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Transient natural gas liquefaction process comparison-dynamic heat exchanger under transient changes in flow for energy storage with cryogenic carbon capture (CCC-ES)

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Transient modeling and optimization of two natural gas liquefaction processes have been done using Aspen HYSYS. In case of energy consumption, the optimized model has been chosen for transient modeling. These results pertain to Liquified Natural Gas (LNG) generally and to an energy storage process associated with cryogenic carbon capture (CCC) in which the LNG process plays a prominent role. The energy storage CCC process influences the time constants and magnitudes of the flow rate characteristics. These flowrate variations affect all units, especially compressors and heat exchangers. New types of heat exchanger design and optimization method; Model predicted control theory (MPCT) have been presented and transient responses have been compared with traditional design. The proposed process controls temperatures, pressures and other operating parameters. K-value and U-value techniques guide flowrate and heat exchanger stream variations. Transient responses to both ramping and step-changes in flow rates indicate process responses including summary effects represented in transient efficiency graphs. Finally natural gas (NG) consumption and LNG production have been compared to show the optimality of new design.

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Enhanced biogas and fertilizer production through anaerobic co-digestion sanitary wastewater and kitchen solid waste under ambient temperature: Waste generated from condominium house

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Addis Ababa is one of the fastest growing cities where high urbanization has become a challenge. The municipality has launched a huge condominium housing program in response to the housing shortage problem in the city. However, sanitary wastewater and solid waste management are the critical problems to those houses. The wastes were collected and evaluated for its biogas production and fertilizer potential to solve the foreseen waste management problems. The physicochemical characteristics of the collected wastes were determined. A laboratory scale batch anaerobic co-digestion of both wastes with different mix ratio of 100:0, 75:25, 50:50, 25:75, and 0:100 (sanitary wastewater: kitchen organic solid waste by volume) were carried out at ambient temperature for 30 days. The amount of biogas produced during the digestion period for those mixing ratios were compared. The physicochemical characteristics showed that kitchen wastes were rich in nutrients and easily biodegradable organic compounds. While sanitary wastewater contains high amount of nitrogen and trace metals, which makes the co-digestion of the two waste more attractive. Highest cumulative biogas yield of approximately 65.6L were obtained from 25:75 mix ratio, followed by 50:50,100:0, 25:75, and 0:100 with biogas productions 52.7, 50.0, 23.7 and 9.5 L, respectively. The percentage of methane gas during the study period was between 19.8-62.8%. With regard to the fertilizer potential of the digested sludge; composting and sun drying process were effective and helpful for land application by completely inactivating the pathogen.

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