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DEWATERING MICROALGAE FOR "GREEN" AVIATION FUEL

Abstract

Today fossil fuels provide more than 80 % of the global energy for aviation industry. The adverse environmental impact from the aviation sector, from the gaseous emission, causing global warming, is growing with increase in global travels demand. In addition to negative impact of climate change, health problem, environmental pollution and increasing crude oil price poses a threat to national security. Therefore a sustainable microalgae biofuel production can play a significant role in alleviating these problems, while reducing the net effect of carbondioxide in the atmosphere. Although this is a promising alternative fuel, it has been slowed by limitations in downstream technology, such as dewatering and harvesting and extraction, which account for 20 -35 % of the total cost of production. The choice of dewatering technique depends largely on the characteristic of the microalgae. In the proposed project, the effectiveness of various flocculants on the dewaterability of microalga was investigated, using measurements such as total suspended solids (TSS), turbidity and absorbance as assessment values. The flocculants which include multivalent metal salts and/or cationic polymers are added to algal suspensions as coagulants to neutralize or reduce the negative charge carried by microalgae cells that prevent their aggregation. Also, the reliability of a laboratory-built, low-cost capillary suction time (CST) device was implored to determine an optimal algal centrifugation speed and time for future dewatering. The optimal time and speed for algae centrifugation was found to be 10 minutes at 2000 rpm, resulting in 11 % solid algae, while the lowest was 4.9 % at 1000 rpm for 5 minutes. After comparing the results of adding the various flocculants, a cationic polymer was found to be the most effective in promoting flocculation. Tests with the fabricated CST device showed that the algae filtered rapidly, which may be due to the thinness of the filter paper used, along with the dilute nature of the algae, while with algae concentration < 1000 mg/L, the filtrate flowed in an oval shape.