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Assessing the Mixing Effectiveness of Dual-Impeller Systems in the Agitation of Viscoplastic Fluids[1] ANDREW RUSSELL, LYES KAHOUADJI, Imperial College London, SEUNGWON SHIN, Hongik University, South Korea, JALEL CHERGUI, DAMIR JURIC, LIMSI, CNRS, France, RICHARD CRASTER, PAUL LUCKHAM, CHRISTOS MARKIDES, OMAR MATAR, Imperial College London — Carbopol 980 (C980) solutions are agitated with impeller systems comprising either a two 6-bladed Rushton turbine (RT) impellers, two 4-bladed 45 pitched blade turbine (PBT) impellers, or a combination of both impeller types. The effects of impeller rotational speed, N, impeller separations, G, and the impeller combinations on the flow were investigated. Phenomena including mixing, cavern-cavern segregation and flow compartmentalisation are explained with respect to the velocity field and streamlines that result from agitation by the various impeller combinations. The quality of mixing is compared for each impeller geometrical setup, with the best mixing, in terms of achieving a state of homogeneity throughout the entire vessel at the lowest N, modified power-law Reynolds numbers (Re_{m}), yield stress Reynolds numbers (Re_{y}) and mixing times, being the PBT(upper)-RT(lower) impeller setup with $G = 0.05$ m. These numerical results, validated against flow visualisation experiments, are important in the context of achieving flow homogeneity in fluids with complex rheological properties in stirred vessel systems, and can be used to show that these flows are sensitive to impeller geometrical setup and other important operating conditions.

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