How we play with wastewater! A story

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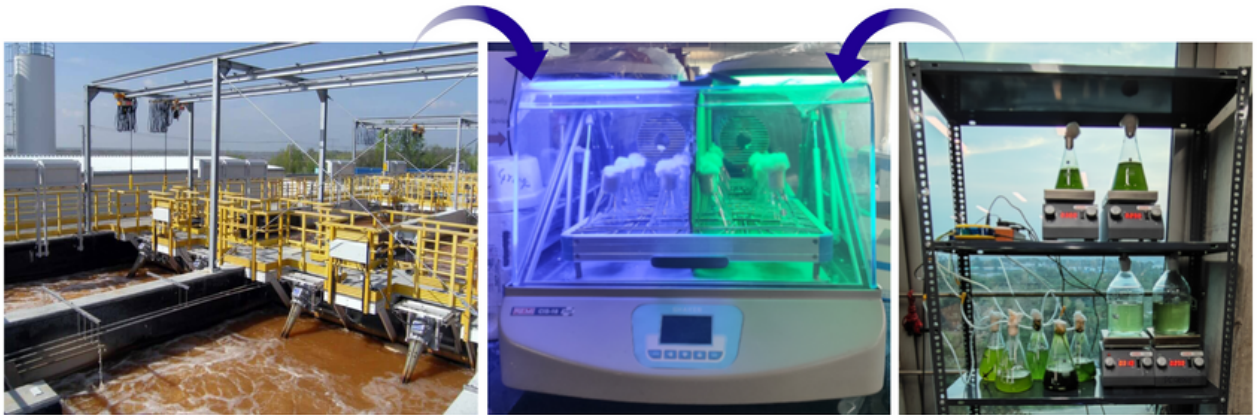
Industrialization is a term that is being used nearly everywhere these days. Like every reaction has an opposite response, industrialization has some adverse effects on the environment and us. Though it eradicates poverty and brings development, its effluents are too toxic. Here, the word toxic means a colossal concentration of pollutants directly harming the Earth, mainly the water bodies. Let us also brief a small statistic, 19% of freshwater is used by industries for their various operations from the Earth's property which is only 3% of total water [1]. Moreover, the water is used for industrial purposes, not giving it back entirely as it was. That means the whole Earth's water would be contaminated in just a matter of time. However, to prevent the scenario, we manage a system called a wastewater/ effluent treatment plant (WWTP). Here another problem arises, we need a massive amount of electricity as energy for it to operate, and who knows, the electricity that we use here is generated from a coal/ fossil power plant and reasoning air pollution! In contrast, there is no doubt that we need a system with minimum energy requirements and impressive efficiency.



Industrial Wastewater, Lab-scale reactor, Microalgae pure strain

Here we develop biorefinery, a technique Earth developed for her remediation. A hero, named microalgae, plays a key role here, we feed the wastewater to it, and it consumes nearly all the toxicity for its growth and gives us a source of energy as a gift. The story summarizes that the hero will purify the wastewater, reduce air pollution, increase oxygen saturation in the air, and resources for energy extraction.

Heavy metals, organic pollutants (pesticides, pharmaceuticals), pathogens (bacteria, viruses), excessive nutrients (nitrogen, phosphorus), and petroleum hydrocarbons are among the toxicants that are often found in wastewater [2].

These compounds threaten the environment, highlighting the need for efficient wastewater treatment to eliminate or reduce their presence.

Based on the motivation from mentioned scenarios, we are attempting to treat wastewater as effectively as possible while simultaneously valorizing byproducts like biofuel, such as biodiesel, biohydrogen, and biomethane. Though it's not an entirely new area of research, it has much scope to bring it up to the industries. We have created a design using statistics and are treating the undiluted industrial effluent on a lab scale. Additionally, we manipulate a few abiotic factors that affect cell activity to maximize the value of microalgal metabolisms for maximum treatment efficiency and biofuel resources. This is how we make wealth from waste.

References

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[2] H. M. Amaro, E. M. Salgado, O. C. Nunes, J. C. M. Pires, and A. F. Esteves, "Microalgae systems - environmental agents for wastewater treatment and further potential biomass valorization," J Environ Manage, vol. 337, Jul. 2023, doi: 10.1016/J.JENVMAN.2023.117678.

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