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Virtual Modelling of Turbulent Fibre Flow in a Low Consistency Refiner for a Sustainable and Energy Efficient Process

Authors : Simon Ingelsten, Anton Lundberg, Vijay Shankar, Lars-Olof Landström, Örjan Johansson

Abstract : The flow in a low consistency disc refiner is simulated with the aim of identifying flow structures possibly being of importance for a future study to optimise the energy efficiency in refining processes. A simplified flow geometry is used, where a single groove of a refiner disc is modelled. Two different fibre models are used to simulate turbulent fibre suspension flow in the groove. The first model is a Bingham viscoplastic fluid model where the fibre suspension is treated as a non-Newtonian fluid with a yield stress. The second model is a new model proposed in a recent study where the suspended fibres effect on flow is accounted for through a modelled orientation distribution function (ODF). Both models yielded similar results with small differences. Certain flow characteristics that were expected and that was found in the literature were identified. Some of these flow characteristics may be of importance in a future process to optimise the refiner geometry to increase the energy efficiency. Further study and a more detailed flow model is; however, needed in order for the simulations to yield results valid for quantitative use in such an optimisation study. An outline of the next steps in such a study is proposed.

Keywords : disc refiner, fibre flow, sustainability, turbulence modelling
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