



The South Texan

2003 Marx Isaacs Award for Outstanding Large Section Newsletter

VOLUME 104 NUMBER 9

May 2004

MAY MONTHLY MEETING • APRIL 29, 2004



Speaker: *Bill Byers*
AICHE National President

Subject: The Changing Face of
Chemical Engineering and
the Role of our Professional
Society

Our chemical engineering profession is changing in many ways and AICHE is changing as in response. As diverse as our profession has been traditionally, the diversity of industries that employ chemical engineers gets broader each year. At the same time, our employers face cost pressures from a global marketplace and, in some cases, are reducing staff and investing less in technology development and professional development.

AICHE has been affected by these pressures and has responded by identifying the "Essential" elements that are most important to us as members. These elements form the core of the Institute from which we can grow to reflect the changing face of our profession. The Essential AICHE will be described and a discussion period will follow.

Bill is President of AICHE for 2004. He has been active in the Institute for over 25 years, serving as Chair of the Oregon Section and Chair of the Environmental Division in the 1980s and early 1990's. He served as Meeting Program Chair for the 1993 Summer National Meeting and chaired the National Program Committee in 1996. Bill previously served on the Board of Directors in 1997-1999 and was elected to as a Fellow of the Institute in 2002.

Bill earned a BS in ChE from Oregon State University and an MBA from the University of Oregon. He started his career with Fractionation Research, Inc. and subsequently worked for Fluor Engineers and Constructors. He started work for CH2M HILL in 1981, for which he is currently serves as Vice President and Technology Development Manager.

The South Texas Section of the
American Institute of Chemical Engineers
Presents the
**Second Annual
Spring Distillation Symposium**
Park Place at Reliant Park
formerly Radisson Astrodome
Thursday, April 29, 2004
Starts: 3:00 PM Ends: 6:00 PM.

Workshop Announcements

The Environmental, CAST, and PEPO workshops are replaced this month by the Second Annual Spring Distillation Symposium. Refer to page 3 of the newsletter for detailed workshop topic and speaker information for the PSM workshop.

PSM

Topic: Determination of Mechanical
Integrity of Pressure Vessels
and Heat Exchangers

Speaker: Israel (Izzy) Perez

How to Stay in Touch with South Texas Section While Migrating to a Paperless South Texan Newsletter

Mandatory Notification of STS for the Mailed Newsletter After This May 2004 Issue. To continue to receive after this issue you must actively notify us.

(1) Mail notice to STS-AICHE; P.O. Box 710773; Houston, TX 77271-0773
(2) Phone to Freeman Self at 713-235-3055 or Matt Kolodney
713-767-3752

(3) Subscription on-line in the South Texan box at <http://www.sts-aiche.org>.
Fee for Mailed Newsletter printing and mailing cost after December 2004.
Website: <http://www.sts-aiche.org>

Newsletter Access:

- 1) Snail Mail to all registered STS members - one week before meeting +/- one week.
- 2) Website at [sts-aiche.org](http://www.sts-aiche.org) - click on Newsletter or Newsletter Archives, accessible mid-month before meeting.
- 3) E-Mail - enroll at the Topica prompt at the bottom of the STS home page - includes URL to current Newsletter, accessible mid-month before meeting.

Workshops and Dinner Meeting Topics, Speakers, Synopses, and Bios:

- 1) About a week after meeting, speakers and topics appear on the website home page for the next month's meeting. Navigation keys home on detailed synopses and bios for each workshop or dinner meeting presentation.

Meeting Location Park Place at Reliant Park

*formerly Radisson Astrodome
(Kirby at South Loop)*

WORKSHOP (NO FEES - NO RSVP) 5:30-6:30 p.m.
SOCIAL PERIOD 6:00-7:00 p.m.
DINNER 7:00-7:45 p.m.
PRICE . \$22.00 with reservation • \$24.00 without reservation
..... Students and Unemployed 1/2 price
MEETING / SPEAKER 7:45-8:45 p.m.

AUTO - R.S.V.P. By 4:00 p.m., Tuesday, April 27, 2004

Call (713) 295-4847

Make reservation using the STS web site: www.sts-aiche.org

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From the Chairman

Matt Kolodney, P.E.



Our migration to a paperless newsletter is proceeding, and we want to continue to reach all our 2,000 subscribers (dues-paying members), as well as other National AIChE members in the STS region. (See the March newsletter for why we're going paperless.) Recently, our broadcast e-mail subscriber list stood at ~650 members. We have switched to a new e-mail broadcast service and our new target is 2800. We have a number of e-mail addresses from National, but many are obsolete, and

many others don't work due to spam blocking software on the receiving end.

To get our e-mail newsletter past those spam blockers, people who are not already on our new e-mail list need to register on our STS web site. If you're not sure, take a minute to register, and if you're already current, the system will tell you. Starting in August, we want to send you all our monthly electronic newsletter, which will be our best method of communicating with the STS membership. (You can also download the newsletter from our web site, www.sts-aiche.org, but we've seen from experience that e-mail is a valuable reminder in our busy lives.) Subscribing will take only 2-3 minutes, but only you can send us your e-mail address!

We are still working out the glitches and need your help. Please try now to sign up on our web site. It only takes a minute, and our computer sends yours a confirmation e-mail. If you receive that e-mail, hit the confirm button at the bottom, and you're confirmed. You'll get a confirmation message. If you don't receive that confirmation e-mail, the first option is to try your other web site. (Many of us have both home and work e-mail, and in general, home e-mail has a looser spam blocker than work e-mail.)

If that doesn't work, send an e-mail to the STS webmaster, and give us two weeks to work on the system. We cannot change the spam blocker on the receiving end, but we'll do what we can on our sending end. In addition, some e-mail systems allow individual users to adjust spam-blocking parameters. We will post updated information, when appropriate, on the STS web site, and share helpful suggestions from other STS users. If appropriate, we will send a reminder post card out over the summer to members who are not registered.

Our e-mail system is "recipient-permissive," the type recommended for protecting your privacy and eliminating any spamming by others.

You will be able to opt-out of this list whenever you want. We hope you want to continue receiving our newsletter. However, whenever you change your e-mail address, please delete your old e-mail address and sign up again with your new e-mail address. Otherwise, your system administrator may see your undelivered messages floating around, mistake us for spammers, and make things harder for other STS members on your system.

If you choose not to receive the monthly e-mail newsletter, the only means by which the mailed newsletter can be sent to you will be by paid subscription. (You can always download the newsletter from the web site, but you won't be receiving monthly reminders.)

REMEMBER: for delivery of the printed "snail mail" newsletter beyond this issue, you must OPT IN. Nobody has done so to date. There will be no charge for the remainder of this year. Beyond December 2004, however, there will be a subscription charge to defray the cost of a hard copy. The fewer requests for the printed newsletter, the better STS can subsidize that format for members who do not have access to e-mail. To opt in:

(1) Write to STS-AIChE; P.O. Box 710773; Houston, TX 77271-0773,
OR (2) Call Freeman Self

The Purpose of the Section, a nonprofit scientific, educational and charitable organization, is the furtherance of the aims and purposes of the American Institute of Chemical Engineers, and the advancement of the science of chemical engineering and of related sciences through (i) the education of members and non-members in the sciences (ii) career guidance and financial assistance to students of the sciences and (iii) encouragement of research in the sciences.

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The South Texan is published monthly, except June, July and August, by the American Institute of Chemical Engineers, South Texas Section. Opinions expressed are those of the authors and not of AIChE.

STS Volunteer Classified Ads

While the volunteer positions listed below do not offer direct compensation, they provide valuable experience as described:

Area: **Interpersonal Relations**

K-12 Outreach

Randy Bachman 832-443-4174

Would you like to learn and/or practice public speaking, teaching, and/or counseling students? Schools periodically request speakers on chemical engineering and other technical topics. Talks could involve career guidance and/or on specific technical topics. They come for a range of student age groups. You personally might want to respond in only certain situations. In order to "cover the waterfront," we could use several volunteers.

ECH Webmaster

Glenn Carlson 713-869-3433

Would you like an opportunity to design, code, and maintain a relatively simple web site? (An opportunity to learn by doing.) The Engineers' Council of Houston is an umbrella organization for local (Houston) sections of engineering, scientific, and technical societies (such as STS). ECH needs its own web site in order to: (1) enable ECH business and communication and (2) link the web sites of the local member society sections.

Media Outreach Committee

Matt Kolodney 713-767-3752

Would you like to deal with members of the media and to put them in touch with experts in different areas of chemical engineering? A variety of potential stories arise annually concerning the chemical industry and chemical engineering. Members of the media would like to talk with knowledgeable people. The Media Outreach Committee would develop a database of chemical engineering expertise and put reporters in touch with the appropriate people on an as-needed basis.

STS Organization & Planning:

Long-Range Planning Committee

Dave Mitchell 281-479-6408

Would you enjoy strategic planning and helping the STS to make a difference for us? AIChE National has conducted focus groups on what chemical engineers would like AIChE to do. The Long-Range Planning Committee would evaluate implementation of these options at STS.

STS Historian

Matt Kolodney 713-767-3752

Would you like a pleasant stroll down memory lane, or an opportunity to learn about the history of the STS and to help us (and yourself) apply the lessons of the past to improve our future? The STS has been around for a while, and has accumulated several file drawers of documents.

Chemstations, Inc., makers of the CHEMCAD Suite of Chemical Process Simulation software, offers free use of its products to unemployed members of the American Institute of Chemical Engineers. Qualified members will have full access to the software for a 30-day period in which to build or 'brush up' their skills with process simulation. An online discussion forum at Chemstations' website, www.chemstations.net, is available to help users learn the software and discuss applications.

The offer is made in conjunction with the **Career Services** department of the **AIChE** and is open to members who have registered as unemployed with the organization. Unemployed chemical engineers should contact Herb Scheffel, of the AIChE, at herbs@aiche.org to learn more about and sign up for the program. To join the AIChE, visit <http://www.aiche.org> or call (800) 242-4636.



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South Texas Section

AIChE
American Institute of Chemical Engineers

of the
American Institute of Chemical Engineers (AIChE)
Presents the

Second Annual Spring Distillation Symposium

Park Plaza at Reliant Center – Thursday, April 29, 2004

Starts: 3:00 PM Ends: 6:30 PM.

Honoring: Dr. Charles D Holland, Texas A & M University, President, Texas
Institute/Advancement of Chemical Technology

Special Guest – Mr. Dale Nutter, 2004 Spring National Meeting Honoree

Featuring: Mr. Henry Z. Kister, Director, Fractionation Technology, Fluor

Symposium Details:

The Distillation Symposium is a joint effort of the South Texas Section Workshop Special Interest Groups. The symposium will start in advance of the usual 5:30 PM Monthly Meeting Workshops to hold eight presentations, including two presentations by Mr. Henry Z. Kister, Senior Fellow and Director, Fractionation Technology, Fluor Corp. Dr. Bruce Eldridge of the University of Texas will moderate the wrap-up Q & A session in Dr. John Kunesh's absence. A contribution of \$10 will be collected to defray expenses for the symposium. Refreshments will be provided. The 29 April 2004 Monthly Meeting will also feature Awards Night, at which the Dinner Meeting Speaker will be William D. Byers, National President of the AIChE. Attendees are encouraged to attend the Dinner Meeting following the Social Hour. [Click Here](#) for Dinner Reservations.

Program - Click Session Number For Abs/Bios (Speaker may be one of several authors.)

D1. Distillation Through Young Eyes : Lessons Learned from Students and Evolution of Chemical Engineering Education, Dr. Kenneth R. Cox, Lecturer in Chemical Engineering, Rice University.

D2. Thermal and Hydraulic Analysis of Distillation Columns, Dr. Ven Pinjala, Business Consultant, Aspen Technology, Inc.

D3. More Effective Use of Distillation Simulations - Matching Simulation to Reality, Mr. Nathan D. Massey, President, Chemstations.

D4. Advanced Hydraulic/Mass Transfer CFD Models for Distillation Column Optimization and Design, Dr. Bruce Eldridge, Senior Lecturer and Head, Separations Research Program, The University of Texas

D5. The Kittel II Tray: Using a Round Peg in a Round Hole, Dr. Ralph H Weiland, Koch-Glitsch LP, Dallas, Texas

D6. Commercial Tray Design Methods and Software - From Pencils to Pentiums Mr. Daniel R Summers, Sulzer Chemtech U.S.A., Inc., Tulsa, Oklahoma

Hydraulic Analysis Is Key To Effective Low-Cost Debottlenecks: Two Case Histories Mr. Henry Z. Kister, Senior Fellow and Director, Fractionation Technology, Fluor, Aliso Viejo, CA

D7. Case 1: Overcoming a Demethanizer Bottleneck

D8. Case 2: Better Feed Entry Ups Debutanizer Capacity

Dr. Holland will be honored for lifetime achievement in chemical engineering, notably modeling of distillation and of staged equilibrium processes. Mr. Kister will sign his texts sold at cost. Tabletop displays of fractionation equipment, diagnostic tools, and simulation models are by contributing Exhibitors. Excess funds will go to the Education Program. From March 28 through April 28, 2004, register on-line at [2004 Distillation Symposium](#). The meeting and arrangements are co-chaired by Workshop Chairs Shane Tierling, John Cheng, Steve Haynie, David Karesh, and Jim Morris. For interested Exhibitors or Corporate Sponsors, contact Solicitation Chair Kai Nirell (nir95@aol.com, 713-952-6819). For Registration, direct questions and comments to Jim Morris (ejmorris@vonl.com, 281-358-7986) or Shane Tierling (shane.tierling@halliburton.com, 713-753-6892). On-site registration will start at 2:30 PM on 29 April 2004. Seating will be limited to 150 - 200, so register early.

Sponsored by Corporate Sponsors, Exhibitors, and STS - AIChE
See [Corporate Logo Page](#)



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South Texas Section

AIChE
American Institute of Chemical Engineers

Second Annual Spring Distillation Symposium - 29 April 2004

Program Abstracts and Biographical Sketches (Click Session Number to Return to Overview)

D1. Distillation Through Young Eyes: Lessons Learned from Students and Evolution of Chemical Engineering Education

Speaker: Dr. Kenneth R. Cox, *Lecturer in Chemical Engineering, Rice University*

Abstract: Teaching process design in the age of computation poses unique challenges. Typically, students entering a design course expect to find a process simulation course where the title clearly says "Chemical Engineering Design". These are really very different entities. Why is there such confusion that a single tool so dominates the student expectations? How do we persuade the students that a successful approach to innovative design involves much more than proficiency with a software package? Are there good aspects to this naive view of process design?

At the same time, chemical engineering education is evolving to reflect changes in employment opportunities for our graduates. No longer can we assume the majority of our students will pursue careers involving large scale chemical processes and petroleum refining. New opportunities exist for our graduates in fields as diverse as advanced materials, pharmaceuticals, fabrication of electronic devices, and pollution abatement. Responsible educators must prepare students for these alternative careers as well.

How do these changes impact the quality of education we provide our students in the practice of distillation? How can we cover so many different topic areas without diluting the quality of education in key areas such as separations design? What can the practicing engineer learn about distillation by looking through young eyes?

Bio: Dr. Kenneth R. Cox is a Lecturer in Chemical Engineering at Rice University, where he has taught senior level courses in equipment design and separation technology, process design, and process dynamics and control, in addition to chemical engineering laboratories I and II. Prior to joining the faculty at Rice University, Dr. Cox taught for 4 years at The Ohio State University and worked for 17 years as a Research Engineer with Shell Development Company in Houston. As an Associate Professor at Ohio State, he taught courses in process design, colloidal behavior, transport phenomena, research planning, and technical communications. His research was in the simulation of colloidal dynamics and stability, with specific applications to biological systems. At Shell Development Company, Dr. Cox specialized in the areas of colloidal dynamics and stability, phase equilibria of complex systems, applications of molecular simulations, and physical properties for process design. He spent 1-1/2 years as an exchange scientist with Shell Research in Amsterdam.

Dr. Cox served for many years as a member of the Editorial Board for Fluid Phase Equilibria, an international journal. He has also served as chairman of the Chemical Engineering Science and Fundamentals programming committee of AIChE. Dr. Cox is a member of the American Institute of Chemical Engineers, the American Society for Engineering Education, and the American Chemical Society. He is a registered Professional Engineer in the state of Texas. His educational credits include a B.S.Ch.E. (1974) degree from The Ohio State University, and M.S. (1977) and Ph.D. (1979) degrees from University of Illinois.

D2. Thermal and Hydraulic Analysis of Distillation Columns

Speaker: Dr. Ven Pinjala, *Business Consultant, Aspen Technology, Inc.*

Abstract: The Column Targeting concept will be briefly reviewed, emphasizing how it can be used for thermal and hydraulic analysis of distillation columns. During design or retrofit analysis of a process, these capabilities can be exploited to identify the targets for appropriate column modifications in order to reduce utilities, improve energy efficiency, reduce capital investment, and facilitate column debottlenecking. The hydraulic analysis is useful in comparing column vapor and liquid flow rates with the minimum (at PNMT) and maximum (flood) limits to determine the range of operation.

The thermal analysis capability is based on the minimum thermodynamic energy for a thermodynamically reversible column with infinite stages, operated at minimum reflux, with coincident operating and equilibrium lines. Each stage is a discrete reversible isothermal flash with reboiler and condenser. The change in enthalpy of each stage is summed, and the cumulative enthalpy plotted against stage number or temperature are called the Column Grand Composite Curves (CGCCs). Optimum distillation order and complex column configurations with side condensers and reboilers, intermediate draws and pumparound/reflux changes can be modeled with this tool.

Bio: Dr. Pinjala received his doctorate from University of Houston in Chemical Engineering. Since then Ven spent 13 years in basic chemicals R&D, working for Union Carbide, Koch and ExxonMobil. For the last 7 years, he worked for Aspen Technology providing support for their Engineering simulation tools.

D3. More Effective Use of Distillation Simulations - Matching Simulation to Reality

Speaker: Mr. Nathan D. Massey, *President, Chemstations*

Abstract: Process simulators are powerful tools for modeling vapor liquid separations in theoretical distillation columns. Use of a simulator allows the solution of complicated separation algorithms with the user's choice of thermodynamic models. Results can be much more accurate and useful than those obtained from 'simple' methods such as McCabe-Thiele or K factor separation estimates.

The challenge in applying simulated results to reality is that the computer model does not contain all the variables present in the real process. A theoretical simulation can differ noticeably from the real process. In many applications, a theoretical model of a distillation column is not useful unless it can closely match the behavior of the actual unit. If we cannot closely match the performance of the unit we haven't gained value by using an expensive simulator to perform a better estimate.

How do we adjust our models to match reality? How do we determine which variables to shift and which to ignore? How do we introduce new data from the actual unit into the simulator? We will discuss the answers to these questions, and include case studies where simulations were brought inline with real performance of the columns and equipment.

Bio: Mr. Massey received a BA in Accounting and an MS in Chemical Engineering from the University of Texas. He has over 25 years of process design and process modeling experience. He has worked at Brown & Root, Mitchell Energy, and AAA Technology & Specialties Co. In 1988, he and his partners, started Chemstations, Inc., to provide chemical engineering analysis software to the chemical process industries. Mr. Massey is a member of AIChE, ACS, the University of Houston's Industrial Advisory Board, and the Houston Chamber of Commerce.

D4. Advanced Hydraulic/Mass Transfer CFD Models for Distillation Column Optimization and Design

Speaker: Dr. Bruce Eldridge, *Senior Lecturer and Head, Separations Research Program, The University of Texas*

Abstract: The project involves the development of a CFD-based model for the hydraulics of structured packing. X-ray tomography and fundamental experiments are being conducted to assist in the development and validation of the CFD model. Results to date have been very promising. The presentation will discuss results from X-ray imaging, pilot scale air-water contactor, and idealized flow system experiments. The agreement between these experimental results and initial CFD simulation will be presented.

Bio: Dr. Bruce Eldridge currently heads the Separations Research Program at the University of Texas at Austin. The SRP is a government and industry sponsored consortium focusing on separations related research. Dr. Eldridge also serves as a Senior Lecturer in the UT Department of Chemical Engineering where he teaches graduate and undergraduate separation processes courses along with the senior design course. Prior to coming to UT, Dr. Eldridge spent twelve years in various design and research positions

with Phillips Petroleum Company. Within AIChE, he most recently served as Chair of the National Separations Division. At the local level, he was chair of the Bartlesville, Oklahoma section. Dr. Eldridge is a registered professional engineer in Texas. He and his wife, Kathleen Dyre, have two daughters.

Dr. Eldridge received his bachelor and masters degrees in chemical engineering from the University of Arkansas. He earned his doctorate in chemical engineering from the University of Texas at Austin under Dr. James R. Fair.

D5. The Kittel II Tray: Using a Round Peg in a Round Hole

Speaker: Dr. Ralph H Weiland, Koch-Glitsch LP, Dallas, Texas

Abstract: Kittel trays have a radial liquid-flow pattern, reversing from column center to wall on alternate trays, that is inherently more natural and much better suited to the circular cross-section of distillation columns. The original version of the Kittel tray was sold mainly into gas processing applications by Johann Stahl GmbH. When Koch-Glitsch LP acquired Stahl's tower internals business in 2001, there were more than 180 columns world-wide using traditional Kittel trays.

Since 2001, Koch-Glitsch LP has been engaged in a development program to modernize the Kittel tray. This has been done in part by applying our patented tray technology, but it has also involved the invention of some completely new approaches. The result is the Kittel™ II tray, having vapor and liquid handling capacities that put it somewhere midway between the very best that can be obtained from cross-flow trays, and our extremely high capacity ULTRA-FRAC(R) tray. The technology will be described and a recent debutanizer application will be discussed.

Comprehensive hydraulic data from air-water simulators has been collected, and efficiency measurements on Kittel II trays at 12-inch tray spacing were made in a depropanizer hydrocarbons research column. The depropanizer is located within the Medford, Oklahoma complex of Koch Hydrocarbon, LP. The Medford depropanizer column is a rather unique research facility. Very promising results of the efficiency tests will be presented.

Bio: Dr. Ralph H. Weiland is a cofounder of OGT. Ralph began working in the area of gas treating as an M.A.Sc. student in 1965 and has been active in basic and applied research in this field ever since. He received B.A.Sc., M.A.Sc., and Ph.D. degrees in Chemical Engineering from the University of Toronto, then spent two years as a post-doctoral fellow in applied mathematics at the University of Western Australia. He taught Chemical Engineering for 30 years at universities in Canada, Australia, and the U.S.A. and directed graduate research in gas treating. Ralph was co-developer with Dr. Sivasubramanian of an earlier version of a mass transfer rate-based model for amine columns and commercialized its concepts in the pre-Windows software package, GasPlant. In addition to the development of the Windows-based ProTreat process simulation package with OGT, Ralph has spent the last five years with Koch-Glitsch LP, Dallas, TX, where he currently leads the development of new tray products.

D6. Commercial Tray Design Methods and Software - From Pencils to Pentiums

Speaker: Mr. Daniel R Summers, Sulzer Chemtech U.S.A., Inc., Tulsa, Oklahoma

Abstract: As popularly known, Dale Nutter was involved early in his career with putting together a design manual for the public on Float Valves that dates back to April 1976. This manual was then made into several electronic (computer) format programs in the early 1980's again by Dale Nutter. In 1988, these programs were assembled into a "Baler" spreadsheet by Dale Nutter and Dave Perry and called the Electronic Design Manual (or EDM) and again made available to the public. In 1995, the EDM was rewritten (with Dale's help and guidance) in Visual Basic (VB) and included both structured and random packings. Finally, in 1999 the EDM program was recompiled and became publicly known as SulTray.

Popular tray design concepts used in SulTray will be discussed in this paper. Additionally, state-of-the-art tray design and tray rating features that are currently incorporated into this "child" of Dale Nutter will be presented. The features discussed will include "Initial Design" and "Performance Diagrams." Tray vibration considerations will also be discussed with reference to the tray rating and design parameters of SulTray. Mr. Dale Nutter will be recognized for his contributions to distillation.

Bio: Dan Summers is the Product Manager of Tray Technology for Sulzer Chemtech, USA at their Tulsa, Oklahoma facility. He has been involved with Separations ever since he graduated from the University of Buffalo in 1977. He started his career with Union Carbide's Separations Design Group in West Virginia, and has since worked for Praxair, UOP, Stone & Webster Engineering and Nutter Engineering. For the past 27 years, Dan has been involved in the design, operation, and troubleshooting of all forms of tower internals in the hydrocarbon, specialty chemical, refining, air separation, and natural gas industries. He is the author (or co-author) of more than 13 papers on distillation and one US patent. His specialty is high capacity tray devices.

Dan Summers is a registered professional engineer in the states of New York and Oklahoma, a member of FRI's Design Practices Committee, is a member of AIChE's Separation Division and has been a full member of AIChE his entire career.

Hydraulic Analysis Is Key To Effective Low-Cost Debottlenecks: Two Case Histories

Speaker: Mr. Henry Z. Kister, Senior Fellow and Director, Fractionation Technology, Fluor, Aliso Viejo, CA

Bio: Henry Z. Kister is a Fluor Corp. Senior Fellow and director of fractionation technology (phone 1-949-349-4679, email henry.kister@fluor.com). He has over 25 years experience in design, troubleshooting, revamping, field consulting, control and startup of fractionation processes and equipment. Previously, he was Brown & Root's staff consultant on fractionation, and also worked for ICI Australia and Fractionation Research Inc. (FRI). He is the author of textbooks Distillation Design and Distillation Operation, as well as 70 published technical articles, and has taught the IChemE-sponsored "Practical Distillation Technology" course 250 times. A recipient Chemical Engineering magazine 2002 award for personal achievement in chemical engineering, and of the AIChE's 2003 Gerhold Award for outstanding contributions to chemical separation technology, Kister obtained his BE and ME degrees from the University of NSW in Australia. He is a Fellow of IChemE, a Member of the AIChE, and serves on the FRI Technical Advisory and Design Practices Committees.

D7. Case 1: Overcoming a Demethanizer Bottleneck

D8. Case 2: Better Feed Entry Ups Debutanizer Capacity

Abstract: For many years, both these towers were bottlenecked by flooding, that was apparent just above a feed point. Raising charge rates would lead to high pressure drops, instability, and poor separation.

In both towers, simulation of plant operating data formed the basis for a detailed hydraulic analysis, which became the key tool for troubleshooting the root causes of flooding. In each tower, the analysis indicated absence of a bottleneck above the feed, but diagnosed a major bottleneck at or immediately below the feed. In the demethanizer, the analysis led to downcomer backup flooding, induced by low hole areas on the trays below the feed. In the debutanizer, the analysis led to flooding induced by the downward pointing of the slots of the feed pipe-distributor towards the tray deck, and the high velocity at which the feed hit the tray deck.

Once the root causes were correctly diagnosed, low-cost solutions could be implemented. Increasing hole area by replacing all tray panels below the feed with new panels containing more holes completely eliminated the demethanizer flooding and enhanced column capacity by more than 20%, with no limit reached.

In the debutanizer, the fix was replacing the feed distributor. Also, trays below the feed were retrofitted with larger downcomers in order to overcome secondary bottlenecks and maximize capacity. Upon return to service, the debutanizer no longer experiences flooding, instability and high pressure drops at the current plant rates. Product purity has improved, and the debutanizer no longer bottlenecks the FCC gas plant.

A correct hydraulic analysis, combined with field measurements and simulation, held the key for successfully identifying and eliminating both tower bottlenecks.