PROCESS INDUSTRIES DIVISION

Editor: Ahmad Fakheri FALL 2003

Message from the Chair Riyaz Papar, PE, CEM

"Greetings from the Flight Deck," is what we typically hear as the first words from our Flight Captain. To a traveler, these words instill an unparalleled level of confidence to go through the ups and downs untill a safe and sound landing at the destination.

My dear fellow members, I take this opportunity to thank you for having shown that same confidence in me to lead ASME's Process Industries Division (PID) through the vicissitudes of our times. But before I talk about my vision and all the great things to look forward to, I would like to extend my gratitude to our Past Chair, Dr. David M. Pratt, who had been at PID's helm for the past 3 years. His contribution and dedication to PID has helped us significantly and though these are large shoes to fill in, I promise you that we will do our very best and exceed expectations!

During my first executive committee meeting as Chair of PID at the National Heat Transfer Conference, Las Vegas (July '03), I provided an analogy that I would like to share with you. I consider PID similar to a publicly held Company. The PID Executive Committee is analogous to the Company's Officers, which reports to ASME's Council of Engineering (Company's Board of Directors). PID members are equivalent to the Company's Shareholders. If the shareholders do not see value in the Company, they will sell their stock and look elsewhere to invest. Being PID's Chair, I want to offer the highest values and the most lucrative returns to our members. This would ensure their continued loyalty and participation, leading to everyone's success and achievement of each individual's goals. Coming to PID's Technical Committees, they correspond to the different Business Units of the Company. If certain Business Units do well, the employees are rewarded. On the other hand, if they are not profitable, the Company's Officers have to rethink their operating strategy to make them profitable. PID has four technical committees, and I plan to look at each of them individually to determine how we can get them to work most efficiently and provide the best of the products and services to our members.

I strongly believe in the concept of defining our objectives at the start of any project. This helps everyone in the team to focus and provides a clear direction to meet our goals. At the same time, it ensures that the team works most efficiently and the team's energy is not wasted on unproductive tasks. Keeping this in mind, I have defined five objectives that PID will try to focus on in the coming year. They are:

- Provide a platform for communication exchange between members for knowledge, feedback and networking
- Recognize its members and their efforts
- Appeal to the younger engineers
- Develop international activities & partnerships
- Define new partnerships and opportunities for the growth of the division

I have full support from both PID's Executive Committee and the Advisory Board on the above objectives. I firmly believe that PID's technical committees are the places where things happen. Hence, I have already had discussions with the chairs and vice-chairs of all the technical committees and have provided them with a significant amount of autonomy to go ahead and approve activities that further PID's overall objectives. The technical committees are mature enough to take these decisions and I look forward to all the wonderful things that they have planned in the coming year.

One other area very close to my heart is the demographics of PID (& ASME). I have been involved with PID for the past 10 years and it has been disheartening to see the average age of our members increase. This has very severe ramifications in the long run for the engineering community. Our most experienced members will soon be retiring and so will be the knowledge that they have acquired over their careers. This leads to a large black hole in the knowledge space that can only be filled by going back to the school of hard knocks. I am very hopeful that we can avert this disaster…. only time will tell! In the meantime, I challenge each one of you to help out in this gargantuan task. PID is here to support you and your efforts in appealing to the younger generation. Please email me at paparr2@asme.org to discuss your ideas and your experiences in this area.

With an excellent support from our ASME Staff and the push from our IT Representative, I am very proud to share our website with you – http://www.asme.org/divisions/pid/. There have been tons of ideas and unaccountable man-hours that have gone into the website to make it into something that benefits everyone. Our website has all the current information about PID's activities, newsletters, technical committees and links to key sites and congoodies. We, at PID, have totally embraced the E-assets and resources here

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Process Industry's Future

Ahmad Fakheri PID IT Representative

To remain competitive, and profitable, the process industries are consolidating, rethinking, reorganizing and reengineering their businesses.

The quick pace of change is shortening the strategic planning cycles to ensure long-term viability, while the financial markets remain demanding in the delivery of short-term results.

The pace of change in the process industries has also been impacted by the Internet technologies, particularly the emergence of electronic commerce, and the launching of e-marketplaces for both procurement and selling, with new alternatives emerging for more supply chain enablement. [1]

Common characteristics of Process Industries

- High capital intensity
- Global competition
- Cyclical business
- Production of high product volumes, low prices, and low profit margins (Commodity products)
- Mature markets and technologies
- Major energy consumers
- Major generators of wastes

The process industries also face tough economic, technological, and environmental challenges in an increasingly global marketplace, where product differentiators such as quality or price will determine survival. The lower labor costs, targeted governmental subsidies, other special supports, and less stringent environmental regulation in many foreign countries, put US manufacturers at a disadvantage. [2]

Reflecting the developments and challenges in the process industries, the Department of Energy's Office of Industrial Technologies (OIT) has focused its R&D funding on primarily eight process industries, which along with agriculture are called the Industries Of the Future (IOF). The eight industries are Metal Casting, Aluminum, Mining, Chemicals, Petroleum, Forest Products, Steel, and Glass. Collectively, IOF industries consume 75% of the energy used by industry and are vital to our economy, produce $1 trillion in annual shipments, directly employ over 3 million people, and indirectly provide an additional 12 million jobs at all skill levels.

Rather than dealing with the diverse issues facing all process industries, the attention is being focused on a number of technologies that cut across all these industries. Given the scale of utilization of the crosscutting technologies, even small improvements can mean substantial energy and cost savings at the national level. OIT has identified three major crosscutting areas, as its focus of research attention

Combustion Systems

Approximately two-thirds of the energy used by U.S. manufacturing is supplied by combustion systems. The DOE's 2020 vision for combustion systems, in addition to safety, include reducing specific fuel consumption by 20 to 50 percent, reducing nitrogen oxides (NOx) emissions to 2 volumetric parts per million, maximizing the use of multiple fuels, including waste and renewable fuels, and improving cost effectiveness and system reliability, by for example, doubling the time between scheduled boiler outages. [3]

Sensors and Controls

Advanced sensor and control technologies will improve monitoring of process parameters, even in harsh environments, and accelerate correction measures to save time, energy, and materials. OIT's Sensors & Automation (S&A) Program provides cost-shared (50%) funding in a competitive process for sensors and automation R&D projects that address the priority areas defined in the industry roadmaps. The program is open to collaborative teams, including producers, suppliers, universities, national labs, and others. The Sensors and Controls Association plays an active role in coordinating industry participation.

Industrial Materials of the Future

The mission of Industrial Materials of the future is to lead a national effort to research, design, develop, engineer, and test new and improved materials, for the Industries of the Future Intermetallic Alloys, ceramic composites, microstructures, and specialized coatings hold solutions to many industrial processing challenges. Advances in high temperature materials and fatigue, corrosion, and wear resistance material will enhance productivity, product quality, and energy efficiency. OIT also provides funding for projects that address the priority areas defined in the industry roadmaps. [2]

Similar to OIT, the chemical industry has also prepared a vision on how to meet its competitive challenges through the year 2020. Below are some excerpts from that document. [4]

High Priority Opportunities

- Metals with high temperature/corrosion capabilities (strong, ductile, corrosion and wear resistant)
- Materials for halogen-based processes (fluorine, chlorine)
- High temperature refractory coatings/materials
- Avoidance of fouling in heat exchangers
- Better corrosion-resistant thermal spray coatings
- Prediction of materials performance without empirical tests
- Materials that resist metal dusting
- Materials for high pressure environments - 10,000 bar
- Self-sensing systems for fitness of service

Priority Research Needs

- Alternate alloy systems for high temperatures
- Longer life refractories that are field repairable and ductile
- Cost-effective techniques for covering steel with corrosion resistant alloys
- Chemical-process-resistant carbon steels
- User facility for acquisition of thermo-physical, kinetic and mechanical data
- Study of the metal dusting problem
- Data for materials reliability/performance for ceramics and composites
- Big picture controls/global inspection techniques
- NDE for fracture toughness
- Use prototypes and simulation of operating environments
- Prediction of materials performance without empirical tests
- Modeling/life prediction of high temperature materials
- Joining/fabrication techniques for ceramics/other new materials
- Design inspection/maintenance practices/codes for non-metallics
- Technology centers for "like" processes
- "How to" guides for inspectors, users, designers to optimize the use of materials
- Methods for non-intrusive inspection of heat exchangers and tanks
- Systems to inspect hidden equipment details (e.g., pipe supports)
- Life cycle cost models for process equipment and piping systems
- Uniform specification system model

[1] www.atkearney.com/main.taf?p=6,6

[2] www.oit.doe.gov/pdfs/prof_part_part1.pdf

[3] www.oit.doe.gov/industries.shtml

[4] www.oit.doe.gov/chemicals/pdfs/materials_construction_roadmap.pdf

Department of Energy Helps Industry to Become More Energy Efficient

Ahmad Fakheri

Office of Industrial Technologies' BestPractices, program helps U.S. manufacturers maintain global competitiveness through strategic energy management. Through the implementation of new technologies and systems improvements, the BestPractices works with industry to identify plant-wide opportunities for energy savings and process efficiency, reducing pollution and emissions, and increasing productivity.

Plants are selected through a competitive solicitation process, and agree to a minimum 50 percent cost-share for implementing the assessment. An industry-defined team conducts an on-site analysis of total energy use and identifies opportunities to save energy in the overall operations and in specific applications such as motor, steam, compressed air, and process heating systems. The recommendations could include implementing emerging technologies that may be on the forefront of industrial manufacturing, are successful and commercially proven.

DOE reports that most companies realize a minimum of $1 million in annual energy savings after just one assessment. For additional information on this program visit http://www.oit.doe.gov/bestpractices.

A similar DOE resource geared towards small and medium-sized manufacturers is the Industrial Assessment Centers. They provide an in-depth assessment of a plant site; its facilities, services and manufacturing operations, and the examination of potential savings from:

- energy efficiency improvements,
- waste minimization and pollution prevention, and
- productivity improvement.

A team of engineering faculty and students from the regional centers, located at 26 universities around the country, (www.oit.doe.gov/iac/schools.shtml) begins the assessment process by conducting a survey of the plant, followed by a one or two day site visits, to gather data to be used as a basis for assessment recommendations. The team then performs a detailed analysis for specific recommendations with related estimates of costs, performance and payback times.

Within 60 days, a confidential report, detailing the analysis, findings and recommendations of the team is sent to the plant. In two to six months, follow-up phone calls are placed to the plant manager to verify recommendations that will be implemented. Recommendations from industrial assessments have averaged about $55,000 in potential annual savings for each manufacturer. For more information visit http://www.oit.doe.gov/iac/

Mental Exercises

1. List all three digit numbers which are equal to the sum of the cubes of their three digits.

   Once you find the answer, you may want to do an internet search on the smallest one "number abc" to find more about this particular number. Note, the largest n digit number which is equal to the sum of the nth power of its digits is for n=39 and the 39 digit number is 115132219018763992565095597973971522401.

2. A large water tank has two inlet pipes (a large one and a small one) and one outlet pipe. It takes one hour to fill the tank with the large inlet pipe, and 5 hours to fill the tank with the small inlet pipe. The outlet pipe allows the full tank to be emptied in 6 hours. If all three pipes are in operation how long (in minutes) will it take for the tank (initially empty) to become half full.

Send your answers to ahmad@bradley.edu the 50th correct answer to each problem will receive an ASME Mug. The winners and the answers will be announced on the PID website on February 15th.

Message From the Chair

continued from page one

at ASME. For example, from the beginning of this year, all our technical committees used ASME's conference web-tool from the start-to-finish in setting up programs, review of papers, submission of final manuscripts, etc. We have come a long way, but I believe we have only seen the tip of the iceberg. There is much more to come and do, for example, an Expert's Corner – where you could pose a question on particular topics, a bulletin board, and so on. Our ideas can only take us so far, but I recommend that you send an email to our IT Representative, Dr. Ahmad Fakheri (ahmad@bradley.edu) and provide him with a feedback on the web content. I am sure he will really appreciate it.

I have almost used up all the space provided to me by my Editor, and I appreciate the time you have spent reading this newsletter. I am going to leave you with the PID activities coming up this year. Our big events are at the ASME Congress (IMECE) in Washington DC, November 17-21, 2003. PID has seven technical sessions, technical and executive committee meetings scheduled at the ASME Congress. PID will also host an Awards Luncheon Event that will feature a talk by Paul Scheihing, US Department of Energy. Additional details on these events are provided on page five in this newsletter. I look forward to meeting you personally at our Awards Luncheon on Thursday, November 20, 2003 at the ASME Congress.

Back to our Flight Captain – Sit back, relax, and enjoy the ride to…Well that's got to change! We can all enjoy the ride for sure…but as your Captain, I need you to be involved 100% in the activities of PID to ensure that we all exceed our expectations.

Thank you.

Process Industries Division Call For Papers

2004 INTERNATIONAL MECHANICAL ENGINEERING CONGRESS AND EXPOSITION

November 14-19, 2004

Anaheim Convention Center/Hilton, Anaheim, CA

The Process Industries Division will sponsor technical sessions in:

Compressor Applications - Novel compressor design and performance evaluation methods including experimental investigation and numerical simulation

Heat Transfer in Heat Exchangers – Jointly sponsored by the PID and K-10 committee of the Heat Transfer Division is a forum for presenting the latest research and developments in all aspects and types of heat exchangers theory, design, testing and operations. The relevant topics include but not limited to:

- Optimization of heat exchangers or heat exchanger networks
- Transient or dynamic behavior of heat exchangers or heat exchanger networks
- Operating problems associated with heat exchangers and heat exchanger networks
- Technology advances of single-phase and phase-change heat exchangers
- Micro- and mini- scale heat exchangers
- New ideas and novel approaches to the development of better understanding and improvement of heat exchangers and their performance

Cryogenics - Innovations in process, design, manufacture and operations of wide spectrum of cryogenics equipment

Industrial Water Treatment - Design innovations, practices, equipment and problem solving in industrial water treatment system.

Authors and presenters are invited to participate in this event to expand international cooperation, understanding and promotion of efforts and emerging technologies in these engineering disciplines.

Authors should submit a text-only abstract to: **http://www.asmeconferences.org/imece04**

ABSTRACT DUE DATE: January 31, 2004

For further information please contact PID program chair, Dr. Arun Muley (arun.muley@honeywell.com)

Heat Exchanger Tech Committee Activities

During the 2003, the Heat Exchanger Technical committee was very active and organized technical sessions in two premium heat transfer events; ASME Summer Heat Transfer Conference and International Mechanical Engineering Congress and Expositions. It organized two sessions (jointly with the K10 "Heat Transfer Equipment: of the Heat Transfer Division) on "Advances in Compact Heat Exchangers" in 2003 ASME Summer Heat Transfer Conference. Seven papers, covering topics of wide interest, such as CFD modeling of compact heat exchangers, enhanced cooling for gas turbine applications and heat exchanger design and coptimization for HVAC applications, were presented in these two sessions. Encouraged by this success, the committee organized four technical session for 2003 IMECE, with 19 full-length papers. These session offered a wide range of topics of current and emerging interests in the field of heat transfer, relevant to process industries. The committee has been very successful in promotion fruitful interaction among heat transfer experts from industry, academia and research organizations.

Process industries will also be actively participating in the 2004 International Mechanical Engineering Congress and Exposition, November 14–19, 2004, in Anaheim, CA. PID will sponsor technical sessions on Compressor Applications, Heat Transfer in Heat Exchangers, Cryogenics, and Industrial Water Treatment. The call for papers can be found on page four in the Newsletter and we hope to see you and your research work in these sessions.

PID Sponsored Sessions in IMECE 2003

PID-1 Heat Exchangers – I:
Thursday, November 20, 2003
07:45 AM-09:15 AM

- Heat Flux Maps For Ovens: Baking Comfort Zones
- Development of Plate-type Heat Exchanger for Exhaust Gas Heat Recovery
- Numerical Investigation of Generalized Correlations for the Pressure Drop and Heat Transfer Applied in Helically Coiled Tube System
- Cooling of a Finned Cylinder by a Jet Flow of Air
- Pulsating Jets Cooling Circular Cylinders
- Advances in Recuperator Technology for Gas Turbine Systems

PID-2 Advances in Cryogenics:
Thursday, November 20, 2003
09:30 AM-11:00 AM

- Cavitating Flow of Liquid Nitrogen in Horizontal Rectangular Nozzle
- A Corona Melting Techniques for Defrosting Evaporator Coils
- An EHD Meso Pump for Cryogenic Spot Cooling of Low Volume Complex Electronics

PID-4B Advances in Thermal Management with Cryogenics, Including Electronic Cooling Applications:
Thursday, November 20, 2003
5:30 PM-7:00 PM

- Methods for Cryogenic Refrigeration with Application to Electronics
- Cryogenic Cooling in Space and Satellite Applications
- Generic Innovations in Ship-Board Cooling System Being Imagined at ONR
- Recent Advances in Cryogenic Refrigeration
- Thermal management of high flux electronics with Single Phase Cryogenics or Ultra Thin Film Evaporation
- Mixed Gas Joule-Thomson Refrigeration Cycles

PID-4A Compressor Session I - CFD:
Thursday, November 20, 2003
02:00 PM-03:30 PM

- Application and Validation of CFD in a Turbomachinery Design System
- Numerically Simulation of Hydraulically Actuated Natural Gas Compressor
- Investigation of a Centrifugal Compressor Stage with Two Volutes and the Same Impeller

INVITATION

Process Industries Division

Luncheon Event

The Marriott Wardman Park Hotel, Park Tower Suite #8226, Lobby Level

November 20, 2003 • 12:00 – 1:30 pm

We invite you to join us and your colleagues at the Process Industries Division Luncheon. This luncheon is not just for PID members. We particularly want to invite non-members to join us ad learn more about the Process Industries, see old friends, meet new ones, and develop a network of colleagues in your area. The luncheon speaker is Mr. Paul E. Scheihin, Team Leader, Industrial Technologies Program, U.S. Department of Energy and the topic of his talk is "US DOE's Role in Enhancing the Future of the Industrial Sector"

Mr. Scheihing is the Team Leader within the Department of Energy's Industrial Technologies Program. Mr. Scheihing provides oversight and leadership to two teams which address chemical and forest product industry process technology development, and crosscutting industrial energy system R&D.

During his fifteen year tenure at DOE, Mr. Scheihing has developed with US industry a variety of research, development and technology deployment partnerships and initiatives that all aim to encourage the more rapid adoption of energy efficient industrial technologies. He recently was the Chemical Industry of the Future program team leader, and from 1992 to 1999, he managed DOE's voluntary industry partnerships such as Motor Challenge, Steam Challenge and Compressed Air Challenge, that were then integrated within OIT's current BestPractices initiative.

The US Department of Energy's Industrial Technologies Program (ITP) identifies with U.S. industry bold visions for improving industrial process efficiency and exploring new modes of manufacturing. In partnership with industry, this work accelerates the pace of change and encourages new approaches to help the industrial sector dramatically increase the energy efficiency and reduce greenhouse gas emissions.

ITP's primary role is to invest in high-risk, high-value research and development that will reduce energy requirements, while stimulating economic productivity and growth. Because energy is an important input for key manufacturing industries, reducing energy use lowers costs, reduces emissions, and improves productivity. ITP focuses on technologies and practices that provide clear public benefit, but for which market barriers prevent adequate private sector investment.

This talk will focus on the ITP technology strategy, highlight several exciting technology development projects, and illustrate how ITP works with industry to improve energy efficiency today and in the future.

PID- 5 Compressor Session II - Design: Friday, November 21, 2003
11:15 AM-12:45 PM

- Application of a CFD-based Program for the Optimization of a Centrifugal Impeller
- Modeling of blade tip geometries in an axial compressor stage
- Methods for and Benefits of Centrifugal Compressor Design Audits

PID-6A Heat Exchangers - IV:
Friday, November 21, 2003
02:00 PM-03:30 PM

- Heat and Mass Transfer Design of a High-Temperature Silicon Carbide Micro-channel Heat Exchanger
- Thermo-Mechanical Design of a High-Temperature Silicon Carbide Micro-channel Heat Exchanger
- A Numerical and Experimental Study of a Staggered Pin-Fin Array Compact Heat Exchanger

PID-6B Compressor Session III - Performance: Friday, November 21, 2003
02:00 PM-03:30 PM

- Range Versus Efficiency – A Dilemma for Compressor Designers and Users
- Utilizing Wave Rotor Technology to Enhance the Turbo Compression in Power and Refrigeration Cycles
- Effects of Inlet Flow Field Conditions on the Stall Onset of Centrifugal Compressor Vaned Diffusers

The evaporator of a large scale Mechanical Vapor Recompression system used for purification of pulp mill effluents. The evaporator unit (placed vertically) contains 3500 (2") tubes. On average, 8,000 m3/day of effluents are purified and recycled daily. The scaling of the evaporator tubes represents an important technical problem. Through a collaborative R&D project between Alberta Research Council and the Millar's Western's Meadow Lake, Saskatchewan pulp mill, a scaled heat exchanger and a numerical model were used to assess the critical parameters responsible for scale build up and for improving operation conditions at the mill. Paper number 39599, Proceeding of IMECE2002.

Courtesy of Dr. Peter Toma, P R Toma Consulting Ltd

PID Home Page www.asme.org/divisions/pid

The PID Home Page was developed and continues to evolve as a communications tool bringing closer the members of the Process Industries. We are in the process of updating our website to make it of more value to our members and the process industry in general. We are soliciting your input and appreciate if you visit the site and tell us what additional information you like to see included. One of the ideas we are exploring is the inclusion of a chat room, where colleagues can have web meetings, post questions, and seek information. A job opportunities section is another idea. Please send your suggestions to ahmad@bradley.edu.