

The GWP-III: a hermetically closed, inclinable and fully automatized flat panel photobioreactor

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background

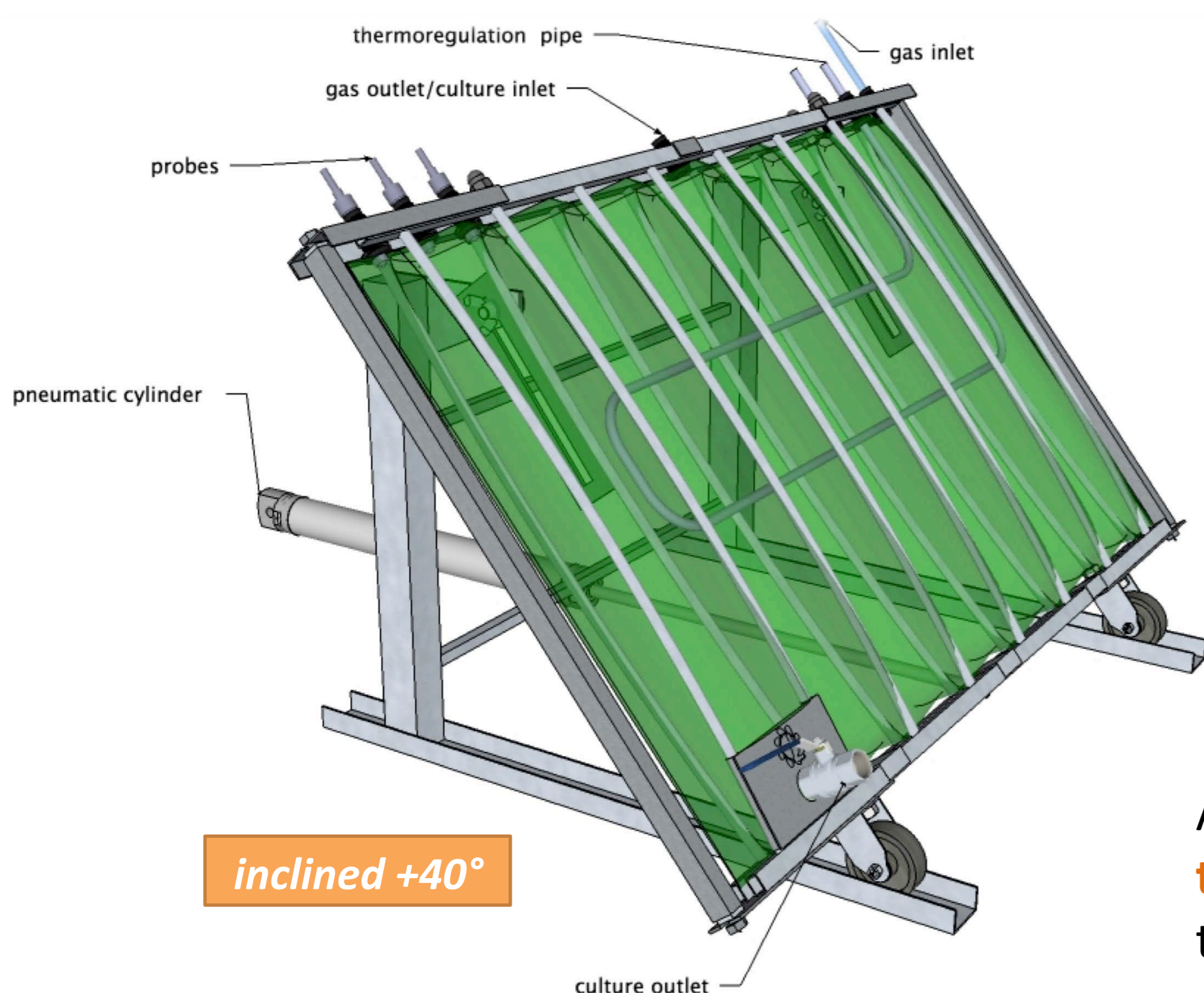
The **Green Wall Panel (GWP)** is a series of flat photobioreactors patented by the University of Florence (WO2004/074423) and by Fotosintetica & Microbiologica S.r.l. (WO2011/013104). The GWP is a **low-cost disposable photobioreactor**, ideal to provide high-quality inocula for large-scale plants and already utilised by several companies (among which ENI S.p.A., ENEL S.p.A., Archimede Ricerche S.r.l., AlgaeFuels - Chile, Necton - Portugal, A4F - Portugal) both for commercial microalgal biomass production and for research purposes.



The GWP-III

(WO2011/013104)

A new design, the GWP-III, which can be used for training and research as well as for industrial applications, was recently developed. The main improvements on the old designs are both structural and operational. The containment and support structure of the GWP-III is **entirely made of stainless steel**, which gives increased stability and longer duration. As in the previous designs, the metal structure contains a disposable plastic culture chamber and allows to maintain an **average light-path of about 3.5 cm**. It can be now **easily opened to quickly replace the plastic chamber** when weathered or damaged. In the GWP-III the **culture chamber is hermetically closed** to prevent contaminations (by positive inner pressure) and allows **gas collection and recycling** to maximize CO₂ utilization.



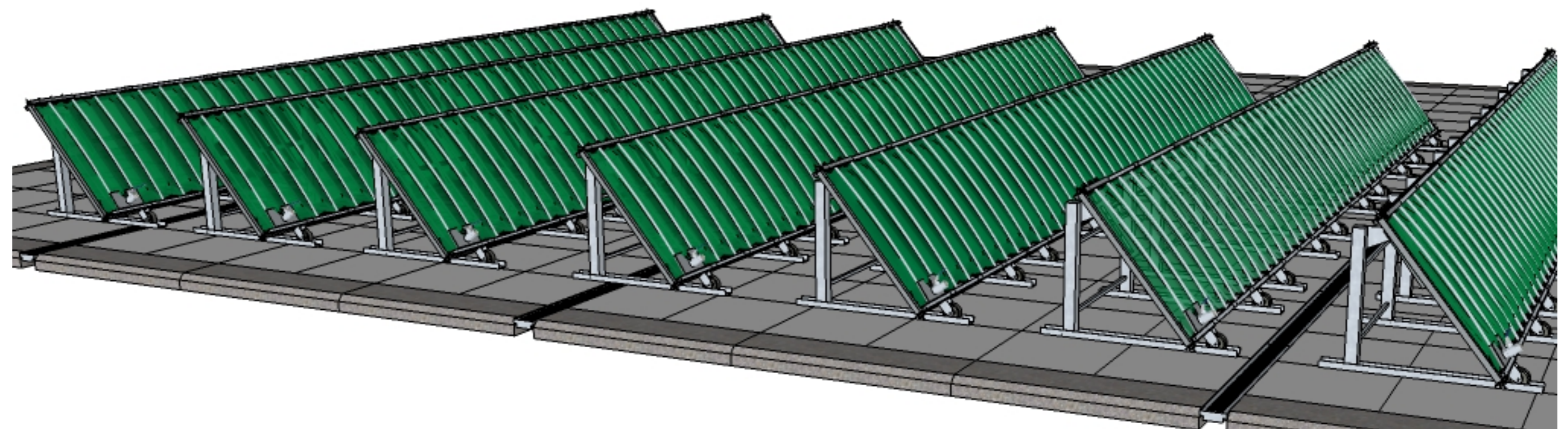
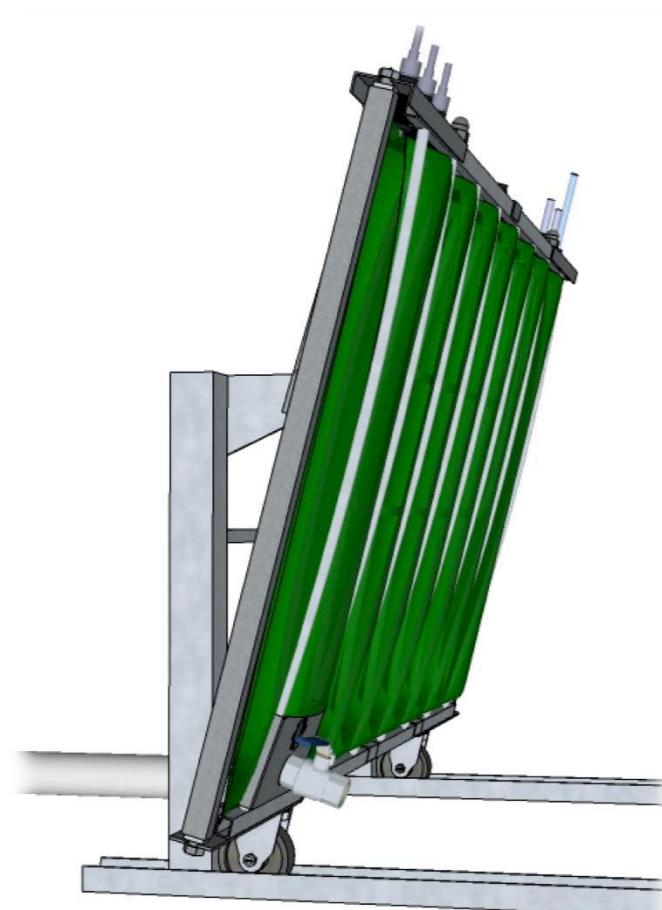
inclined +40°



The GWP-III is equipped with sensors (for pH, temperature, light, pCO₂, pO₂, gas flow) and a processor that allows continuous regulation of the cultivation process, data storage and alarm messages. **The harvesting process is totally automatized**. All the operations (angle change, dilution, pH correction, gas recycling, harvesting) can be **remotely controlled**.

A pneumatic cylinder operated by a photocell allows **continuous tilting and adjustment of the reactor to the incoming light** so as to optimize irradiance at the culture's surface (e.g., to increase the light availability to the cells, or avoid photo-inhibition, or reduce the request for cooling at noontime). The device varies reactor **tilting from +40° to -5°** with reference to the vertical, and thus it can be also used to alternatively scour the inner walls of the culture chamber by diverting bubbles from one wall to the other.

inclined -5°



As in previous models, if required, the energy necessary to operate the system can be produced directly by the photobioreactor itself, thanks to **photovoltaic bands integrated in the reactor's walls**.