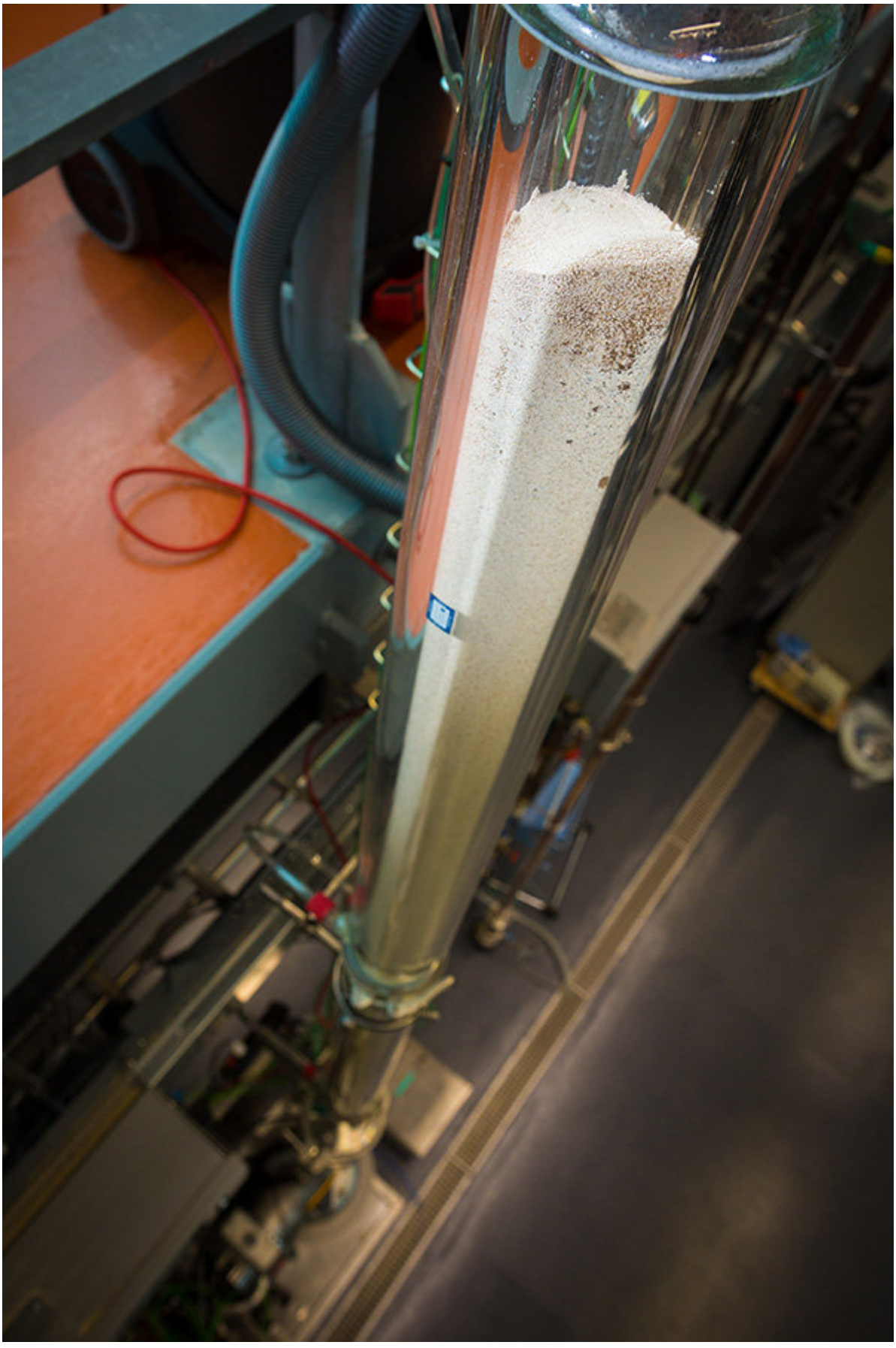
A new air capture technology, developed by the University of Twente, captures CO2 from atmospheric air in a cheap and efficient way. The CO2, in turn, is used for growing algae, as a promising feedstock in the bio based economy. Another application is a closed cycle for storing solar and wind energy.

The new unit was designed to capture 500 gram CO2 from air per day, for using it for micro-algae production. It uses ambient air: for one kilo of CO2, about 1400 cubic meters of air is needed. Algae are very valuable feedstock for food, chemistry and sustainable energy. Their growth rate rises substantially when CO2 is added. The capacity of the new air capture unit can be compared to that of four mature trees, each on a surface of 50 square meters.

To achieve their goal, the UT researchers use solid particles, sorbents, for capturing CO2. When they don't have a 'load' yet, the particles enter an air flow, going through the setup with a low pressure drop. As soon as they collect CO2, the particles travel up to the top of the adsorber column, about six meter in height. From there, they flow down through a heated desorber, and deliver their CO2 load. After that, the sorbents enter a new cycle of collecting and release of CO2.

The CO2 rich gas goes to the algae reservoir. Although cooling down and heating require energy, the net energy consumption of the capture unit is low. The energy costs, of about 75 euro per 1000 kilograms of

CO2 are at a competitive level at the current market. Except for growing algae, greenhouse farming could also benefit from the new setup. The unit is flexible, isn't dependent of industrial plants for collecting CO2 and can thus be used anywhere in the world, according to project leader dr. Wim Brilman.



The adsorber column seen from above. Credit: Gijs van Ouwerkerk

Another application could be in storing energy from solar or wind energy . Storage is one of the main challenges in the energy transition. Using CO2 from air, together with hydrogen, it is possible to produce methane ('natural gas') for home use. In this way you store energy without the need of batteries: you use the excess energy from sun or wind for producing the gas. It is an attractive 'closed cycle' approach, in which the boiler doesn't have CO2 exhaust anymore. This approach is currently tested in a housing complex in Rozenburg. It would easily fit in the current infrastructure of houses, although this may change in the future, when of houses that don't have gas mains anymore.

Provided by University of Twente

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