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Assessment of Wastewater Treatment Feasibility from the Hydrothermal Liquefaction of Biosolids

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ABSTRACT

Hydrothermal liquefaction is a thermochemical process which converts organic material to renewable crude oil at high heat and pressure. This process produces wastewater as a byproduct, with the largest of these being a wastewater stream. Biosolids comprise a promising feedstock for hydrothermal liquefaction because they are constantly produced by wastewater treatment plants and are amenable for conversion to a renewable crude oil product. The co-location of hydrothermal liquefaction and wastewater treatment facilities present an opportunity to improve the circular economy credentials of hydrothermal liquefaction by providing a sustainable treatment and disposal path. However, there has been little evidence developed with regards to assessing the feasibility of biologically treating this hydrothermal liquefaction waste stream.

This presentation will exhibit the results from the hydrothermal liquefaction of various biosolids. The biosolids utilized in the experiments were obtained from differing wastewater processes to assess the breadth of facility types encountered in industry. The wastewater resulting from the production of renewable crude oil was separated from the solid, organic and gaseous phases of the reaction and subjected to a series of experiments to quantify the make-up of the wastewater to collect information suitable for the modelling and design of biological processes for the treatment of this waste. The components of the wastewater were able to be correlated with properties of the biosolid feedstock allowing for prediction of wastewater properties depending on the pretreatment the biosolids had undergone prior to hydrothermal liquefaction.

Knowledge of the physical and chemical parameters of a particular wastewater is not sufficient on its own to design a biological treatment process. Also of importance is the impact the wastewater will have on biological activity. To that end, this presentation will also exhibit preliminary experimental results that assess the impact of the wastewater on the growth of bacteria obtained from the mixed liquor of a wastewater treatment plant. The data obtained allows for the kinetic impact of the waste on the wastewater treatment plant to be estimated.

KEY WORDS

Hydrothermal liquefaction, wastewater treatment, renewable fuels.

BIOGRAPHY

Robran is a charteerd professional engineer with over two decades of practicing experience in the field of water and wastewater treatment. His background in chemical and environmental engineering has seen him work on some of the country's largest water projects in a number of project phases from concept engineering through to commissioning, operations and optimization. In addition, Robran is also in the later stages of a part time PhD in the School of Chemical Engineering at the University of Adelaide where he is researching the environmental impacts of wastewater from the hydrothermal liquefaction of biosolids.

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