PROCESS SCIENCE & TECHNOLOGY CENTER

TEXAS A&M UNIVERISTY

THE UNIVERISTY OF TEXAS

UNIVERSITY OF SOUTH CAROLINA

Mission Statement:

The PSTC's goal is to promote advances in process science and technology and workforce education by leveraging government and industrial resources in a highly collaborative program.

Center Structure:

The center is divided into three focus areas:

- Separations technology development
- Process optimization, control, and safety
- Energy and environmental research

Funding Mechanism

Level A - A minimum contractual payment of $ 15,000 is required to participate in the center activities. This entry fee is directed by the sponsoring organization to one of the three focus areas. At this level of participation, the sponsor receives rights to participate in all areas of the program and to receive all technical information generated by all the program researchers.

Level B – In addition to the rights of the Level A participants – an additional contribution of $ 25,000 to a specific Project Manager (PM) or project entitles the participating organization to have a representative on the Center's Board of Management and participate as a voting member one a focus area steering committee.

The contractual period is two years with fees increased periodically to cover increased center operating costs.

Center Administration

The central PSTC administration is located at UT-Austin with the project activities coordinated by the center Principal Investigator. Individual PM activities are conducted at their host institutions. Center administration costs are obtained from the company contributions and are leveraged with external funds.

Meeting frequency and location

Two meetings are held per year at either the University of Texas or Texas A&M.

Board of Management / Intellectual Property Rights

The operation of the Board of Management and the assignment of IP rights are covered in detail in the Center's Research Participation Agreement. In summary, the individual focus group steering committees will meet once a year at the end of the Fall PSTC sponsors' meeting. The committees will consist of one voting member from each eligible company and the non-voting center director. Research concepts may be generated by either the PM or through interaction with PSTC sponsoring companies. However, the PM will be responsible for submitting the proposal to the steering committee

Participants will have royalty free use rights to all intellectual property generated by the center. The intellectual property will be assigned to the host institution(s) of the PM(s) with royalty free use rights given to sponsoring companies.

Deliverables

An annual report will be prepared summarizing projects supported by the center. Presentations summarizing the status of each on-going project will be made yearly. Presentations of externally funded projects of interest to the center sponsors may be made if time permits. These projects may also be included in the center annual report. Student resumes will be made available to sponsoring companies with the intent of facilitating the placement of students with center sponsors. Draft manuscripts will be available to PSTC sponsoring companies at the time they are submitted for publication. Organized short courses will be offered with PSTC members receiving a discount on course enrollment fees.

Project Managers

The Project Manager list consists of researchers at the associated institutions. It is possible that these researchers may form collaborations with colleagues external to the host institutions. For projects funded by the center, external collaborators will be funded through subcontracts with all relevant IP agreements in force. Table 1 lists PM's who are currently participating in the center. Additional investigators may be added as appropriate.

Current Sponsors

Air Products
Cargill
ConocoPhillips
Eastman Chemical
Evonik
Raschig Jaeger
Saudi Aramco
UOP
BASF
Chemstations
CD-Tech
Engineers India
ExxonMobil
SABIC
Shell
Chevron
Dow Chemical
EPRI
GTC
Sachem
Total

Table 1 – Project Managers

Investigator	Area of Expertise
Benny Freeman	Membrane technology for liquid and gas separations
Bruce Eldridge	Vapor-liquid process development and modeling
Dan Shantz	Inorganic-organic composite membranes for reverse-selective separations
Frank Seibert	Extraction and distillation experimentation and model development
Gary Rochelle	Separations involving chemical reactions / CO_2 recovery
Jim Ritter	Adsorption cycle modeling / adsorbent material development
Juergen Hahn	Process modeling, control, and optimization
Keith Johnston	Complex fluid thermodynamics / green solvent development
Mahmoud El-Halwagi	Integrated process design / environmental impact minimization
Tom Edgar	Advanced process control and optimization

Potential Projects

Separations technology development

- Non-cryogenic reactive absorption process for olefin recovery.
- Chemical production via reactive distillation technology.
- Extractive fermentation process for chemical production.
- Hybrid distillation-pressure swing adsorption processes: model based feasibility study and adsorbent development
- Heavy reflux pressure swing adsorption cycles for the concentration and recovery of heavy gases like carbon dioxide.
- Rapid cycle pressure swing adsorption processes for gas separation and purification.
- Effects of surface tension and viscosity on the wetted area of random and structured packing.
- Porous membrane performance improvement via membrane orientation.
- Development of microporous mixed matrix membranes for gas and liquid separations.
- Control of membrane micro-structure for improved liquid separations.
- Crystallization of Nanoparticles of Specialty Chemicals and Pharmaceuticals with High Dissolution Rates.
- Next generation membranes for desalination and wastewater purification.
- Hydrocarbon / hydrocarbon separations using advanced membranes.
- Distillation performance of novel commercial-scale packings
- Development of improved packed distillation column models.
- Development of improved packing and tray models for liquid extraction
- Ceramic-polyimide nanocomposite membranes for olefin/paraffin separations.

Process optimization, control, and safety.

- Modeling and control of emissions from petrochemical and refinery flares.
- A framework for sensor placement, robust fault detection, and fault identification for nonlinear processes.
- On-line batch process monitoring for faults in chemical and biochemical reactors.
- Nonlinear model reduction of systems described by differential-algebraic equations for nonlinear model predictive control.
- Modeling, optimization, and control of amine absorption/stripping systems for CO_2 capture.
- Process simulation and process integration safety analysis for next generation energy production.

Energy and environmental research

- Development of computer-aided tools for energy integration and cogeneration (combined heat and power).
- Process yield and efficiency enhancement through process integration.
- Biofuel production from alternative feedstocks.
- High activity catalysts formed by deposition of pre-synthesized nanocrystals in mesoporous materials.
- Carbon dioxide-in-water emulsions: Fundamentals and applications including enhanced oil recovery.
- Rigorous modeling of absorbers and strippers for CO_2 removal by aqueous amines.
- Degradation at stripper conditions of aqueous amines for CO_2 removal.
- Reclaiming of aqueous amines used for CO_2 absorption from combustion gases.
- New membranes for carbon capture, including CO_2 / H_2 and CO_2 / CH_4 separations.
- Systematic approaches to pollution prevention and wastewater management