

The use of Physical Modelling to Investigate Complex Industrial Mixing Problems

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Abstract

The investigation of industrial mixing problems is often hampered by limited physical access, lack of appropriate measurement techniques and the difficulties associated with disrupting a commercial process. In many instances, physical modeling is highly effective in overcoming these challenges, providing significant insights into process behaviour and allowing potential modifications to be evaluated prior to implementation in production environments.

A typical physical modeling study begins with dimensional analysis, selection of appropriate analog fluids and construction of an appropriate laboratory model. A wide range of measurement techniques are available depending on the nature of the problem including flow visualization, laser Doppler velocimetry, laser induced fluorescence, phase Doppler interferometry, conductivity measurement, torque and power measurement, sample extraction, particle sizing, etc. This presentation reviews a number of industrial mixing problems which Coanda Research and Development Corporation has successfully tackled over the last fifteen years. These case studies demonstrate the tremendous insights, and the effective and practical solutions that can be achieved with physical modeling.

keywords: mixing, physical modeling, dimensional analysis, LIF, LDV, conductivity, industrial fluid dynamics, process optimization, purging.

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