# Integrated CFD model for optimization of polypropylene production

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CFD (computational fluid dynamic) method was incorporated with RSM (Response surface methodology) to identify the optimum process parameters for estimation of maximum of polypropylene production rate in the fluidized bed reactor. Computational Fluid Dynamics (CFD) technique was applied to give an idea for non-linear fluidized bed dynamic behaviors. RSM approach was exercised to describe the comprehensive phenomena of the process parameters on production rate. Semi-batch type experimentations were conducted to validate the hybrid CFD model. The process parameters, sensible to the thermo-mechanical properties of polypropylene, were chosen for optimization factors. Polymerization rate was calculated per pass basis. Response surface methodology (RSM) in combination with analysis of variance (ANOVA) was applied to explain the significant of the process parameters interaction, identification of optimum percentages of polymerization and significance of model parameters. In order to explain the elaborate findings the three dimensional RSM design and 2D contour graphs were generated. Both methods showed that the process parameters have significant effect on polymerization rate in the pilot scale reactor. The successful combination of CFD with statistical theory has proved that the very complex bed structure investigation at optimum process conditions is possible through this integrated model.