

Mechanical Engineering

Spring 2008 Seminar

Wednesday, April 16, 2008

1:00-2:30pm

Room 224 MEC

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New Jersey Institute of Technology

Mechanistic Modeling of Dilute Powder Flows

Typical concerns in transport of dilute powder flows through pipelines or reaction chambers include the hydrodynamic power consumption, the powder loss due to the pipe wall attachment, redistribution of powder constitutes due to the different dynamic response of constitute, and change in powder characteristics due to charge generation or redistribution. The turbulent transport characteristics of dilute powder flows depend on the controlling physical mechanisms of particle-fluid interactions, particle-wall interactions, and turbulent transport, as well as the pipeline configurations and transport conditions. Most powders carry electrostatic charges generated via triboelectric charging by particle-wall collisions or by other charging mechanisms such as corona charging. Thus, an appropriate modeling approach of dilute powder flow involves not only the particle-laden turbulent flow with a confined wall boundary but also the coupling effect of powder charges. Pipe configurations and pipe materials can have dominate effects on the heterogeneous flow patterns of powders. This presentation will first review some basic physical mechanisms of dilute powder flows, followed by an introduction of general modeling approaches. Some modeling examples of dilute powder flows will be illustrated. Typical features and applicability of some commercial CFD codes to the prediction of dilute powder flows will also be discussed.

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