

PID

Process Industries Division Newsletter

Naresh Amineni, Editor

Fall 2002

Message from the Chair



David Pratt

Pablo Picasso once stated, "It is your work in life that is the ultimate seduction." This statement best describes my tenure within the Executive Committee of the Process Industry Division. During

which I have seen the division transform from a relatively antiquated committee with a relatively lack luster approach to future planning to one that utilizes state-of-the-art technologies for the dissemination of information and one that is determined to meet both near and far term needs of its members. The first statement is best illustrated by our pursuit to create a new executive committee position whose sole responsibility will be the maintenance, upkeep and modernization of our E-assets and our use of electronic media. We are also examining and determining the 'hows' associated with web based conference logistics to mitigate and minimize some of the obstacles that are associated with conference paper submission and coordination. These items will be reflected on our state-of-the-art web site

(www.asme.org/divisions/pid/). Additionally on that site is news about PID, information on our organization and our current strategic plan.

The strategic plan posted on our web site is a living document that we are using for determination of division resource focus. Meeting the near and far term needs of our members has been and will remain at the center of our attention and the focus of a considerable amount of our resources. To this end we have created a near term strategic plan matrix and are creating mid and far term strategic plans. Additionally, each of the technical committees in PID are developing parallel yet unique plans for determination of future goals, focus, profiles, actions and time phasing to meet their mission requirements. This will enable us as committees to follow appropriate and fiscally obtainable strategies while fulfilling our mission, pursuing our vision and meeting our goals.

While as previously stated my tenure within the PID executive committee has been extremely rewarding, there remain areas requiring immediate and persistent attention. These include the demographics of the division, the decrease in membership and our ability to recruit and maintain the required leadership. We have started pursuits that address the demographic concern and we will soon address the others. Detailed demograph-

ic analysis has shown that the division has a substantial percentage of its members that are over 60. This leads to concerns in two areas. First how do we revitalize the society and make it more attractive or useful to the next generation of engineers and secondly, how do we fully utilize the unique qualifications of this demographic. Both of which may be addressed by empowering our over 60 demographic. To start this we are surveying them about their interest in our technical committees, their affiliations with companies or industries and their desired participation. Our hope is for them to work with our technical committees and their personal affiliates to enhance PID.

One last quote before my tenure ends - an analogy for various facets of ASME. That quote is by Archimedes and was recorded in the Pappus of Alexandria. It states that with "... a lever long enough and a fulcrum on which to place it, and I shall move the world." The analogy here is obvious ... that with a lever (ASME) and a fulcrum (the volunteer leadership) I shall move the world (**we shall change the world.**) It has been a pleasure serving as the chair of PID and I look forward to new challenges as member of the Manufacturing Technology Group's executive committee.

David Pratt

TECHNICAL COMMITTEE REPORTS 2001-02

The PID Executive Committee and the Chairs and Vice-Chairs of each of the Technical Committees of PID would like to take this opportunity to thank its members for all their efforts and support during the past year. The achievements by the Technical Committees wouldn't be possible without its members behind it.

We would also like to acknowledge the outstanding efforts and enthusiasm of all the authors and co-authors of technical papers. Their work and dedication helped us to select interesting topics for our sessions, get valuable technical papers, and present them during PID sessions at ASME Meetings. We look forward for this continued support in future. The reports from the Technical Committees are presented below.

HEAT EXCHANGERS

The main focus of the Heat Exchangers Technical Committee has been its participation in the related conferences to reach out to its members, promoting the PID at the industry level and increasing its member strength. The Committee has met with all its goals over the past year and hopes to do so in the coming years.

Over the past year, the Committee managed to get a very active cooperative effort between members in USA, Canada, Italy and South Africa. This played a pivotal role in presenting and reviewing papers and seeking new technical areas. The committee sponsored 2 Heat Exchanger sessions each at IMECE 2001 and 2002. It also participated in the PID booth at the IJPGC (2001) in New Orleans, LA.

The Committee aims to improve the co-operation and dialogue with industry, particularly into new industrial areas such as: fuel cells, micro-heat exchangers (with application to cooling electronics components and miniaturization). It aims to provide a platform for fostering technology and idea exchanges between Academia, R&D Organizations and Industry, and within other ASME sub-committees. It aims to improve industry representation, particularly from new areas of expertise and energy-saving/co-generation sector.

CRYOGENICS

The history of the Cryogenic Technical Committee is somewhat obscure in the sense that it has existed for many years but never seemed to bloom. The main challenge is that cryogenic processes are widespread among many industrial clusters, from medical to aerospace to metallurgy. To this day, the word "Cryogenic" is still associated with rocket science and post-mortem medical fiction in the mind of most. Even in the industry, cryo-coolers and air separation plants are considered secretive black boxes. The proportion of engineers actively involved in cryogenics is minute.

We set an impressive standard of leadership in bringing the committee to an actual working organization and growth among its members. The Committee was also instrumental in setting up the first web site (<http://www.asme.org/divisions/pid/techareas/cryo.html>). The Cryogenic Technical Committee regroups engineers and scientists from a wide industrial and academic spectrum.

The Cryogenics Technical Committee members participated in IMECE, IGTI and IJPGC over the past year. The committee sponsored a technical session at IMECE-2001. The Committee also participated in hosting a booth at the IJPGC-2001 in New Orleans, LA.

The Cryogenic Technical Committee faces several challenges in the coming years. Truly, the Cryogenic Technical committee members need to raise their entropy level and participate more. The committee has several international members including Holland, India and Canada and travel could be a hindrance, but other modes of communication and meetings are being evaluated. Another challenge is the mission of the Cryogenics committee and the goals and how the Committee can act to build a bridge between the Compressed Gas Association, Cryogenic Society of America and ASME.

INDUSTRIAL WATER TREATMENT

The second meeting of the Industrial Water Treatment Committee was held at IMECE - 2001 in New York City. There was outstanding attendance, with several members participating. Topics included

goals and objectives:

- Committee newsletter, training courses, papers, presentations, standards development
- Creation of a "Vision Statement"
- Ways of increasing the committee membership
- Outreach to other organizations with similar objectives (AWWA Research Foundation, ASTM D-19 Committee)
- Web-page development
- Technical articles for ASME News or other publications
- Possibilities for subcommittees (pre-treatment, high purity piping/welding, specifications, education, ion exchange, membranes, separations/filtration, analytical instrumentation)

There was a good discussion of the standards to be used for papers and presentations, especially regarding possible conflicts of interest in the area of commercial bias. In addition, three papers were presented by members during a technical session "New Technologies in Ultra-pure Water Production" at IMECE - 2001.

COMPRESSOR APPLICATIONS

In 2001 we continued our efforts to provide a forum to the members dealing with the industrial and pipeline compressors. In this regard we sponsored two sessions at the IMECE 2001 and participated in the PID booth at the IGTI-IJPGC (2001) in New Orleans, LA. The sessions at the IMECE 2001 were well received with good attendance while the PID booth at IJPGC was very helpful in boosting our committee membership.

This year we are again sponsoring two sessions at the IMECE 2002. The organization of these sessions has been made possible by some of our new and very active members. They have attracted papers on a wide range of topics ranging from return channel sizing to regenerative compressors.

The committee is aiming to increase our participation in both IMECE and other conferences through joint sessions with other committees and divisions. In this regard we request our members to provide their input as to what topics would be of greatest interest.

Turbo Chillers using Water as a Refrigerant

Norbert Müller, Assistant Professor, Michigan State University

The use of water as a Refrigerant (R718) in industrial chillers is an environmental friendly new technology, successfully installed over the recent years. This technology has its challenges in all stages of its realization from the development, through design and manufacturing as it is rewarding to an out-of-the-box thinking in the phase of planning the chiller implementation.

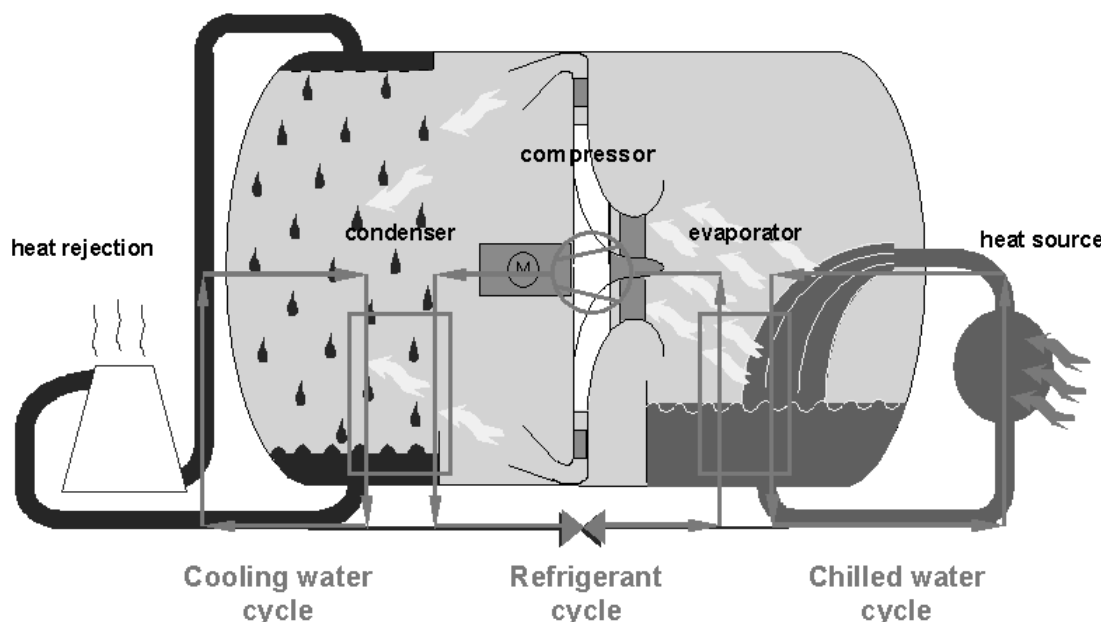
Water is a natural refrigerant. It is absolutely harmless to man and nature. It is easily available and there are no problems disposing it after use. Even though water is one of the oldest refrigerants, it requires state of the art technology to use water as a refrigerant in absorption chillers or in compression chillers with steam injection compressors. These techniques are energy efficient as long as there is waste heat or steam available. Much higher energy efficiency can be achieved using compression refrigeration plants with turbo compressors.

The key component of a R718 turbo chiller is the compressor, since water as a refrigerant has some specific features that complicate its application in refrigeration plants with turbo compressors. Since the cycle works under coarse vacuum, the volumetric cooling capacity of water vapor is very low and hence huge volume flows have to be compressed with relative high pressure ratios. So, compared with classical refrigerants like R134a or R12, the use of Water (R718) as a refrigerant requires approximately a 200 times higher volume flow and about a double pressure ratio for same applications. Due to the thermodynamic properties of water vapor this high pressure ratio requires approximately a two to four times higher compressor tip speed, depending on the impeller design, while speed of sound is approximately 2.5 times higher. Reynolds numbers are about 300 times lower and the specific work transmission per unit mass has to be around 15 times higher.

This states challenges for the compressor design. Today they are successfully solved in commercial industrial plants mainly installed in Europe using unique high-performance mixed-flow turbo compressors with or without stationary guide vanes. Other concepts are under investigation, like mixed flow compressors with inducer or pre-runner or axial multistage compressors, promising a higher pressure ratio or a more compact design. High pressure ratios are obtained by the combination of high rpm and large diameter, where the diameter is primarily limited by the available space and manufacturing facility. When compressing water vapor, the tip speed is often limited by the rotor stability rather than by the speed of sound. Working under vacuum the forces exerted by the gas on blades are very small. So the blades must primarily withstand centrifugal forces resulting from their inherent mass allowing for more economic lightweight constructions with extremely thin, mostly straight blades, made of special materials like titanium or composites. These impellers are very much different from usual high-performance impellers. They cannot be milled. They are built of several parts, indicating a challenge for manufacturing and balancing of the high-speed system. Advantageous is the use of variable speed direct-drive motors, working under vacuum and water vapor atmosphere, requiring special bearing, cooling and electrical isolation. Such motors are not readily available and need to be developed for each new power level.

In a R718 turbo chiller system the chilled water, the refrigerant and the cooling water are the same agent (see figure). It is water from the tap not requiring any special treatment. Hence direct heat exchangers are used, allowing initially for a higher overall COP (coefficient of performance), if the system is not hydraulically decoupled from the loop. Further due to the properties of water vapor under vacuum, such R718 chillers feature a greater gain of COP than conventional chillers, when they are used for higher cooling temperatures. This encourages modern air-conditioning implementations with higher advance temperatures. So retrofitting a R718 turbo chiller is one solution but it is much more energy efficient if the plant design engineer can adapt the user loop accordingly. Industrial cooling and heat pump application can feature attractive high overall COP as well. Furthermore R718 turbo chillers have a lower noise emission and require no special safety installation concerning drainage and ventilation. R718 turbo chillers represent a cutting edge technology, which is challenging and rewarding. They allow a move towards greener technology with a huge potential for application and manufacturing even outside of Europe.

R718 Turbo Chiller



A CALL TO PID MEMBERS

The biggest asset of ASME's Process Industries Division (PID) is its members. PID is currently developing a strategic plan and action steps that we need to take as a Division in the next 2-5 years. One effort that we surely and positively want to pursue is to engage our most experienced, senior and retired members to play an active role in defining PID's role in the future.

The breadth and depth of knowledge and technical expertise on Process Industries that exists in our members is unparalleled in ASME. As a Division, we would want to continue to have that distinct stature. As new engineers emerge and take the helm, we need to make sure that they are equipped with the best of the tools and knowledge in the currently, cost-competitive and ever-changing industry. Succeeding in this gargantuan task is not easy and PID can be the Flagship but cannot do it without your support.

As the next Chair of PID, I would like to capture some of your thoughts and interests as regards the issue. PID would really appreciate if you please take a moment to fill this questionnaire and provide us with your valuable comments. I am personally responsible for your feedback and promise you that it will be given all the attention it needs. I also look forward to speaking to you in the future. Thank you very much for your time and support.

Riyaz Papar, Vice Chair, 2000-03

PID Member Questionnaire

1. Which of the following represent your Technical Area of Expertise? (Check all that apply)

- Process Industries
- Compressor Applications
- Heat Exchangers
- Water Treatment
- Cryogenics

2. Which of the following PID activities would you like to participate in the future? (Check all that apply)

- Reviewer of Technical Papers
- Write an article for the Newsletter / ME Journal / PID Website
- Presentation of a Technical Paper at a Conference
- Organize and Chair a Session at a Conference
- Speaker at a Plenary Session
- Develop a short-course on a technical topic
- Be a Trainer for a short-course developed by self
- Be a Trainer for an ASME developed course
- Present a short seminar (2 to 4 hr) at an ASME Local Chapter level
- Present a short seminar (2 to 4 hr) at a National Conference
- Present a short seminar (2 to 4 hr) to a select audience from industry
- Be an Office Bearer for the Technical Committee
- Be an Office Bearer for the Executive Committee
- Be a Corresponding Member of an Advisory Committee
- Other

3. Please provide us with any other ideas that you may have and would like to pursue with PID.

4. Please provide us with your most convenient contact information.

Name: _____

Phone Number: _____

Email: _____

Please return this completed form to Vanessa Lane, Administrator, ASME, Fax: 212-591-7671.

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PID Sponsored Sessions in IMECE 2002

PID-1A: Sunday November 17, 11:15 am–12:45 pm

Meso-micro Heat Exchangers and Pumps

- Electronics Spot Cooling of High Heat Flux Electronics with Liquid Nitrogen VLSI
- VLSI Hotspot Cooling Using Two-Phase Microchannel Convection
- Opportunities and Challenges in Micropump Technology
- On Partially Corrugated Ducts in Heat Exchangers

PID-2: Sunday November 17, 2:00 pm–3:15 pm

CFD Application in Centrifugal Compressor Design and Analysis

- Numerical and Experimental Study of Impeller-diffuser Interaction
- Investigation of Advanced CFD Methods and Their Application to Centrifugal Compressor
- Understanding the Interaction between an Impeller and Its Inlet Guide Vanes
- Streamlining of the Radial Inlet Design Process for Centrifugal Compressors

PID-3: Sunday November 17, 3:45 pm–5:15 pm

Developments and Challenges in Compressor Application In Process Industry

- The Challenge of Design and Optimization of Centrifugal Compressors for the UK's Largest Producing Offshore Gas Field
- A New Approach to Predicting Centrifugal Compressor Sideload Pressure
- A Parametric Study of Surge and Flow Instabilities in Gas Pipeline Compression System
- The Effect of Pipe Parameters on Surge Margin
- Current Status, Design and Performance Trends for the Regenerative Flow Compressors and Pumps

PID-4: Sunday November 17, 5:30 pm–7:00 pm

Challenges In Industrial Heat Exchanger Applications for Process Industry

- Log Mean Temperature Correction Factor - An Alternative Representation
- Cooling of a Finned Cylinder By a Jet Flow of Air
- Study of Refrigerant Mixtures with Gas Liquid Injection
- Reducing the Deposition of Scale in a Evaporator of a Mechanical Vapor Recompression System for Concentration of Pulp Mill Effluents

Please see on-site program for session room locations.

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KEYNOTES

WORKSHOPS

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SOME SESSION HIGHLIGHTS...

DESIGN TRACK: Human Factors Methods for Design Engineers; Making Systems Safe, Reliable, Productive; FEA for Design Engineers; Benefits and Pitfalls: Designing Against Fatigue Failure

MANUFACTURING TRACK: Nanotechnology and Nanomanufacturing; E-Manufacturing: 6-Sigma; Lean Manufacturing; Micro/Meso Scale Non-traditional Machining

PLANT ENGINEERING TRACK: Condition Monitoring Discussion Group; Reliability and Risk Management Discussion Group; Plant Safety and Security

ENTERPRISE IT TRACK: Supply Chain Logistics; E-Business; Warehouse/Materials Handling Logistics

MANAGEMENT IN GLOBAL ECONOMY TRACK: People, Performance, Productivity and Profits; The Performance-Driven Enterprise – Implementing an Executive Dashboard

TECHNOLOGY TRANSFER TRACK: Entrepreneurship and Technology Commercialization; Protecting Inventions with Patents

Visit the website for a complete listing of sessions and speakers.



www.asme.org/nmw

ASME International is the organizer of the National Manufacturing Week Technical Conference. National Manufacturing Week is produced by Reed Exhibitions.

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