

## **Process analysis of microalgae biomass thermal disruption for biofuel production**

### **Abstract**

The continual usage of petroleum-sourced fuels is now widely recognized as unsustainable due to the depleting supplies, and the contribution of these fuels to the accumulation of greenhouse gases in the environment. A suitable alternative is the utilisation of renewable transport fuels. These fuels are environmentally friendly and economically sustainable. Biodiesel and bioethanol derived from plant lipids and carbohydrate-based crops are potential renewable alternatives to petroleum fuels. In recent years, the cultivation of microalgae as an alternative feedstock for the production of biofuel has received significant attention. This is as a result of the fact that, they have a fast growth rate, can accumulate high quantities of lipids and carbohydrates intracellularly for the production of biodiesel and bioethanol, respectively. That notwithstanding, the processes involved in the cultivation of microalgae, dewatering, biochemical extraction, and conversion to biofuels are energy intensive and as a result undermine its full-scale application potentials. This therefore has necessitated the need for an intensive attention and research in order to debottleneck the aforementioned areas. Electroporation, High pressure homogenization (HPH), Ultrasonic and Bead mills are examples of present cell disruption technologies. However, the electroportation process which at present seems more energy efficient than the rest has only been tried on a lab scale, and yet to be experimented on an industrial scale capacity. In this work, a successful design of an energy-efficient cell disruption technology that can treat up to a mass scale of 10,000gal/annum of lipids was designed by means of thermal lysis. A comparative analysis with other methods reveals that the designed system is significantly reliable, with the least fractional energy registered as low as 0.41 at an algal concentration of 6kg/m<sup>3</sup>.