

Mechanical Engineering Colloquium

Spring 2011 Semester

1pm Wednesday April 13

Room 224 Mechanical Engineering Center

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“Interactions of Flow and Reaction in Fluid Catalytic Cracking (FCC) Risers”

Abstract:

The Fluid catalytic cracking (FCC) process has been the most widely used technology for the conversion of various refinery hydrocarbon streams into high-octane gasoline and high-value petrochemical feed-stocks. Great strides have been made to develop predictive process models for riser reactor performance; with development focused on molecule-based cracking kinetic network and little attention has been paid to fundamental coupling of multiphase hydrodynamics and reaction kinetics. Local coupling between hydrodynamics and reaction kinetics is critical to the development of riser reaction models, as most reactions occur inside catalysts pores. The reaction performance relies strongly on catalyst temperature, local CTO, spent-fresh catalyst composition (due to back flow near wall), and reaction time duration; which are all functions of local reaction-coupled hydrodynamics. Few of these coupling mechanisms have been investigated.

As a first step, we develop modeling approach to capture dominant features of flow-reaction coupling in FCC riser reactor. The model predictions reasonably match with plant data and shows the cracking intensity at the riser bottom is much greater than that calculated from conventional riser models, which neglects oil-catalyst hydrodynamic coupling and catalyst dilution due to volume expansion.

Mr. Rajeshkumar Patel is a doctoral candidate in the department of Mechanical & Industrial Engineering of the NJIT. He received his Bachelor degree in Mechanical Engineering from Sardar Patel University, India, in 1999 and Masters degree in Thermal Science from the Maharaja Sayajirao University, India, in 2002. Before joining NJIT for his PhD study in mechanical engineering in 2008, he worked as a Lecturer then Assistant Professor at the Laljibhai Chaturbhai Institute of Technology (LCIT). He has published 8 technical papers in professional journals and conference proceedings during his doctoral research at NJIT.

For more information, please contact Dr. Zhiming Ji, 2011 Spring Seminar Coordinator