3D Surfaces Design for Microalgae Cultivation in Algal Turf Scrubber Systems

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Abstract

Several researches have shown that the surface relief of the microalgae cultivation area in Algal Turf Scrubber - ATS systems directly influences productivity. Large-scale ATS systems are being employed to sequester Nitrogen and Phosphorus from lakes and eutrophic environments. The adoption of this technology presents a new vision in systems of treatment and recovery of water sources, mainly for those that serve as water supply for their populations. This article discusses the preliminary phase of the research that aims to develop 3D surfaces for microalgae cultivation in ATS systems in laboratory scale, incorporating technology and evaluating the environmental performance of the system to guide research with large scale application. The definition of surfaces used was based on rocks, natural fibers and mathematical models that extend the effective surface of the 3D model in relation to a projected surface. Consideration was given to the ease of obtaining the raw materials for molds and models and the complexity of the surfaces to be created to facilitate the cleaning of the surface and the harvesting of the algae in determined periods. The product design also aims to facilitate the large-scale manufacturing process, so it was employed various techniques for the preparation of surfaces such as: 3D modeling, 3D printing, 3D scanner, resin molding and gluing. Current results have shown that it is possible to develop low-cost, easy-to-manufacture 3D surfaces of medium complexity, thus providing the widening of the available surface area that can directly impact microalgae productivity.

Keywords: *Algal Turf Scrubber, Microalgae, Eutrophication, Product Design, 3D Surface*