Energia Technologies

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REACTORS - Design, Analysis and Scale-up
Example Class Syllabus

Section 1: General Introduction

Section 2: Reactors

- Reactor Types
- Advantages and Disadvantages
- Reactor Selection
- Applications

Section 3: Reactor Design

- Part 1 (Design)
  - Flow Regimes
  - Pressure Drop
  - Catalyst Distribution (number of catalyst beds/individual bed lengths)
  - Catalyst Loading
- Part 2 (Performance-Hydrodynamic Parameters)
  - Liquid Hold-up
  - Liquid Distribution
  - Catalyst Contacting Efficiency
  - Liquid Residence Time Distribution
- Part 3 (Performance-Kinetic Parameters)
  - Reaction Kinetics
  - Reactor Temperature Profiles
  - Mass Transfer/Heat Transfer

Section 4: Reactor Scale-up

- Pilot Plant/Commercial Reactor Differences
- Scale-Up Strategies, Simple to Complex
- Laboratory Reactors

Section 5: Modeling

- Hydrocracker Reactor Model
- Reactor Model Description
- Lumped Reaction Chemistry
- Model Validation
- Simulations of Reactor Performance

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Section 6: Reactor Internals

- Components and Functions
- Performance Requirements
- Design Criteria
- Flow Distribution
- Quenching and Mixing

Section 7: Cold Flow Modeling

- Benefits and Limitations
- Scale-Up Data
- Lessons Learned

Section 8: Reactor Safety

- Temperature Excursion/Temperature Runaway
- Safe Design and Operating Guidelines
- Stability Criteria
- Catalyst Loading and Preparations
- General Emergency Guidelines

Section 9: Troubleshooting

- High Reactor Pressure Drop
- Pressure Drop Buildup During Operating Cycle
- Pressure Pulsing of the Reactor
- Channeling
- Flow Maldistribution
- Temperature Maldistribution
- Quench Efficiency
- Low Initial Catalyst Activity
- Loss of Catalyst Activity
- Low Temperature Response