

178c Using CFD to Capture Macro-Instability Modes in a Stirred Tank

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Macro-instabilities (MIs) have been widely observed in baffled stirred tanks of all sizes agitated with both radial and axial impellers. This type of instability is characterized by a precessing vortex structure with a period far longer than that of the rotating impeller. In vessels with radial impellers, precessing vortices are often observed above and below the impeller centerline. Recent measurements of MIs in Rushton-stirred vessels (1) show prominent fundamental modes in the energy spectra and, in some cases, harmonics. The ability of CFD to capture these modes will be reviewed. Using the sliding mesh impeller model in a finite volume solver (FLUENT), both unsteady RANS and large eddy simulation (LES) turbulence approaches will be considered. Other factors that could influence the ability of CFD to capture the modes, such as grid dependence, will also be addressed.

1. Micheletti, M. and Yianneskis, M., *Precessional flow macro-instabilities in stirred vessels: study of variations in two locations through conditional phase-averaging and cross-correlation approaches*, Proc. 11th Int. Symposium on Applications of Laser Techniques to Fluid Mechanics, Lisbon, 12-16 July 2004.