



Chemical Engineering Sponsored Junior/Senior Engineering Clinic Project Preview Fall 2008



EXCLUSIVE RANKINGS

#1 BESTSELLER

U.S. News & World Report

2008 EDITION

\$670,000 IN SCHOLARSHIPS

FROM AEA IN ASSOCIATION WITH U.S. News

DETAILS ON PAGE 8

America's Best COLLEGES

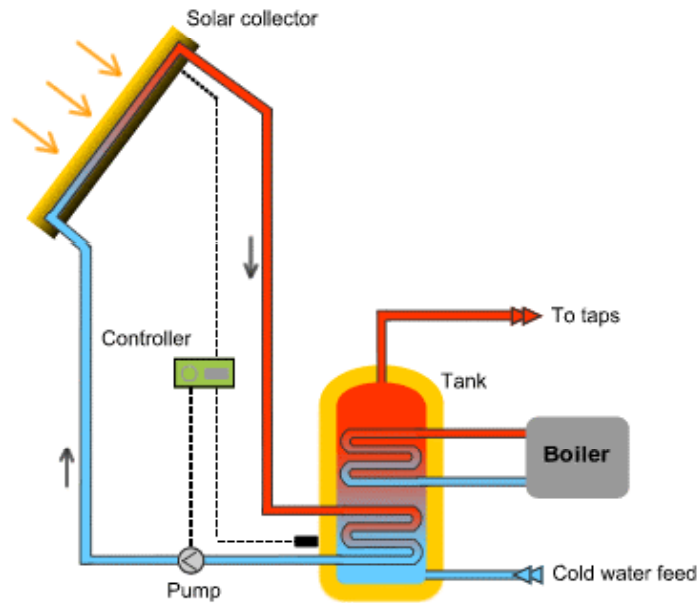
Rowan ChE
Top Ranked
Public Undergraduate
Program 2008

ChE 01 – Novel Approaches to Solar Heating

Project Manager: Dahm

Co-PM: Lefebvre

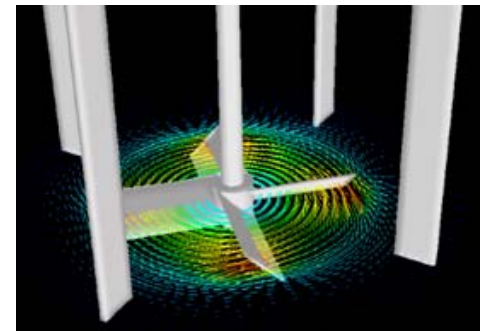
Sponsor: Helios Products, LLC



ChE 02 – UNSTEADY TWO PHASE MIXING

PMS: Drs Etchells, Grenville, Simpson from DuPont. Hesketh

- Unsteady mixing of slurries is a common problem in processing catalysts or mineral ores or pharmaceuticals
- Example: Zn based catalyst slurry feed to a continuous pharmaceutical reactor.
- Examine using several geometries:
 - Unsteady single phase flow out of stirred vessel
 - Unsteady 2-phase flow from stirred vessel
- Measure
 - Suspension quality
 - flowrates



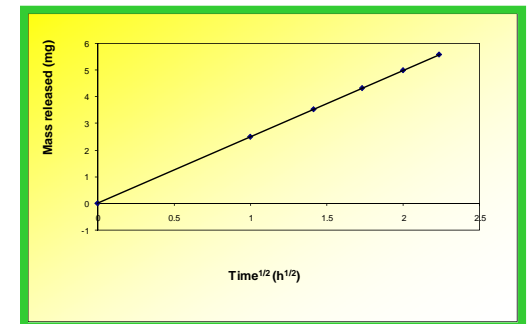
Students: 3 Chemical Engineers, 1 Mechanical Engineer



ChE 03 - Drug Delivery From Solid Matrix Tablets

PM: Farrell CoPM: Savelski

- Major pharmaceutical R&D area
- High growth sales market
- ChEs are essential to success
- Develop educational materials to introduce
 - Drug delivery
 - Oral dosages
 - Tablet preparation
 - Data analysis
 - Physical properties
 - Rate of release



Funded by [NSF/Rutgers ERC](#) for Structured Organic Particulate Systems

ChE 04 - Feeding Tube Occlusion

PM: Farrell

- Clogging is a common problem with nasogastric (n-g) tubes
- Investigate factors causing occlusion in pediatric n-g tubes
 - flow rate
 - Tube diameter
 - Specialized formulas
 - Gastric pH
- Collaboration with MDs at Medical University, Graz, Austria



Che 05: Particle Properties: Investigation for Course Development

(PIs: Gephardt / Savelski)

(2 ChEs)

- Particle properties course demonstrations and laboratories
- Hopper/funnel flow
- Forces in particle flow
- Particle segregation
- V- mixing
- Publication

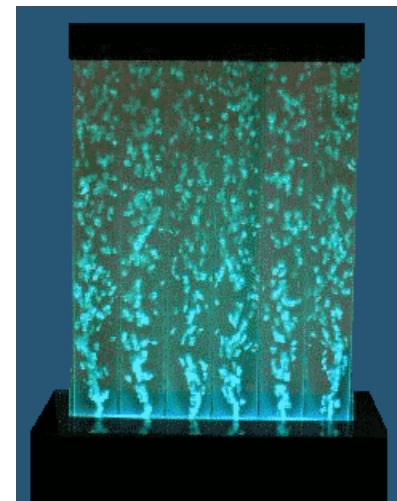
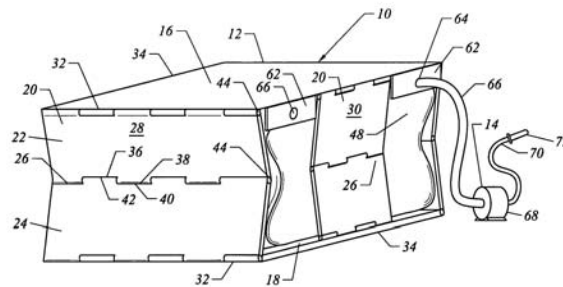


ChE 06 – Airlift Technology Applications

PI: Gephardt

(1 ChE and 1CEE or 2 ChEs)

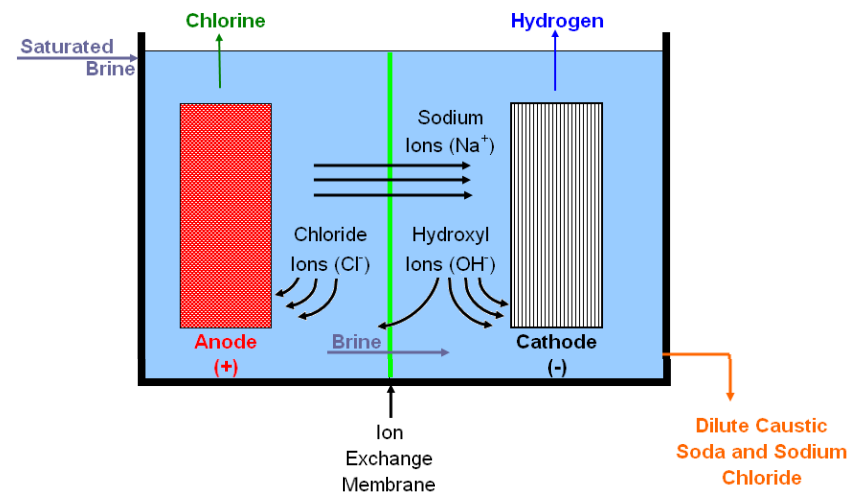
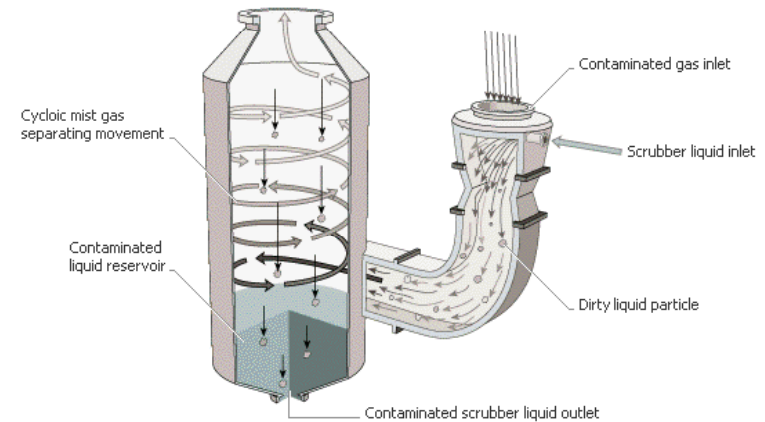
- Model development based on existing work
- Optimization
- Investigation of effect of air bubble size on liquid flow size on liquid flow
- Experimental Design



ChE 07 - Johnson Matthey Spent Scrubber Solution Recycle PM: Hesketh, Co-PM Farrell



- NaOH used to scrub acid gases from processes
 - 1500 tons of 50% NaOH annually
 - NaCl by-product from rxn with HCl
- Recycle spent scrubber solution
 - Design and test a lab scale system for electrolytic treatment
 - Define key variables
 - Perform economic analysis
- Students: 3 ChE + 1 Chem



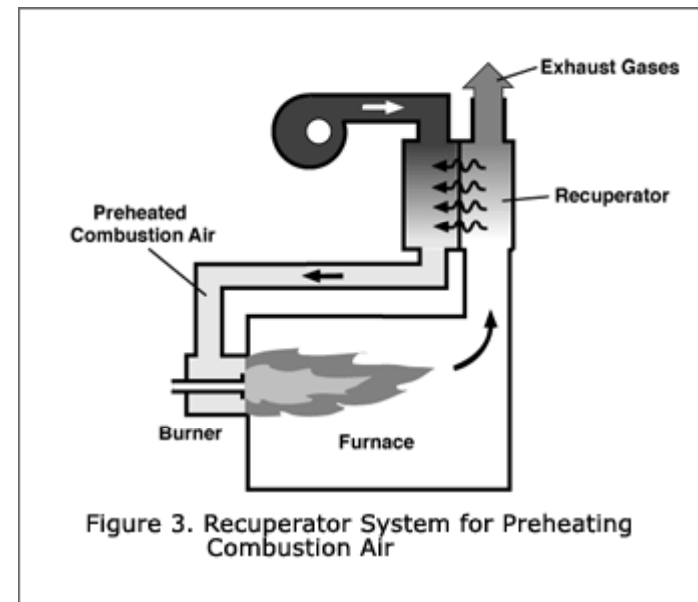
ChE – 08 Johnson Matthey

Waste Heat Recovery

PM: Hesketh Co-PM: Farrell

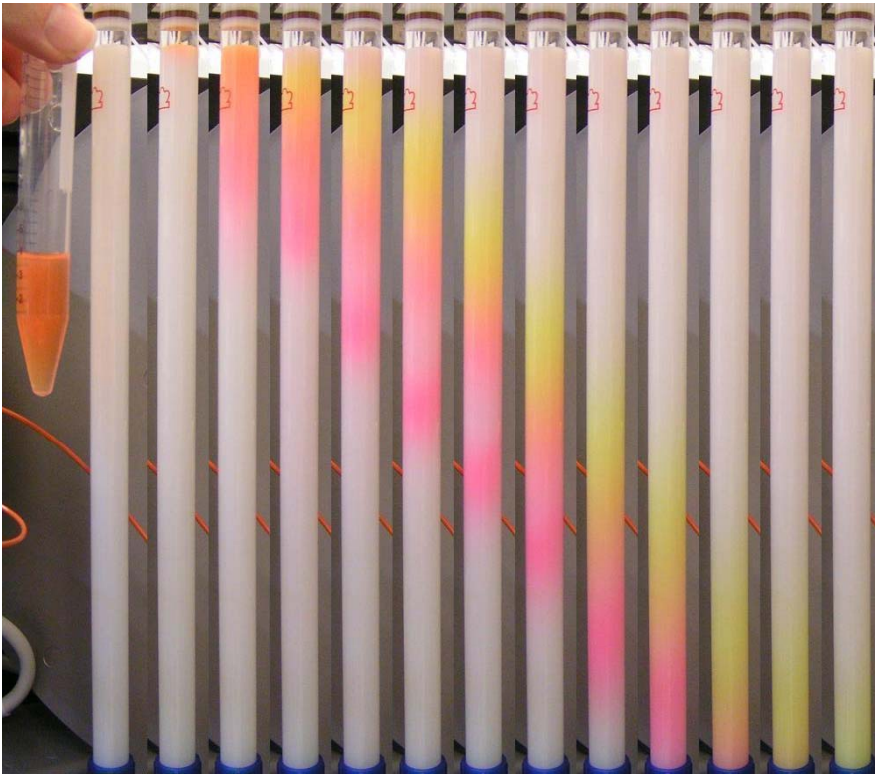


- Reduce natural gas consumption
- Reduce greenhouse gas emissions
- Design waste heat recovery system
 - Reclaim waste heat from plant furnace
 - Pre-heat combustion air to same system
- Interact with key plant personnel
- Requires travel to JMI
- Students: 1-2 ChE + 1 ME



ChE 09 - Colorful Proteins

PI: Lefebvre, co-PI: Farrell



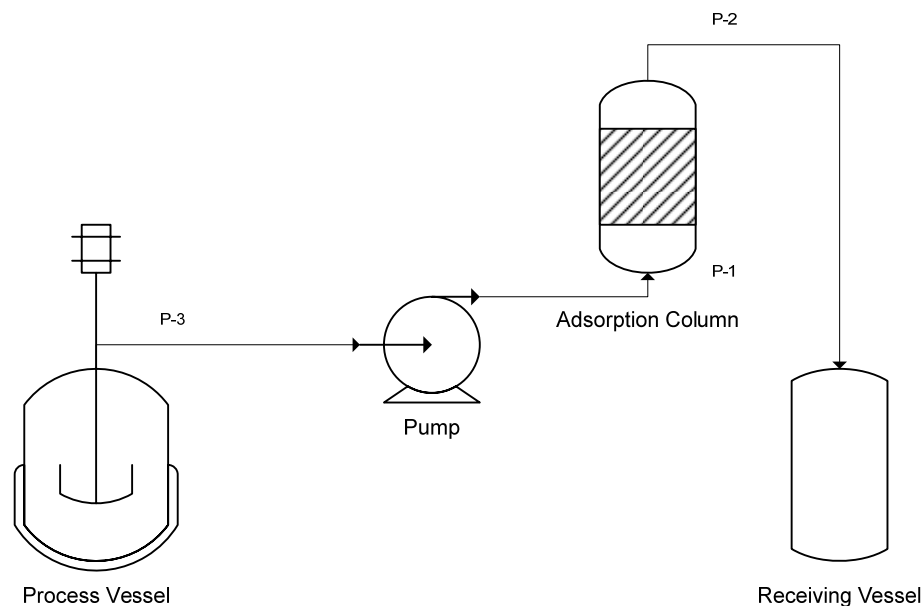
- Produce colorful proteins in *E. coli*
- Use mixtures of the colorful proteins to illustrate and test bioseparations (HIC, RME)



ChE 10 – Catalyst Removal from Pharmaceutical Processes

PI: Lefebvre, co-PIs: Farrell, Hesketh

- Sponsored by Novartis (East Hanover, NJ)
- Improve process for palladium removal from reactor by designing adsorption column
- Interact with Novartis chemists and engineers
- Produce model API
- Study adsorption column performance
- Model adsorption behavior, predict scale-up





ChE 11 - Bug Power: Fermentation

PIs: Lefebvre, Savelski, Hecht

THE PROBLEM:

Preparation of feedstock for bioethanol production results in the production of various organic compounds that are toxic to the fermenting organism

THE PROJECT:

1. Identify new ethanologenic bacterial mutants resistant to multiple specific toxins.
2. Carry out toxicological analysis to quantify the new strains.
3. Conduct pilot fermentation tests to produce bioethanol using the new strains. Looking for additional students on this project task.

ChE 12 – Coal Gasification

PMs: Ramanujachary & Hesketh

- Develop a process for sustainable liquid fuels
- Experimental Plan
 - Prepare a nano catalyst
 - Characterize (SEM, XRD, TGA)
 - Test catalyst
- 2 ChE's and 2 Chemists

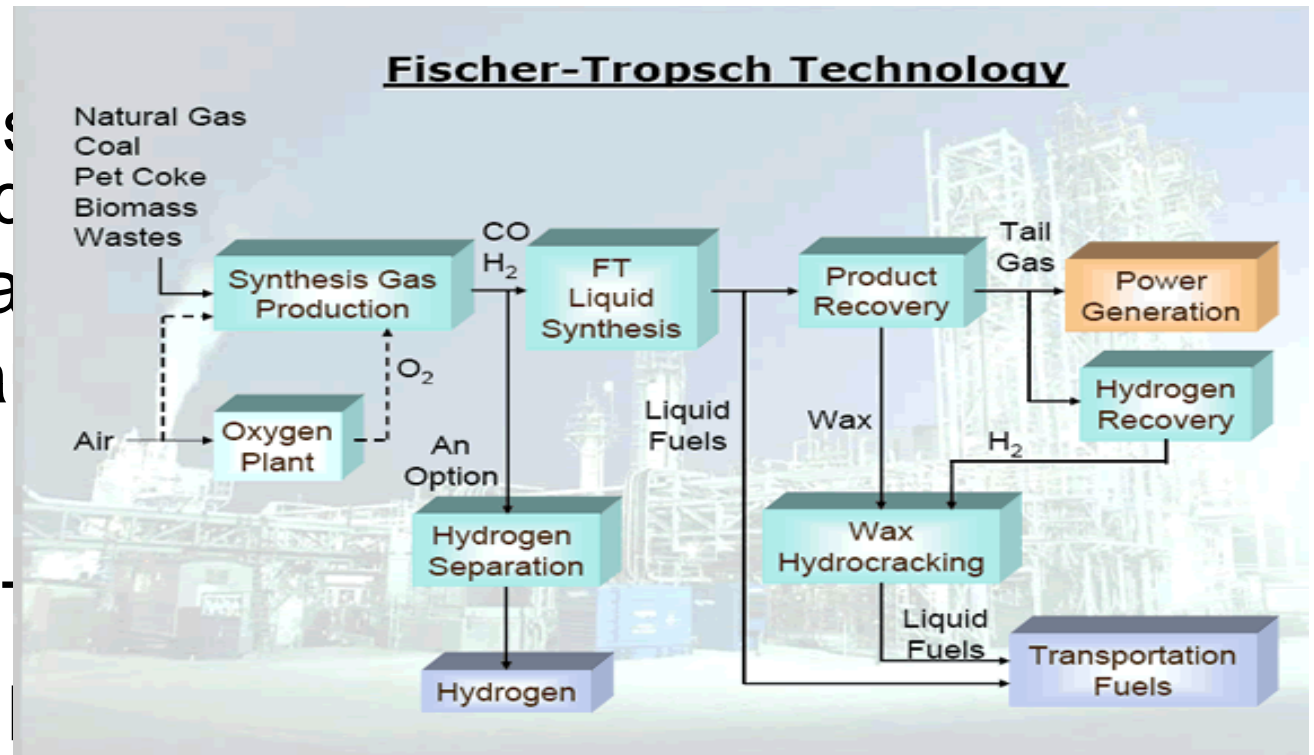


Figure : Flow Diagram of the Synthesis Gas to Liquid Fuel Process

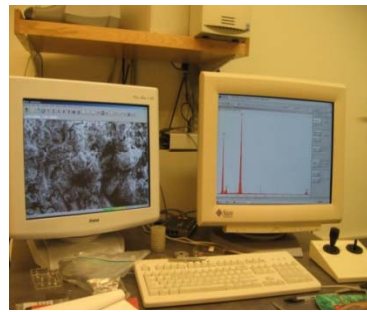


Figure : SEM Image of Cobalt Metal Dispersed on Silica Catalyst Particles



Figure : Autoclave Engineer's BTRs Jr.

ChE 13 – Particle Filtration Laboratory Development

PI: Slater Co-PI: Savelski

- Solid-Liquid filtration is used in pharmaceutical, cosmetic, food and specialty chemical industry
- Develop an experiment for the Unit Operations Laboratory course (some work started Summer 2008)
- Develop experimental write-up (background, procedure, results, etc) based on time and process constraints; generate data that can be appropriately analyzed by filtration equations – write-up example lab report
- Note: if you are afraid of getting wet, don't sign-up



ChE 14 – Curriculum Module in Organic Particulate Processing

(PIs: Slater, Savelski)

- Rowan is the Outreach Partner for the NSF Engineering Research Center on Structured Organic Particulate Systems (Rutgers, Purdue, NJIT, Univ Puerto Rico-Mayaguez)
- Develop instructional materials – problem sets for introductory ChE courses on processing (particle flow, mixing, tableting, particulates used in pharmaceutical and consumer product industries)
- Interact with Grad students/Faculty at Rutgers and Purdue to get info and feedback on project
- Problem sets, “Curriculum Fact Sheets,” link to research theme of Center and fit within objectives of ChE course and have flexibility for K-12 to College audience

