Photobioreactor – Laboratory bench

The plant consists of an air-lift photoreactor for the photosynthetic growth of microalgae placed on a support table in which the electronic equipment related to the photobioreactor is mounted. The whole assembly is connected to a process computer that monitors and controls the microalgae culture. The body of the air-lift photoreactor for photosynthetic growth of microalgae is of plate-type and has a total volume of 6 liters: V = 320 x 375 x 50 mm^3 (of which a useful volume of about 5 liters). The photobiorector has two transparent faces and a width of only 5 cm to allow the biomass access to light. Active photosynthetic radiation is provided by a LED panel located near the photobioreactor and can be varied as needed. The top of the photoreactor is provided with holes for accommodating the aeration system, the inlet and outlet ports, the septum, the condenser and various sensors. The photobioreactor can also operate continuously, with two variable-flow peristaltic pumps, one for feeding the culture medium with fresh medium and the other for exhausting. The homogenization of the culture is done by bubbling air or nitrogen through a ceramic diffuser. For the addition of gases in the microalgae culture, the photobiorector is provided with two flowmeters:

- Bronkhorst flowmeter for N_2, 0 – 100 mL/min;
- Bronkhorst flowmeter for CO_2, 0 – 20 mL/min (source of inorganic carbon for photoautotrophic micro-organisms).

For monitoring the microalgae culture, the plant was provided with a series of sensors provided by Mettler Toledo as following:
- Turbidity sensor, 0 – 4000 FTU;
- pH sensor with integrating temperature sensor, 0 – 14 pH units, 0 – 120 °C;
- Dissolved oxygen sensor, 0 – 20 mg/L;
- Dissolved carbon dioxid sensor, 0 ... 1000 mbar pCO_2.

A light sensor is used to monitor incident light LI-COR (0 – 10.000 µ) which can be mounted on a portable device or an adapter connected to the process computer for the continuous acquisition of the light signal.