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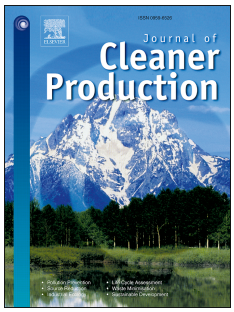

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Environmental impact of CO_2-expanded fluid extraction technique in microalgae oil acquisition

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Abstract

Environmental impact of CO_2-expanded fluid extraction technique in microalgae oil acquisition was quantitatively analyzed using life cycle assessment (LCA) method and compared with other available extraction techniques. It was found that CO_2-expanded fluid extraction technique exhibited only one-tenth of environmental impact over other extraction methods, particularly on organic respiratory and climate change. Achieved low environmental impact was mainly attributed to the high extraction efficiency that further allows it for operating in mild pressure and shortened period of time, which dramatically decreases the energy consumption and afterwards environmental impacts. Utilizing renewable energy for CO_2-expanded fluid extraction would further lower its environmental impact by minimizing carbon footprint resulting from electricity generation. Importantly, based on water-energy nexus consideration, the low environmental impact along with low energy consumption of CO_2-expanded fluid extraction technique arises an opportunity to regard microalgae oil an energy storage vessel in response to the intermittent nature of renewable energy. This would be a new incentive for the development of microalgae oil production.

Keywords: CO_2-expanded fluid extraction, Microalgae oil, Life cycle assessment, Water-energy nexus, Energy storage vessel