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Design, Global Sensitivity Analysis and Optimisation of a Counter-current Spray Column for Splitting Triglyceride Mixtures

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We present the model of a counter-current spray column which hydrolyses mixtures of triglycerides with water and leads to fatty acids and glycerol. A finite volumes model was implemented in Fortran and validated with an analytical model derived from experimental data found in literature.

Global, variance-based (Sobol) sensitivity analysis allowed to assess the sensitivity of the sweet water glycerol content to liquid density, overall mass transfer coefficient, reaction rate coefficient and the equilibrium ratio to rank them accordingly and to evaluate if the confidence intervals of the predicted properties are acceptable in respect to the calculated design or economic costs.

Monte-Carlo based optimisation was performed to minimize operating cost varying the steam inlet flow rate and distribution as the independent variables.

This model-based approach allows to be adapted to different spray column setups and gives the engineer a valuable tool to validate, analyse and optimise an industrial scale spray column. The possibility to perform parameter estimation is given if experimental data from an existing plant is provided.

Please feel free to contact us for any questions you may have:

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