A109 - KONTROLLIERTE CO2-VERSORGUNG FÜR ALGENWACHSTUM

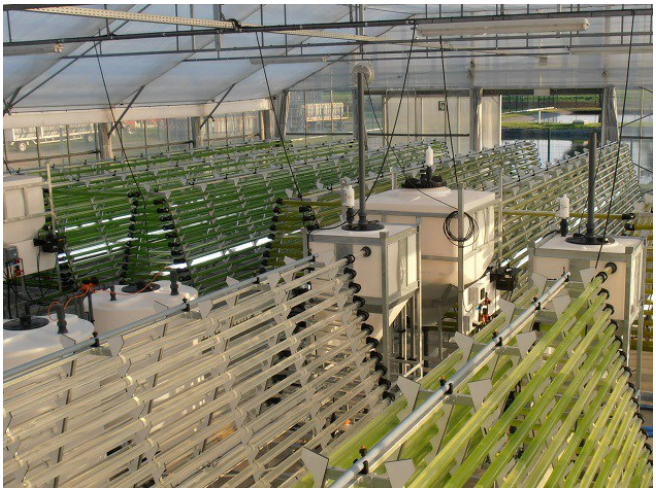
APPLICATION NOTE A109 - FP02

CONTROLLED CO_2 SUPPLY FOR ALGAE GROWTH

Radius, a strategic research group of the Belgian Thomas More University of Applied Sciences, investigates the conversion of CO_2 with sunlight into specialty chemicals. Microalgae play a key role here, and their CO_2 fixation rates and growth capacities are examined.

This research falls within European efforts to build a low-carbon economy to guarantee a sustainable, reliable and affordable supply of energy (e.g. biofuel) and materials (e.g. chemicals and cosmetics). In this respect, the greenhouse gas CO_2 is considered a valuable alternative source of carbon that is abundantly available, in applications for food, feed and biobased chemicals.

The researchers of Radius cultivate microalgae in photobioreactors. In order to investigate how much CO_2 gas is captured and converted by their algae, they need an accurate measurement of the CO_2 that is supplied to the algae during cultivation. To this end, the help of Bronkhorst's devices was requested.



(Source: Thomas More | Agro- and Biotechnology)

Application requirements

The amount of CO_2 that is dosed to the microalgae influences the pH in the cultivation system that - in turn - has a large influence on the microalgae growth. Therefore, the accuracy of the CO_2 supply according to the pH in the growth medium of the microalgae is important. Moreover, all parameters that are involved in the process need to be monitored.

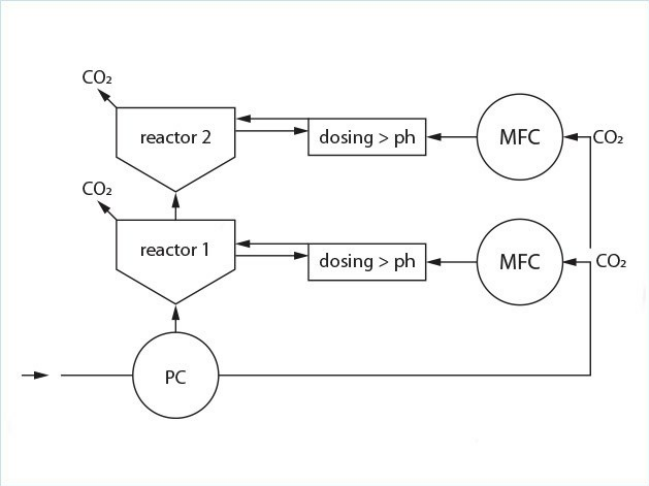
Important topics

- Automated process for accurate supply of CO_2 based on current pH value
- Monitoring of process parameters

Process solution

At Radius, experiments for microalgae cultivation on a pilot scale are conducted in closed, tubular photobioreactors with a total volume of 300 liters each, operating at atmospheric pressure in a climate-controlled greenhouse. Two IN-FLOW thermal mass flow controllers are used, each of them to supply CO_2 to these pilot scale reactors, with a maximum dosed flow rate of 886 milliliters CO_2 per minute for each reactor. There is a direct, automatic feedback between the current pH value and the supplied CO_2 flow.

After a meeting with their supplier of CO_2 gas, Radius was introduced to Gefran, which is a distributor of Bronkhorst products in Belgium. Radius and Gefran together looked for a system that could accurately dose CO_2 based on the pH value in the growth medium of the microalgae. The combination of their requirements ultimately led to the purchase of the IN-FLOW mass flow controllers from Bronkhorst.



Flow scheme

In the past, the supply of CO_2 gas as well as the control of the pH had to be done manually. With this new system, which utilises LabVIEW (instrument driver), they can perfectly monitor the CO_2 dosage in their pilot plant, and keep the pH at the desired level without too much effort. The best conditions for the algae to grow are in the pH range between 6.5 and 9.5, preferably around 8.

According to Radius, the accuracy of the mass flow controllers, the capabilities of the PID controller and the usability of LabVIEW makes Bronkhorst IN-FLOW mass flow controllers a solid and reliable system. Currently they are looking for an extension of the system to monitor the outgoing CO_2 flow, in order to be able to even more accurately monitor the CO_2 uptake by their microalgae.
Moreover, in future the two larger reactors with a total volume of 1800 liters each will also be foreseen by Bronkhorst mass flow controllers for the CO_2 supply.

THOMAS MORE | University of Applied Sciences

Response Thomas More University

Joris Doumen: "With a balanced CO2 dosing system, the future of algae cultivation becomes even more sustainable and greener!"

Recommended Products

IN-FLOW F-201AI

Min. Bereich 0,4…20 ln/min
Max. Bereich 0,6…100 ln/min
Druckstufe 64 bar
Kompaktes IP65 Design
Hohe Genauigkeit und Wiederholbarkeit

BRONKHORST (SCHWEIZ) AG
Gewerbestrasse 7
4147 Aesch BL (CH)
Tel. +41 61 715 90 70
info@bronkhorst.ch