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New technologies for the complete rendering and economic conversion of waste scum to biodiesel

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Scum is a floatable material skimmed from the surface of primary and secondary settling tanks at wastewater treatment plants. It is made of a variety of sources including animal fats, waste cooking oil, food wastes, plastic material, soaps, and other trace impurities discharged from restaurants, households, and industry. A newly developed process technology serves the dual purpose of extracting and converting scum oil to higher value products (biodiesel and glycerin), while reducing environmental pollutants in both landfills and water resources. By passively removing high-energy fats and oils from the total waste stream, a free substrate for on-site energy production becomes available, rather than goes to landfill or incinerated. According to industrial experts, 70-90% of the operating cost of running a biodiesel facility is the cost of purchasing the initial oil substrate. Large waste water treatment facilities can produce over 20,000 pounds of scum a day. Laboratory results indicate that 62.5% of the dried and filtered scum oil can be extracted as usable oil and converted to ASTM grade biodiesel. Citing experimentally generated pilot-scale conversion efficiencies against assumed operational costs, a techno-economic analysis of the process conservatively estimated a 3-4 year ROI. A patent has been awarded by US patent office to protect the IP. Further research was conducted to combine the two technologies, biodiesel transesterification and microwave-assisted pyrolysis (MAP), with the overall goal of improving process yields and waste management during biodiesel production. The objective was to recovery methyl esters from the biodiesel waste stream Vacuum Distillation Bottoms (VDBs), using MAP. Using the rapid heating capabilities of the MAP system with fixed-bed catalyst along with novel reactor designs, a bio-oil was produced that could be blended seamlessly into distilled biodiesel, without causing analytical failure during certification testing, according to ASTM D6751. MAP processing allowed for the recovery of over 85% wt/wt bio-oil in the form of methyl esters and hydrocarbons.

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