Grapevine, Texas

# 2005 NPRA Q&A and Technology Forum

Gaylord Texan Resort & Convention Center
Grapevine, Texas
October 18 – 21, 2005


NPRA

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| 5:30 pm – 8:00 pm | Registration | Texan Station: Lone Star Entrance |
| 6:00 pm – 10:00 pm | Opening Reception | Texan Station |
| **Wednesday** | **October 19, 2005** | |
| 7:00 am – 5:00 pm | Registration | Texas 1 Registration Desk |
| 8:00 am – 8:30 am | Keynote Address | Texas Ballroom B |
| 8:30 am – 12:30 pm *(concurrent)* | FCC Q&A | Texas Ballroom B |
| | Gasoline Processes P&P | Texas Ballroom A |
| | Plant Automation: Process Control | Texas Ballroom 1-3 |
| 10:00 am – 10:30 am | Coffee Break | Texas Lobby |
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| | FCC P&P | Texas Ballroom A |
| | Plant Automation: Operator Tools and Effectiveness | Texas Ballroom 1-3 |
| 3:00 pm – 3:30 pm | Refreshment Break | Texas Lobby |
| **Thursday** | **October 20, 2005** | |
| 7:00 am – 5:00 pm | Registration | Texas 1 Registration Desk |
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| | Hydroprocessing P&P | Texas Ballroom A |
| | Plant Automation: Managing the Business – Decision Support | Texas Ballroom 1-3 |
| | Design & Operations Safety Session | Texas Ballroom C |
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| 12:30 pm – 1:30 pm | Luncheon | Texas Ballroom D |
| 1:30 pm – 5:00 pm *(concurrent)* | Hydroprocessing Q&A | Texas Ballroom B |
| | Crude / Vacuum / Coking P&P | Texas Ballroom A |
| | Plant Automation: Maintaining & Upgrading the Plant Automation Infrastructure | Texas Ballroom 1-3 |
| 3:00 pm – 3:30 pm | Refreshment Break | Texas Lobby |
| **Friday** | **October 21, 2005** | |
| 7:00 am – 11:00 am | Registration | Texas 1 Registration Desk |
| 7:00 am – 7:30 am | Continental Breakfast | Texas Lobby |
| 7:30 am – 9:00 am *(concurrent)* | Plant-wide Systems P&P | Texas Ballroom A |
| | Plant Automation: The Refinery of the Future | Texas Ballroom 1-3 |
| 9:00 am – 9:30 am | Coffee Break | Texas Lobby |
| 9:30 am – 11:00 am | The Refinery of the Future Panel Discussion | Texas Ballroom 1-3 |

October 18 - 21, 2005

# 2005 NPRA Q&A and Technology Forum

The 2005 NPRA Q&A and Technology Forum addresses real problems and challenges that you face at your facility and helps you sort through solutions as you discuss them with panelists and in networking with other attendees. Today's competitive refining environment requires attention to plant safety, superior technology, innovation, and excellence in operations. Networking with refiners, petrochemical producers, catalyst and chemicals suppliers, process licensors, engineering firms, and other industry experts at the Q&A and Technology Forum keeps you on top of the latest developments as you cope with demanding business conditions.

**Principles & Practices**

The Principles & Practices (P&P) sessions, which correspond to and complement the Q&A sessions, will be ideal for operations superintendents, process engineers and others that can benefit from a session that is focused on practical issues, the fundamentals of good operations, and eliminating persistent problems.

- Crude & Vacuum Distillation and Delayed Coking
- Gasoline Processes
- FCC
- Distillate Hydroprocessing
- Plant-wide Systems

**New in 2005:**

This year's program has been expanded to include a *Design and Operations Safety Session* which will use refiners' experiences and lessons learned from incidents and near misses as a basis for making improvements in plant safety.

**Plant Automation & Decision Support**

In 2005, the Plant Automation and Decision Support Conference is being co-located with the Q&A and Technology Forum so that attendees whose responsibilities overlap between process engineering, unit operations, process control, and planning will be able to use their conference time effectively. This "conference within a conference" will have its own program and will provide a comprehensive array of topics for plant automation professionals.

- Process Control
- Operator Tools and Effectiveness
- Managing the Business – Decision Support
- Maintaining and Upgrading the Plant Automation Infrastructure
- The Refinery of The Future

Attendees will be able to attend any of the Q&A, P&P, plant automation, or safety sessions. There will be one keynote session for all attendees on Wednesday and the hospitality suites will be open to every attendee.

NPRA

## Session Information

## Wednesday
## October 19, 2005

### Principles & Practices Sessions

The Principles & Practices (P&P) sessions are discussion-oriented sessions that complement the information exchange that occurs in the Q&A sessions. Each of the P&P sessions will address the fundamentals of good operation and the bedrock principles for the technologies that are commonly employed. These sessions will usually have short presentations which will be followed by a time where attendees can ask further questions or present their own particular problems and benefit from the collective experience of the other attendees. The five P&P sessions are:

- Crude & vacuum distillation and delayed coking
- Gasoline processes
- FCC
- Distillate hydroprocessing
- Plant-wide Systems (Hydrogen Systems, Tank Farm, Corrosion Control, Automation & Instrumentation, Flare Systems, Safety, Utilities)

### Plant Automation and Decision Support

The NPRA Plant Automation and Decision Support Conference is ideal for those individuals who are responsible for plant automation, process control, planning and scheduling, IT and modeling/ simulation. Unlike other plant automation and decision support conferences, this conference is designed by operating companies for operating companies.

The Plant Automation and Decision Support Conference will have five separate sessions:

- Process Control
- Operator Tools and Effectiveness
- Managing the Business – Decision Support
- Maintaining and Upgrading the Plant Automation Infrastructure
- The Refinery of the Future

### Keynote Address

8:00 am – 8:30 am
Texas Ballroom B

**J. William Haywood**
Senior Vice President, Refining
Tesoro Petroleum Corporation

The refining industry faces multiple, simultaneous challenges while navigating a chaotic business environment and the Gulf Coast hurricanes. What must we do?

## Sponsors

**Opening Reception Co-Sponsors:**
Advanced Refining Technologies
Air Products / Technip Hydrogen Alliance
Aspen Technology, Inc.
BJ Chemical Services
Chevron Lummus Global
Emerson Process Management
Engelhard Corporation
ExxonMobil Research & Engineering Co.
Fluor Corporation
GE Infrastructure Water & Process Technologies
Grace Davison
Gulf Chemical & Metallurgical Corp.
Honeywell Process Solutions
Johnson Matthey Catalysts
Nalco Energy Services
Shaw / Stone & Webster
STRATCO, DuPont Refinery Solutions
UOP LLC

**Wednesday Morning Coffee Break:**
Air Products / Technip Hydrogen Alliance

**Wednesday Afternoon Refreshment Break:**
CB&I Howe-Baker

**Thursday Morning Coffee Break:**
Plant Automation Services, Inc.

**Thursday Afternoon Refreshment Break:**
Air Liquide

**Conference Bag:**
GE Infrastructure Water & Process Technologies

**Q&A Screening Meeting:**
Criterion Catalysts & Technologies
Flint Hills Resources, LP

**Electronic Session Counter:**
Baker Petrolite Corporation

## Gasoline Processes Principles & Practices

8:30 am – 12:30 pm
Texas Ballroom A

Presider
*Ron Marrelli*, Holly Refining & Marketing

1. Alkylation Acid Consumption – ConocoPhillips
2. Monitoring and Operation of Reformer Heaters – Turpin Consulting
3. Corrosion Monitoring and Control for Naphtha Hydrotreaters – Baker Petrolite
4. MACT II Issues for Reformers – UOP and Chevron Products

## FCC Q&A

8:30 am – 12:30 pm
Texas Ballroom B

**Panelists**
*Ken Bruno*, Albemarle Catalysts
*Rajan Krishnan*, TOTAL Petrochemicals USA Inc.
*Marshall Letts*, Shell Canada Products
*Pat Maher*, ExxonMobil Research & Engineering
*Joe Niedecken*, Valero Energy Corp.
*Jeffrey Spearman*, Barnes & Click, Inc.
*Herb Telidetzki*, Tesoro Petroleum Corp.

See page 15 for questions.

## Plant Automation: Process Control

8:30 am – 12:30 pm
Texas Ballroom 1-3

Presider
*Steve Elwart*, Ergon Refining

**Auditing APC Applications for Improved Performance**
*James Gunderman*, Staff Process Control Engineer, Chevron Corporation

Plant process control engineers need to audit advanced process controls (APC) to improve APC application performance. This presentation will discuss Chevron's methodology for conducting APC audits, their evolving approach and lessons learned in this process.

**Identification of Dynamic Inferential Models Using Slow and Irregular Analyzer and Lab Data**
*Dr. Yucai Zhu*, Tai-Ji Control; *Jinghua Wang* and *Qingling Fu*, Sinopec Guangzhou Refinery

Knowledge of the dynamics in inferential modeling is critical to determining the accuracy of data that the model provides. Using a newly developed identification method, dynamic inferential models of several product qualities (e.g. endpoints, flash point) for a crude unit at Sinopec's Guangzhou Refinery have been developed.

**Security and Data Access – Striking the Right Balance**
*Rick Kaun*, Collaborative Production Management, Matrikon Inc.; *Donovan Tindill*, Supervisor, CPM Network Services, Matrikon Inc.

Data from remote locations needs to be secure and readily accessible. There is a way for operating companies to strike a balance between security and data access without increasing security risks or investing large amounts of capital.

**Securing Control Systems in the Oil and Gas Infrastructure: The I3P SCADA Security Research Project**
*Dr. Ulf Lindqvest*, Program Director, SRI International; *Ben Cook*, Research Staff, Sandia National Laboratories.

Cyber secuirity should be a high priority at every refining and petrochemical company. The Institute for Information Infrastructure Protection (I3P) is working with 10 research institutions to undertake a two-year R&D effort to improve the cyber security of control systems in the oil and gas industry. This presentation will identify some cyber security concerns for the industry, provide an overview of the research program, and highlight some specific tools and technologies under development by the I3P team.

**Reduction of "Bad Actor" Nuisance Process Control Alarms**
*Douglas Rothenberg*, D-RoTH, Inc., *Probir Shah*, ConocoPhillips

Refiners and petrochemical producers need to be able to evaluate the performance of their DCS alarm systems. This presentation will review current best practices in DCS alarm management and describe an effective program for reducing nuisance alarm activations. Attendees will learn how a program of data capture, analysis and the pruning and tuning of alarms can result in a 10-15% initial reduction of nuisance alarms.

## FCC Principles & Practices

1:30 pm – 5:00 pm
Texas Ballroom A

Presider
*Cheryl Joyal*, BP, p.l.c.

1. Fluidization Fundamentals – Grace Davison
   a. Fluidization fundamentals
   b. Standpipe aeration calculations and FCC pressure balance
   c. Troubleshooting-commercial case studies and examples

2. Heat Balance Fundamentals and the Effects of Changing Feed – UOP
   a. Heat balance fundamentals and key variables
   b. Commercial case studies – feed effects and combustion modes
   c. Heat balance quiz

3. FCC Equipment Technology Types and Key Design Parameters

## Gasoline Processes Q&A

1:30 pm – 5:00 pm
Texas Ballroom B

**Panelists**
*Darryl Hess*, ExxonMobil Refining & Supply Company
*Tom Johnston*, Murphy Oil Company
*Greg Joppa*, Flint Hills Resources, LP
*Ron Marrelli*, Holly Refining and Marketing
*Jean-Luc Nocca*, Axens North America
*Jeffrey Spearman*, Barnes and Click, Inc.

See page 17 for questions.

## Plant Automation: Operator Tools and Effectiveness

1:30 pm – 5:00 pm
Texas Ballroom 1-3

Presider
*Steve Venner*, Honeywell Inc.

**Ensure Safe Production (ESP) and Achieve Economic Targets through Improved Work Processes and Increased Collaboration**
*Bart Winters*, Honeywell Inc.

Shell affiliates implemented an operating management solution to support Shell's ESP process at all US refineries. This presentation will describe how these advanced applications enabled the ESP work processes and the benefits Shell received by using these applications.

**Establishing Operator Performance Improvements and Economic Benefit for an ASM® Operator Interface**
*Dal Vernon Reising*, Partner,
*Jamie Errington*, Senior Partner,
*Peter Bullemer*, Senior Partner and
*Time SeMaere*, Partner, Human Centered Solutions, LLP

A controlled comparison of an abnormal situation management (ASM) operator interface to that of a traditional DCS interface was conducted with 21 professional operators. The results indicated that operators using the ASM® interface completed fault scenarios 41% faster and were 26% more successful. A Monte Carlo simulation using these results estimated an economic benefit of $870,000 per year for an average-size plant.

**Operator Situation Awareness**
*Ian Nimmo*, President, User Centered Design Services LLC
Alarm management, human interface design, and control room ergonomics are all important topics for today's plant operations however, if they are done in isolation, they will be unsuccessful. This presentation will introduce "operator situation awareness" and how each of these disciplines can impact the operator's ability to respond to abnormal situations; how modifying the alarm system can be supported by enhancement of the graphics; how the graphics can be improved by human factors and ergonomic design of the operating console and how the console communications can be improved by ergonomic design of the control room.

**Improved Operation Performance Delivers Better Plant Reliability**
*Sanjeev L. Mullick*, Aspen Technology

Today, oil companies are focusing on increasing production to improve profitability with historically high margins. Running more barrels through the refinery at top capacity introduces a whole new set of issues related to safe, reliable operation. Plant reliability and safety initiatives can help minimize the potential for disruptions. Equipment reliability through condition-based monitoring and reliability-centered maintenance is one way to ensure plant uptime. Another important approach for overall plant reliability is business process improvement and execution. This paper will focus on the best practices in business processes and performance management for better plant reliability. Industry examples and case studies will be highlighted.

**Panel Session to Discuss Alarm Management**
- *Peter Jofriet* – Honeywell Inc.
- *Dave Shook* – Matrikon Inc.
- *Fred Woolfrey* – Yokogawa Corporation of America

**Thursday**
**October 20, 2005**

## 2005 NPRA Q&A Peter G. Andrews Lifetime Service Awards

8:00 am – 8:30 am
Texas Ballroom B

The Peter G. Andrews Lifetime Service Award honors members who have made long lasting contributions to the value and vitality of the NPRA Q&A meeting. Recipients of this award have served as Q&A panelists, screening committee members, and, most importantly, active participants in the dialogue that is fundamental to the meeting. During their careers, the recipients have demonstrated a willingness to pass on their knowledge and expertise to future generations in this forum, have made significant contributions to the meeting's quality, and have emphasized the importance of sharing knowledge in making continuous improvements.

**George Quinn**

**Art Suchanek**

## Hydroprocessing Principles & Practices

8:30 am – 12:30 pm
Texas Ballroom A

Presider
*Jeff Johns*, Chevron Products

1. Reactor Safety – Chevron Products
2. Reactor Gas Scrubbing in Hydroprocessing Units – UOP
3. Process Monitoring – ExxonMobil Research & Engineering
4. Catalyst Handling – Cat Tech

## Crude / Vacuum Distillation and Coking Q&A

8:30 am – 12:30 pm
Texas Ballroom B

**Panelists**
*Jeff Handwerk*, Tesoro Petroleum Corp.
*Tom Johnston*, Murphy Oil Company
*Sonny Loudon*, CITGO Petroleum Corp.
*Mike McGrath*, Foster Wheeler North America
*Bob Reynolds*, Nalco Energy Services Co.
*Sim Romero*, Valero Energy Corporation

See page 18 for questions.

## Design and Operations Safety Session

8:30 am – 12:30 pm
Texas Ballroom C

This year NPRA's Fire and Accident Prevention Committee will present a session on plant safety topics for process engineers, design engineers, and operations supervisors and managers. The Design and Operations Safety session will cover best practices, lessons learned from recent events, the use of safety instrumented systems, and designing for loss-control. The program will consist of presentations and information sharing by attendees on issues that impact safe operations.

**Operator Alarm Overload**
*David Strobhar*, President, Beville Engineering

**Process Hazard Analysis Revalidations: Team Composition and Other Considerations**
*Joseph E. Zanoni*, Vice President, Baker Engineering and Risk Consultants

**Ergonomics for the Engineer**
*Dennis Attwood*, Principal Human Factors Engineering, RRS Engineering

## Managing the Business – Decision Support

8:30 am – 12:30 pm
Texas Ballroom 1-3

Presider
*Jack Davis*, Aspen Technology

**Planning & Optimization Best Practices**
*Michael Hileman*, Vice President, Solomon Associates

The common work practices, routines, or procedures used in Pacesetter refinery / petrochemicals facilities to guide the purchase of feedstocks, set refinery process unit conditions, and determine product marketing plans constitute a set of industry best practices. This paper is an overview of these planning and optimization best practices, including use of LP models to help planners unlock the potential for increased margin generation for their operations.

**Supply Chain Decision Support for a Multi-Site Refining Company**
*Paul Fetter*, Honeywell, Inc.

This presentation will describe a project in which an Asian oil company decided to implement numerous advanced decision support solutions to integrate and optimize the corporation's hydrocarbon value chain. It will also discuss how the supply chain planning decision support was integrated across the corporation through a hierarchy of optimization models. This resulted in an integrated planning model that covered the entire supply chain.

**Crude Supply and Inventory Management: Tools and Techniques**
*Darrell Rangnow*, Director, Invensys

It may seem to some people that the process of having the right crude at the right place at the right time for the right price would be straightforward, but for those in the industry that are trying to do just that it is anything but straightforward. The decisions made by these individuals have a large impact on overall refining profitability and must be made with large uncertainties in demand, product prices, crude quality, logistics, and refinery operating capabilities/capacities. As a result of these risks and incentives, many companies have focused significant effort on developing tools and techniques to maximize the value gained and reduce the uncertainties. This paper describes some of these innovative approaches, characterizes the effectiveness of these practices, the various business strategies employed, and provides industry examples.

**Better Decisions, Less Effort, via Scheduling Technologies**
*Craig Acuff*, Valero Energy Corporation

Plant scheduling tools have evolved significantly over the past five years. Several vendors are addressing issues such as cost benefits, complexity, functionality, and integration. Better decisions are made with less effort using integrated scheduling tools. This presentation presents an overview from an operating company perspective on how today's technologies have overcome legacy issues and provide the basis for making better decisions.

**Intelligent Information Management**
*Ken Johnson*, Account Manager, Matrikon Inc.
*Tom Porritt*, Operating Engineer, Tesoro Alaska Refinery

Movement management is a key area in the refinery, and typically the focus of the oil accountants. All refineries have a movement management system of one sort or another, whether it is in the form of a logbook, a spreadsheet, an Access database or an automated system provided by DCS vendors. If information is gathered at the source, how can we use this information in a more efficient way to create significantly more value through highly efficient business processes? This presentation will discuss how one refinery has optimized their information management by changing their business processes and adding additional applications without putting any additional data collection or management burden on Operations.

**Panel Session on Cutting Edge Technology in Decision Support**
- *Rich Bowman* – TOTAL Petrochemicals
- *Basil Joffe* – Aspen Technology
- *Pat Kennedy* – OSIsoft
- *Dean Trierwiler* – Haverly Systems

## Crude / Vacuum Distillation and Coking Principles & Practices

1:30 pm – 5:00 pm
Texas Ballroom A

Presider
*Paul Moote*, Sinclair Oil

1. Heater Design and Heater Decoking Techniques – Foster Wheeler
2. Expansion Options – Pre-flash Towers and Flash Drums – Process Consulting Services
3. Heat Exchanger Train Design for Minimum Energy Usage and Minimum Fouling – Process Consulting Services
4. Getting More out of your Crude and Vacuum Towers – Koch Glitsch
5. Coke Cutting Optimization – Flow Serve
6. Resid Contaminants
   a. Effects on operation
   b. Effects on liquid products and coke
   c. Effects on heater coking

## Hydroprocessing Q&A

1:30 pm – 5:00 pm
Texas Ballroom B

**Panelists**
*CT Chang*, Sunoco Inc.
*George Hoekstra*, BP Refining Technology
*Greg Joppa*, Flint Hills Resources, LP
*Larry Kraus*, Albemarle Catalysts
*Mike McGrath*, Foster Wheeler North America
*Jeffrey Spearman*, Barnes and Click, Inc.
*Brent Stratton*, Lion Oil Company

See page 20 for questions.

## Maintaining and Upgrading the Plant Automation Infrastructure

1:30 pm – 5:00 pm
Texas Ballroom 1-3

Presider
*Blake Larsen*, Western Refining

**2006 Industry Comparative Performance Analysis to Drive Automation Upgrades**
*John Havener*, Senior Consultant, Solomon Associates

There is significant interest in upgrading the automation systems which in the refining industry average 15 years of service. This presentation will describe the areas presently targeted in the study and describe how the study results will be targeted to help drive automation upgrades. The first step will be a comparative performance analysis followed by identification of gaps to the best performers. Quantification of the financial impact provides a springboard to determine if upgrades are justified; define the projects and returns; and implement change.

**Integration of Wireless Technologies into Operational Work Practices**
*Stephane Lauzon*, Honeywell Inc.

Wireless technologies are becoming pervasive and surround us in our daily lives. Wireless technology in an industrial setting, while not yet as commonplace, is also growing. An industrial setting, however, brings a different set of unique challenges. The purpose of this paper will be to review the current "state-of-the-art" in wireless technologies and provide an example with guidelines for their appropriate integration into work practices at an industrial plant. First will be a review of existing wireless technologies and standards. Following this, an operations scenario from one of Honeywell's operating facilities will be presented and discussed. Finally, there will be a look ahead at future technological developments in this area and their potential implications.

**A Future Vision of IT-based Systemized Control Room Operation**
*Tetsuji Tani*, Engineering Consultant and *Fumitaka Higuchi*, Chief Engineer of Idemitsu Kosan Co.

Since the year 2000, over 30 ISCS /AMS systems have been applied at the oil/petrochemical refineries operated by Idemitsu Kosan in Japan. As a result: 1) manual operation time has been reduced by 98% through the application of ISCS to the grade change operation; 2) monitoring time has been reduced by 85% through the application of AMS to the grade change operation; 3) the expert's operational knowledge has been partially systematized to help automate start-up and shutdown operations; and 4) knowledge sharing and the dissemination of operational skill have improved.

**Application of Automated Step Testing and Modeling on a FCC Unit at the Hovensa St. Croix Refinery**
*Phil Celaya*, Senior Applications Engineer, *Jasna Zekic*, Process Engineer, *Zul Bandali*, Applications Developer and *Rohit Pantwardhan*, Advanced Control Engineer, Matrikon Inc.

Technology that facilitates automated monitoring and maintenance of model predictive control (MPC) applications is critical to sustaining these applications. The Hovensa St. Croix refinery has several MPC applications that were commissioned, on average, 5-7 years ago. This presentation describes the MPC maintenance efforts on the FCC application based on automated, closed loop, multivariable step testing and modeling technology.

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**Thursday**
**October 20, 2005**

## Maintaining and Upgrading the Plant Automation Infrastructure

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**Managing Security for Open Control Systems**
*Johan Nye*, ExxonMobil Research and Engineering Company

This presentation will illustrate exactly what an open control system is, how it differs from a DCS system and the challenges it brings to operators. These challenges are managerial (evaluation, risk assessment, roles, training) and technical (separation from other control systems and networks, cyber security and critical process control functions). The presentation will conclude with a short case study of how this works at ExxonMobil.

**Technical Forum on the "Normalization of Deviation"**
"Normalization of Deviation" is when individuals or teams repeatedly accept a lower standard of performance over time until that lower standard becomes the "norm". Usually, the acceptance of the lower standard occurs because the individual/team is under pressure (budget, schedule, etc.) and perceives it will be too difficult to adhere to the expected standard. Their intention may be to revert back to the higher standard when this period of pressure passes. However, by "getting away" with the deviation, it is likely they will do the same thing when the same stressful circumstances arise again. Over time, they fail to see their actions as deviant. This open forum will discuss the concept of normalization of deviation in the refining and petrochemical industries from a plant automation orientation.

**Friday**
**October 21, 2005**

## Plant-wide Systems Principles & Practices

7:30 am – 9:00 am
Texas Ballroom A

Presider
*Matt Baebler*, Tesoro Petroleum

1. Tank Farm and Blending Logistics in a Clean Fuels Environment
2. Optimizing Hydrogen Production and Utilization
3. Controlling Corrosion in Process Units

## "The Refinery of the Future"

7:30 am – 11:00 am
Texas Ballroom 1-3

Presider
*Anne Keller*, Jacobs Consultancy

**Keynote:**
**"Plant Automation as Seen by a Plant Manager"**
*Wouter Raemdonck*, Vice President of the Americas Refining, TOTAL Petrochemicals

**Keynote:**
**"A Refinery of the Future"**
*Mike Sarli*, Plant Automation Technology Program Manager, ExxonMobil Research and Engineering Company

**Panel Discussion on "The Refinery of the Future"**
- *Jay Atkins* – BearingPoint
- *Wendy Foslien* – Honeywell Inc.
- *Mike Sarli* – ExxonMobil Research and Engineering Company

**Ken Bruno** began his career with Amoco at the Research Center in Naperville, IL. His focus was catalytic cracking where he served as Pilot Plant and Experimental Design Engineer, Technical Service Engineer, FCCU Model Development and Application Engineer, and FCC Process Specialist. Ken then moved to Amoco's (BP) Whiting, IN, refinery as the FCC and Alky Consultant where he was responsible for process and catalyst optimization.

In 1999, Ken joined Albemarle Catalysts, LLC in Houston, TX, as Sr. Technical Representative, performing technical service and catalyst selection for customers across North America. In 2002, he was named FCC Development Manager, NA, responsible for developing and introducing new products, and providing the interface between customer's new product requirements, research and development initiatives, and marketing.

Ken Bruno received his BSChE from the University of Akron and his PhD in Chemical Engineering from the University of Notre Dame.

**CT Chang** is the Hydroprocessing and Hydrocracking processes Specialist for Sunoco R&S. He is responsible for catalyst and technology evaluation and selection for Sunoco's 15 hydroprocessing units. More recently he has been involved in the technology selection and implementation of Sunoco's clean fuel projects. He spent the first 20 years of his 24-year career at Sunoco in lube base oil process development and manufacturing support. CT has a BSChE and a MSChE and a PhD in Physical Chemistry from the University of Illinois at Urbana, Illinois.

**Jeff Handwerk** is Process Safety Superintendent and Process Consultant for operations engineers at Tesoro Petroleum, Salt Lake City, UT refinery. He provides support for all refinery operations and is responsible for power sales from new refinery cogeneration units. Before joining Tesoro he provided technical assistance and project development in the areas of crude distillation, reforming, aromatics recovery, alkylation, and lube oil and wax production for Sun Oil Company and Amoco Oil Company.

Jeff received his BS and MS degrees from the Colorado School of Mines.

**Darryl Hess** is Fuels Systems Coordinator at ExxonMobil's Baton Rouge, LA refinery. Darryl has worked in several engineering assignments at the Benicia, CA, refinery for Humble Oil until 1976 when he transferred to the Billings, MT refinery, serving in several supervisory assignments until 1979. Relocating to Baton Rouge as the Cogeneration Project Site Development Coordinator, he was transferred to the Baton Rouge Refinery Coordination and Product Quality Department in 1982. After several staff assignments in Refinery Economics and Chemicals Interface Coordination, he moved into his current job in 1992 where he has oversight for the scheduling, blending, shipping, and quality management of up to 450 kB/D of motor gasoline, aviation gasoline, jet fuel (including JP-8), and diesel production from the Baton Rouge, LA refinery.

Darryl received his BSChE from Montana State University and his MBA from Louisiana State University.

**George Hoekstra** is process specialist for hydroprocessing in BP's Refining Technology Department. His current work focuses on evaluation of new catalysts and providing support to BP's refining business units for all hydroprocessing issues. George has worked for 32 years with Amoco and BP as a Research Engineer and Research Supervisor in hydroprocessing, catalytic cracking, oil shale, and lubricants. For several years, he worked in Amoco's lubricants business, serving as Product Manager for industrial lubricants and Director of Lubricant Product Development and Technical Services. George has a BSChE from Purdue University and an MBA from the University of Chicago.

**Tom Johnston** is the Process Engineering Supervisor at Murphy Oil USA, Inc., Meraux, Louisiana. Tom began his career in 1968 at Shell Chemical Co. Over the next 23 years he worked for Crown Central Petroleum and Fina Oil and Chemical. He held various positions in process engineering, process development, operations and refinery management.

In 1992, Tom joined Murphy Oil USA, Inc. and held positions in technical services and project management and in 2004 began his current assignment as Process Engineering Supervisor where his responsibilities included oversight of crude, vacuum, naphtha hydrotreating, Platforming, distillate hydrotreating, amine treating, and sulfur recovery.

Tom received his BSChE from Louisiana Tech University and his MSChE from the University of Houston.

**Greg Joppa** is Strategic Planning Manager at Flint Hills Resources' Corpus Christi, TX, refinery. Greg worked for five years at UNO-VEN/CITGO in Lemont, IL, as a process engineer where he dealt mostly with the chemicals units, including a naphtha hydrotreater and fixed-bed reformer. In 1999, he started working with Koch/Flint Hills Resources in Corpus Christi, Texas. He spent almost three years as the oil flow optimizer for the chemicals complex before taking his present assignment as a process engineer on the CCR.

Greg received his BSChE from the University of Illinois at Urbana-Champaign.

**Larry Kraus** is the hydroprocessing catalysts Technical Service Manager for Albemarle Catalysts Co. He has worked for Albemarle Catalysts Co. (and Akzo Nobel LLC) for six years. In his current position, he provides technical advice and support on catalyst system design, unit operations, unit monitoring, and unit troubleshooting for technical service representatives, reviews catalyst technology applications; and develops/coordinates training for Albemarle and client personnel. Prior to the Technical Service Manager role, Larry held positions as a hydroprocessing specialist for the fixed bed resid/heavy FCCU feed pretreat, diesel, and reactor internals areas, and as a hydroprocessing technical service representative on a commercial team.

Larry's career began over 15 years ago with Amoco Oil R&D. He spent six years working on a variety of projects including synthetic/alternative fuels process design, catalyst development, and commercial hydroprocessing catalyst evaluation. Following this, Larry worked four years at Amoco Worldwide Engineering & Construction in Houston and the Amoco/BP-Amoco Texas City refinery on small/medium capital project evaluation/implementation and unit optimization studies in hydroprocessing and other refining areas.

Larry received BS degrees in Chemical Engineering and Chemistry from Kansas State University and MS and PhD degrees in Chemical Engineering from Northwestern University.

**Rajan Krishnan** is presently the Assistant General Manager and Technical Manager for TOTAL Petroleum Port Arthur, TX, refinery where Rajan leads and manages the refinery Technical Department and is responsible for maximizing refinery earnings by continuous improvement of unit performance, advanced process control, development of investment strategies, project management, mechanical integrity and reliability, quality control (including ISO 9000 certification) and information management. He has 27 years of professional experience in refining, petrochemicals and gas processing, as Development Engineer, Process Engineer, Project Manager, Business Unit Manager, Department Head, Process Manager and Technical Manager.

Rajan received his Masters degree in Refining and Chemical Engineering from the French Petroleum Institute and his BSChE from Calicut University, India.

**Marshall Letts** is the Technical Manager, Shell Canada Products, Sarnia Ontario, Canada where he is responsible for the Process Engineering, Process Control/ Instrumentation and Engineering Services. He has been with Shell Canada for 24 years and has performed a number of roles involving process design, unit start-up, projects and consultancy at Shell Canada's head office and the Sarnia and Montreal East refineries. Prior to his current position, he was Head Engineer- Catalytic Cracking and Thermal Cracking for Shell Canada Products. He received his BSChE from the Technical University of Nova Scotia.

**Arthur 'Sonny' Loudon** has been with CITGO since 2000 and is currently the Process Technical Manager at CITGO's Corpus Christi, TX refinery. He has also served as Manager of Process Development and Section Supervisor at the CITGO Lake Charles, LA refinery. Sonny started his career in Conoco's Process Engineering Department in Ponca City, OK, and also worked in engineering and operations assignments at the Conoco Chemicals Complex in Lake Charles, LA. He then worked for Pennzoil in their Roosevelt, UT refinery. In 1995, he was the lead process engineer in Pennzoil's Houston Corporate Design Group for a grassroots RCC/alkylation unit which was built at the Pennzoil Shreveport refinery where, after startup, he served as the refinery Chief Process Engineer.

Sonny received his BSChE from Brigham Young University and is a Registered Professional Engineer in LA.

**Patrick Maher** is a Distinguished Engineering Associate for ExxonMobil Research and Engineering Company at Baytown, Texas. Pat began his career in 1978 at the ExxonMobil Process Research Laboratory in Baton Rouge, LA, where he did R&D work in the areas of FCC, hydroprocessing and reforming. He held positions in the Refining & Supply organizations in Baton Rouge and Houston before joining the ExxonMobil Area Engineering Office in Baytown. He provides technical support for ExxonMobil FCC operations in the U.S. and South America. Pat received his BSChE from the University of Louisiana-Lafayette and his MS and DSc degrees from Washington University in St. Louis.

**Ron Marrelli** is the Engineering Manager for Holly Refining & Marketing Co. in Woods Cross, UT. Ron has 32 years experience in the refining industry most of which was with Phillips Petroleum Company and the past two years with Holly. In his current position, Ron is responsible for overseeing the engineering activities, capital project development and providing support to the operations and maintenance groups at the refinery. Ron has experience in various process units during his time at Holly and Phillips, including reforming, HF alkylation, isomerization, crude fractionation, naphtha and distillate hydrotreating, solvent de-asphalting, sulfur recovery and amine treating. During this time in refining, Ron worked in various refinery engineering and operations positions and worked as a team leader on the alkylation/reforming/isomerization team at the Phillip's Research and Development Center. Ron holds a BSChE from the University of Utah.

**Michael McGrath** is the Director of Refining for Foster Wheeler North America Corporation in Houston, TX. Mike joined Foster Wheeler Corporation as a process design engineer in Livingston NJ. After progressing through various positions, including Group Supervisor of Hydroprocessing, Chief Process Engineer of Light Oils, Manager of Light Oils and Petrochemicals, Manager of Process Designs Operations, he was promoted to head the Process Design & Development Department in 1993. In this position he was responsible for the process groups both in Houston, TX and Perryville, NJ. He assumed his present position in 2004. He has authored several papers on heavy oil processing and was a member of the 1987 NPRA Q&A panel.

Mike received his BSChE from Texas A&M University.

**Joe Niedecken** is the Economics and Planning Manager at the Valero Memphis, TN refinery. He has over 17 years of refining experience at several different facilities with BP, Tosco Premcor and ConocoPhillips. He has had operations or technical experience on most major refining processes, including FCC, reforming (CCR and semi-regen), delayed coking, hydrocracking, hydrotreating, HF alkylation and crude units.

Joe holds a BSChE from the University of Cincinnati.

**Jean-Luc Nocca** is Vice President of Technology Sales & Marketing for Axens North America, Inc. Prior to holding this position, Mr. Nocca carried out various technical and commercial assignments in North America (Houston and Princeton) and at IFP's headquarters in Rueil-Malmaison, France.

Mr. Nocca has over 25 years experience in the refining industry. He is the author of several technical papers in the field of petrochemicals and clean fuels production.

Mr. Nocca holds a Bachelor of Science degree from "Ecole Supérieure des Industries Chimiques" (ENSIC), Nancy, France and from the "Ecole Supérieure des Pétroles et Moteurs" (ENSPM), Rueil-Malmaison, France.

**Robert Reynolds** is the R&D Manager for Downstream Research in the Energy Services Division of Nalco Company in Sugar Land, TX. Bob currently manages Nalco's research and technical support activities for the refinery process treatment and fuel and lubricant additives areas. His experience includes desalting, corrosion inhibition, fouling control, FCCU catalyst metals passivation, slurry oil settling aids, antifoams, H2S treatment and cleaners. Bob joined Nalco in 1977 and has had prior assignments as District Manager, Technical Director, Product Manager, Research Group Leader and Research Chemist. He holds a BSChE from Clarkson University.

**Sim Romero** is Director of Coking and Heavy Oils for Valero Energy Corporation. As Director of Coking and Heavy Oils, Mr. Romero is actively involved with the expansion, optimization and troubleshooting of Valero's resid conversion units. Mr. Romero has over 25 years experience in delayed coking and heavy oil conversion and has worked for Conoco, BP, ARCO, Bechtel and ExxonMobil.

**Jeffrey Spearman** is Principal Consultant at Barnes and Click, Inc. Jeff began his career in 1985 at Marathon Oil Company's Garyville, LA, refinery, where he was initially responsible for process engineering support of FCC, HF acid alkylation, isomerization, gas separation/treating, and sulfur removal/recovery process units. He subsequently held positions of increasing responsibility, including Lead Process Design Engineer for a 30 Mb/d ROSE unit, Capital Projects Coordinator, and Foreman over the refinery's four-unit reforming and hydrotreating complex. Jeff was transferred to Marathon's Robinson, IL, refinery in 1992 and named the Operations Supervisor for the refinery's FCC, alkylation, MTBE, and gas recovery complexes. He was later named the Start-up Supervisor for a new 75 Mb/d distillate desulfurization and sulfur recovery complex, and then assumed complete responsibility for a new business area consisting of the start-up units and the refinery's reforming, hydrocracking, and isomerization complexes. Jeff broadened his expertise beginning in 1995 as a consultant, and later as a principal of his firm, specializing in refining & marketing strategy, feasibility studies, independent engineering, and litigation support. He has assisted clients in the U.S., Latin America, West Africa, the Middle East, and Southeast Asia. Jeff joined Barnes and Click, Inc. in 2001.

Jeff received his BSChE from the University of Michigan.

**Brent Stratton** is Manager of Process Engineering for Lion Oil Company in El Dorado, AR. During his 11 years at Lion Oil, Brent has been responsible for technical service, optimization, and process design at the El Dorado, AR refinery. In his current role, Brent is responsible for coordinating the activities of the Process Engineering department, including catalyst management, unit monitoring and optimization, and capital projects. Prior to joining Lion in 1994, Brent was employed by Walk, Haydel, and Associates in New Orleans where he did contract refinery engineering. Brent received his BSChE from the University of Arkansas.

**Herb Telidetzki** is presently Tesoro Petroleum's FCC and alkylation specialist assisting in project development, unit troubleshooting and monitoring at their various facilities. His career began nearly 25 years ago with Esso Petroleum Canada at their Vancouver, British Columbia, facility in their Process Control and Technical Services group, primarily for the FCC area. After 10 years, he moved to the Project Design and Technical Services group in Dartmouth Nova Scotia specifically to debottleneck and start up a revamp of the FCC gas plant, polymerization unit and downstream fractionation.

Herb then joined Amerada Hess for two years at their Port Reading, New Jersey, FCC unit as their FCC Technical Service engineer, including start-up of the MTBE unit. After Hess he spent 11 years with KBC Advanced Technologies as their specialist for FCC, alkylation and FCC light ends processing. This work included process optimization studies, development of strategic capital projects and implementation of initiatives. Later, he was also the project leader for a process optimization study and site implementation involving all areas of the refinery (crude fractionation, FCC, alkylation, isomerization, hydrotreating, reforming).

Herb received his BSChE from the University of Alberta.

## NPRA Q&A Screening Committee

The Q&A Screening Committee is a forum where NPRA members can discuss operations in the refining and petrochemical industries, with special emphasis on process technology. The Q&A Screening Committee and panelists met on June 13-15 in Colorado Springs, CO, where the Committee selected 102 questions deemed most interesting and beneficial to the conference from those submitted. If you submitted questions which are not adequately covered by the selected questions, you may still present them from the floor during the appropriate Q&A session. The following are members of the 2005 Screening Committee:

*Vito Bavaro*, Criterion Catalysts & Technologies
*Sandie Brandenberger*, ConocoPhillips
*Tim Campbell*, Axens North America
*Ken Chlapik*, Johnson Matthey Catalysts
*Gerianne D'Angelo*, Advanced Refining Technologies
*Daryl Dunham*, ConocoPhillips
*Jim Evans*, Shaw/Stone & Webster, Inc.
*Gary Everett*, LYONDELL-CITGO Refining, LP
*Jon Finch*, Flying J Inc.
*Tom Germany*, Murphy Oil USA, Inc.
*Stephen Haik*, Motiva Enterprises LLC
*Fred Hill*, Marathon Petroleum Company LLC
*Dave Holbrook*, UOP LLC
*David Hunt*, Grace Davison
*Cheryl Lynn Joyal*, BP p.l.c.
*Larry Kremer*, Baker Petrolite Corporation
*Larry Lacijan*, UOP LLC
*Warren Letzsch*, Shaw/Stone & Webster, Inc.
*Larry Lew*, Chevron Products Company
*Linda Lord*, Western Refining Company
*Sam Lordo*, Nalco Energy Services
*Bob Ludolph*, Sunoco Inc.
*Tariq Malik*, CITGO Refining & Chemicals Company LP
*Ron Marrelli*, Holly Refining & Marketing
*Chris McDowell*, Tesoro Petroleum Corporation
*Joe McLean*, Engelhard Corporation
*Dave Mendrek*, Murphy Oil USA, Inc.
*Michael Mills*, GE Water and Process Technologies
*Paul Moote*, Sinclair Oil Corporation
*Brian Moyse*, Haldor Topsoe, Inc.
*Donald Mulraney*, CB&I Constructors, Inc.
*Dan Neuman*, Tricat Industries, Inc.
*Randy Peterson*, STRATCO-DuPont
*Kevin Proops*, Flint Hills Resources, LP
*Bob Roddey*, Roddey Engineering Services, Inc.
*Glen Scheirer*, ExxonMobil Research & Engineering Co.
*Gary Stephens*, Coastal Chemical Co., Inc.
*Brent Stratton*, Lion Oil Company
*Michael Toole*, United Refining Company
*Lee Turpin*, Turpin Consulting
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*Rick Fontenot*, Lyondell Chemical Co.
*Jim Gillingham*, Valero Energy Corp.
*Steve Jackson*, Hunt Refining Company
*Vince Kelley*, Sunoco Inc.
*Pat Kimmet*, CHS Inc.
*David Lamp*, Holly Corporation
*Rick Leicht*, National Cooperative Refinery Association
*Mike Lewis*, Motiva Enterprises LLC
*Rich Mendel*, Afton Chemicals Corp.
*Keith Osborn*, Coffeyville Resources LLC
*Al Prebula*, CITGO Petroleum Corporation
*Jay Reinhardt*, Flint Hills Resources, LP
*Jaspal Singh*, Indian Oil Corporation Ltd.
*Stephen Smiejan*, Amerada Hess Corp.
*Jim Stump*, Frontier El Dorado Refining Co.
*Roy Whitt*, Marathon Petroleum Company

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## NPRA Fire and Accident Prevention Program Committee

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## Q&A and Tecnology Forum: Questions 1 – 14

### FCC

**Process**

1. What are your plans for FCC feed selection and treatment to meet the upcoming ULSD regulations? Specifically, are you planning or considering atmospheric resid hydrotreaters?

2. Are you processing unhydrotreated heavy coker gas oil (HCGO) in the FCC? What are the impacts on yields, product qualities and heat balance?

3. What types of slops streams are charged to FCC's? Are there any limits for the various slops streams, and why? What contaminants could be present that affect FCC catalyst additives as well as the cracking catalyst?

4. How can oxygen contaminated FCC gasoline be reprocessed to prevent problems in downstream units?

5. What options are available to maintain the heat balance on full or partial burn units as they process more severely hydrotreated feeds? As an extreme case, how would a two-stage regenerator resid FCC unit run with 100% hydrocracker bottoms as the feed?

6. What is your recent experience with catalyst fines removal from FCC main column bottoms product, either using a mechanical device or a chemical? If a backflush system is employed, where is the backflush material routed? If routed to the FCC riser, what is the impact on regenerator emissions?

7. To what extent does LCO cloud point impact your distillate blending? What changes in feed properties, catalyst formulation, riser/reactor conditions, product fractionation and/or FCC equipment technology will impact LCO cloud point? By how much?

8. Have you seen FCC equipment degradation over a 5-year run that has affected LCO quality (gravity, cetane, sulfur, nitrogen)? What changes are needed to maintain product quality specifications?

9. What FCC unit feedstock, operating, equipment and catalyst factors affect gasoline olefin production? What steps do you take to increase or decrease FCC gasoline olefins content? Will a lower FCC gasoline olefins level help preserve octane through a gasoline hydrotreater?

10. What factors influence the ratio of C3 olefins to C4 olefins in the FCC? What could cause a reduction in the propylene yield at constant butylenes yield? We have seen this with no apparent increase in propylene loss to the fuel gas system.

11. What are the options for processing or reducing LCO yield from the FCC?

**Environmental**

12. When considering the addition of a wet gas scrubber to the flue gas system, how important is the flue gas piping arrangement for inlet gas distribution to the scrubber? Has the liquid spray distribution ever been the cause of a scrubber performance problem?

13. Have you quantified the SO2 loss associated with a condensing drying system for FCC stack analyzer sample conditioning? For drying our sample, we have a cooling/condensing drying system followed by a reverse osmosis drying system. We are concerned that at 20ppm SO2 we may be losing a significant amount of SO2 in the condensing coolers (v. the amount lost at 150ppm SO2) and that this is possibly related to ammonia (NH3) slip rates. Is anyone using a different sample conditioning system without these issues?

14. What ratios of SO2 to SO3 have you observed in the FCCU regenerator flue gas? What are the key process variables impacting this ratio? Does SOx reduction additive affect the ratio? We have seen changes from 10% SO3 in SOx to 40% but don't know why. Have others seen these high SO3/SOx ratios at very low SO2? Could there be issues with analysis related to sampling and/or sample moisture levels?

15. NH3 can be added at several locations in the flue gas system – upstream of the electrostatic precipitator (ESP), upstream of the CO boiler for selective non-catalytic reduction (SNCR), or upstream of a selective catalytic reduction (SCR) unit. Where and how are you monitoring the NH3 slip? Do you have experience with continuous NH3 slip monitoring? What do you consider to be state-of-the-art? Have you monitored NH3 at the wet gas scrubber (WGS) stack and what would impact NH3 slip through the WGS?

16. What are the FCC equipment capabilities and analytical measurement concerns for meeting PM10 (particulate matter, <10 microns) from the FCC flue gas stack? What levels of PM10 have been measured from tertiary cyclones or ESPs? How do the measurement method and NH3 affect the determination of PM10 from precipitation of salts and/or inclusion of condensable particulate matter?

**Equipment**

17. How is the run length or reliability of a FCC feed fired heater affected if it is used to control reactor temperature versus supplying a constant temperature?

18. Have you used computational fluid dynamics (CFD) modeling to study vapor-catalyst flows in FCC risers (sloped riser, new feed nozzles, etc)? How did you validate the models?

19. What practices do you use for online cleaning of air blower turbine surface condensers? What problems have been encountered? How do you address energy control to allow cleaning half of a split-box condenser?

20. What could cause a gradual (months long) localized reduction in the regenerator dense bed temperature to less than 1200°F? The other two bed temperature indicators remained above 1250°F. There has been no step change in air grid pressure differential (dP) and a profile gamma scan of the bed shows relatively even fluidization, though a grid tracer study indicates that more air is passing through the cooler side of the bed.

21. What are the coking mechanisms and ways that coke formation has been controlled in the FCC main fractionator bottoms system? Have you experienced coke laydown in the fractionator bottoms system piping? What analytical monitoring can help make adjustments to reduce coking tendency?

22. More severe hydrotreating of FCC feed reduces H2S in the main column overhead system. What changes have you made in your wash water scheme to avoid higher pH water and potential carbonate stress corrosion cracking in the overhead carbon steel piping?

23. Our FCC emergency shutdown systems include feed block valves and diverter valves which dump gas oil feed to the main fractionator. The dump valves protect the feed pumps and charge heater from loss of flow. Our emergency procedures shut down the FCC feed pumps within minutes. Leaking diverter valves may put gas oil into decant oil during normal operation, which is a significant economic penalty. Do you divert feed back to the feed drum instead? Is there a risk of losing main fractionator bottoms circulation in this case?

**Catalyst**

24. Have you used a ZSM-5 additive and seen no apparent effect on FCC gasoline octane? What would be a possible explanation?

25. Will the use of ZSM-5 additives influence the effectiveness of a gasoline sulfur reduction catalyst or additive? Do high amounts of ZSM-5 additive (>10% of fresh catalyst makeup) have more influence than lower (more typical) concentrations of ZSM-5?

26. The resid FCC generates spent catalyst with metals content of about 10,000 to 12,000 ppm nickel plus vanadium. We have not found a suitable disposal option to either the cement or clay manufacturing industries. Are there viable options such as metals recovery that could make this spent catalyst suitable for landfill and prevent leaching of the metals to soil?

## Gasoline Processes

### Alkylation

27. What is the minimum acid consumption achievable in a hydrofluoric (HF) or sulfuric alkylation unit? Please specify feed type and alkylation technology. What operating practices and technologies are available to reduce acid consumption?

28. What are the "best practices" for monitoring and combating corrosion in alkylation units (both HF and sulfuric)?

29. What has been your experience with online acid analyzers in HF and/or sulfuric alkylation units? How have you resolved the differences between laboratory and online analyzers results? What reduction in frequency of sample collection (if any) have you observed when online acid analyzers are installed in sulfuric acid and HF units?

30. Do you analyze your sulfuric acid alkylation unit's spent acid for water content? Is there an optimum water content for HF or sulfuric acid with respect to octane response? Is there an online analyzer available that will measure acid strength and water content for sulfuric acid?

31. In sulfuric acid alkylation units, do you direct the olefin feeds segregated by carbon number to separate points in the reactor or to separate reactors? Are the separate reactors running at conditions optimized for the feed carbon number? What are the advantages of doing this?

32. Please share your commercial experience with alkylation contactor tube inserts. What increase in apparent heat transfer coefficient have you observed? Did adding inserts allow you to increase unit capacity?

33. Do you alkylate amylene? If so, why are you doing so and what technology are you using?

34. Are you doing alkylation unit API RP-751 audits and how often? Please estimate how many refiners are doing these audits. What kinds of things are you finding?

### Gasoline Post-Treating

35. As of January 1, 2005 each refinery's annual average sulfur content in finished gasoline may not exceed 30 ppm (credits can be used) and beginning January 1, 2006 sulfur content may not exceed 80 ppm on a per gallon basis (except for refineries that have temporary exemptions). How will you ensure that the FCC gasoline desulfurization units meet that specification? For example, will you consider producing a lighter gasoline cut from their prefractionator? Will you hydrotreat FCC feed and, if so, will you install a spare recycle hydrogen compressor to keep the unit on line in case of a compressor trip?

36. What has been your experience with silver strip corrosion testing of gasoline? What are the best proven means of avoiding failure of the silver strip test? Has the mechanism for silver strip test failure been determined definitively and, if so, what is it?

37. Additives, such as anti-oxidants, are currently added to the FCC gasoline. Are such additives required after hydrotreating of the FCC naphtha? What is current commercial practice?

38. Which gasoline streams have online analyzers installed for measuring low levels of sulfur? Have online sulfur analyzers been installed for severity control of FCC gasoline hydrotreaters?

### Naphtha Hydrotreating

39. What are the important parameters to consider when designing and implementing a system to remove silica from naphtha? Please share your experiences with hydrotreating catalyst, silica guard beds for reformer feed, and sources of silica.

40. Have you experienced nitrogen breakthrough in naphtha hydrotreater (NHT) units, including ammonium salt formation in associated reformers, due to processing crudes containing higher concentrations of organic nitrogen? What solutions have been or could be developed to address this problem?

### Naphtha Reforming

41. Do you have experience with hydrocarbon emissions from the dust collectors in continuous reformers and, if so, how do you handle the emissions? What are typical benzene concentrations when opening the dust collectors?

42. Due to upstream limitations, we often operate below the ammonium chloride sublimation point in the top of our reformer stabilizer. What strategies can be employed to mitigate the impact of salt formation (i.e. water wash, stabilizer feed chloride removal, process changes, etc.)? What problems or complications can result from these solutions and how can they be handled?

43. What experience do you have with sending platinum-group metals (PGM) catalyst offsite for screening and/regeneration? Under what conditions would a refiner send catalyst offsite for regeneration? Please address the impact of quantity of catalyst to be handled, ultimate catalyst destination (reload or send to metals recovery), hazardous material handling of unregenerated catalyst, distance to offsite facility and economic incentives. Have you quantified the difference in PGM fines recovery between on-site and offsite screening?

44. Which FCC naphtha cut points are acceptable for reformer feedstock? What are your experiences when straying from these cut-point limits? Do these cut-point limits change if you operate a resid FCC?

45. What advances have been made in naphtha reforming with respect to higher hydrogen production?

46. What are you doing (or plan to do) to reduce benzene in gasoline if regulations impose a cap of 0.95, 0.75, or 0.5 vol-%? How low can benzene be reduced by prefractionating the reformer feed?

### Isomerization

47. What is the maximum concentration of benzene in light straight run (LSR) isomerization unit feed that refiners have demonstrated can be saturated within the safe operating envelope of the isomerization unit? What solutions have been, or could be, developed to increase this concentration?

48. Do you feed butanes from HF alkylation units to isomerization units? If so, how do you handle fluorides in the butane stream?

### Blendstocks

49. What gasoline blending problems related to Driveability Index (DI) arise when replacing MTBE with ethanol?

50. What will you do with surplus pentanes that may result from lower RVP requirements and the use of ethanol?

51. Are there any catalyst alternatives for catalytic polymerization (cat poly) units other than solid phosphoric acid (SPA) catalyst? Are there any technical advances to oligomerization processes?

52. For refiners converting MTBE units to isooctene units, what are you doing (or plan to do) with the alcohol side stream?

## Crude / Vacuum Distillation and Coking

### Crude Oil Evaluation

53. It seems that treatment of crude cargoes with amine-based hydrogen sulfide scavenger chemicals is becoming more common. Which crudes are being treated with amines? What negative effects have been observed from processing these crudes? What are the effects on corrosion and wastewater quality?

54. What are the “best practice” techniques for analyzing the salt content of crude oils? Are there any compounds in the crude that will interfere with the salt content analysis’ accuracy and what are they?

55. What chloride species are found in vacuum resids from heavy crude oil processing? Why are they not removed in the desalting process? What laboratory methods are used to identify these species? Is there an upper limit specification for chloride in delayed coker feedstocks?

## Q&A and Tecnology Forum: Questions 56 – 71

**Desalting**

56. What technologies would you recommend for desalter level control instruments in heavy oil applications? What new technologies have been implemented or are being considered? What is your experience with these technologies with respect to reliability?

57. What operational, mechanical, or chemical approaches are being employed to increase removal of filterable solids in crude tankage or during desalting? Where is the most effective place to do this? Which method do you use to measure filterable solids?

58. What are you doing to prepare for the processing of high conductivity, high calcium, and high TAN (total acid number) crude types (such as Asian, African and North Sea crudes), especially with regard to desalter design improvements, chemical emulsion breakers and related corrosion control treatment? What impacts do you expect in the wastewater treatment plant (WWTP)?

59. We observe oil soluble organic chlorides that carry corrosive salts to downstream process units. What are the sources of these compounds and why are they showing up in downstream units? What are the preferred analytical techniques?

60. What have been your recent experiences using naphthenic acid corrosion inhibitor chemicals? Have they been cost effective?

**Distillates**

61. Do you experience thermal stability problems in your straight run kerosene and what may be the possible causes? Do you use chemical additives (stabilizers) or clay treat the product? What criteria are used to select the clay type?

62. What are the pros and cons of NaCl versus CaCl2 drying for middle distillate haze suppression?

63. Our refinery has been struggling with premature failures of clay treaters in jet fuel service. Our gauge for determining a failure is whether we pass a JFTOT test downstream of the clay treater. We used to run for several years without a clay changeout and now we are lucky to make three months. Are you seeing the same trend? If so, what are the possible causes?

**General**

64. What cutpoint can be achieved in an atmospheric crude tower running heavy crudes? What is limiting – heater outlet temperature, atmospheric tower pressure, or something else? What are your “best practices” to minimize diesel to the vacuum unit?

65. What is the average energy consumption (MMBTU per barrel of crude oil) of your crude/vacuum units? What is currently being monitored to optimize energy recovery? What is being done to improve the energy efficiency of your crude/vacuum units?

66. What parameters are used to control corrosion in the naphtha section of a crude tower? Do you have packing in the naphtha section of the tower and are you experiencing any problems with corrosion? What metallurgy is being used with success?

67. What layers of protection do you employ to minimize risk of a catastrophic pump seal failure in high vapor pressure streams, including streams such as unstabilized naphtha? Are you evaluating double seals, increased monitoring (vibration, lubrication), local hydrocarbon detectors, and/or pump operating criteria such as minimum flowrates?

**Vacuum Distillation**

68. Do you have any experience with high performance vapor horns in vacuum towers? If so, what improvements have you seen? What are the key design parameters to minimize entrainment?

69. What parameters do you use to optimize the wash oil rate in vacuum towers?

**Coking**

70. Have you analyzed coker heater deposits for percentages of organics v. inorganics and speciated these deposits to determine possible causes for accelerated coke deposition? Is sodium or iron an issue?

71. Have you seen the exact same coker furnace spalling procedure work one time and not another? Are there differences in the coker feed or heater deposits which prevent effective spalling?

72. What is your experience with coker 3-way switching valves? What type are you using? What is their maintenance history and what are you doing to improve their reliability?

73. Is there a "best practice" to minimize/eliminate hot spot formation in the coke beds of delayed cokers?

74. What type of coke drum unheading devices are you using? Are you satisfied with their safety and performance?

75. What is the minimum outage that can be run without risk of foamover that you have experienced? What is the drum reference point for the measured outage?

76. Please provide your "best practice" guidelines for antifoam usage in the coker drums. Specifically, please answer these questions:

a) What is your as-delivered strength of silicone? What is the strength of diluted silicone as injected into the drum?
b) At what drum level should you start adding antifoam? When should one end?
c) What is a reasonable amount of antifoam to use in a complete cycle (pounds silicone per 1000 barrels of feed)?
d) What viscosity antifoam do you use?
e) What carrier for the silicone do you use?
f) What type of antifoam injection system do you have?
g) What silicon levels do you experience in coker product streams?

77. Have you used hollow cone sprays in the coker fractionator? What are the advantages and disadvantages of this application? How many levels of sprays do you recommend? What angle and pressure differential (dP) do you use?

78. How are you currently injecting sludge streams into your coker? What are the sludge sources? What limits the amount of sludge you can inject?

## Hydroprocessing

### Catalyst

79. Please share examples of problems that you have encountered and lessons learned as a result of dense loading techniques.

80. Please discuss quality assurance and "best practices" during catalyst loading. Please contrast inert atmosphere procedures with procedures used when air is present.

81. Will the increased severity anticipated for ULSD operations increase the probability of runaway reaction conditions occurring? What mitigation strategy are you planning to reduce the probability of runaway reactions? What additional operating training is planned? How does the presence of LCO impact the probability of a runaway reaction?

82. How have recent molybdenum price increases impacted your strategy for managing spent hydroprocessing catalyst?

83. Hydrotreating catalyst availability has been very tight in 2005. How are you managing the current long lead time requirements for catalysts, associated materials, and services? What is the outlook for availability in the next 6 months, 12 months, 18 months, and beyond? Are there plans for increasing catalyst production?

84. Are hydrotreating catalyst vendors and/or refiners planning to maintain catalyst in inventory for emergency requirements?

### Process

85. How do you manage cracked stock introduction during start-up of new catalyst, especially in light of new low-sulfur fuels specifications?

86. Have you had success in producing ULSD as a side cut from a cat feed hydrotreater (CFHU or FCC Pretreater) fractionator? Describe what was done to the fractionator and other considerations.

87. Why does light naphtha produced from mild hydrocracking contain more than 1% benzene? What can you do to reduce the benzene content?

88. Please discuss "best practices" for the location and number of thermocouples within hydrotreating reactors for assessing temperature distribution in the catalyst beds.

89. Please comment on how existing CFHU's are being utilized in the production of ULSD. Are they part of the solution?

## Q&A and Tecnology Forum: Questions 90 – 102

90. Are you designing ULSD hydrotreating units to operate in trickle flow during the entire catalyst cycle or allowing 100% vapor operation at some point in the cycle? Please discuss actual experience.

91. What crudes or purchased feedstocks are presenting the greatest challenges for hydroprocessing catalysts with respect to contaminants? How are you managing these crudes and/or protecting the catalysts?

92. Are there "best practices" for predicting hydrogen consumption when designing a make-up hydrogen compressor? If you rely on pilot plant data, how do you obtain the most accurate hydrogen consumption information (flow meters, carbon/hydrogen balance, etc.)?

93. How are you dealing with increased loading in amine systems due to increasing hydrotreating severity and increasing crude oil sulfur content?

94. How are you dealing with increased hydrogen demand/consumption resulting from low-sulfur fuels regulations and lower quality feedstocks?

95. Are you planning to use any non-traditional heat exchanger designs in ULSD units (e.g. plate-type exchangers, etc.)?

96. How are you planning to communicate and mitigate the effects of transient upstream operations to downstream ULSD hydrotreaters?

**Quality**

97. Have you observed that new ULSD hydrotreaters generate a by-product naphtha stream with high benzene content? Is this causing problems within your gasoline pool and how do you plan to handle it?

98. Remembering the issues that occurred with low-sulfur diesel (500 ppm max) in 1993 with respect to lubricity additives, are there similar concerns associated with the introduction of ULSD regarding lubricity, conductivity, and/or thermal stability, etc.?

**Safety**

99. Please discuss pros and cons and your criteria for using independent shut-down valves in hydrocarbon and sour water lines between the high pressure and low pressure separators in terms of safety.

100. What are your "best practices" for inspection of hydrogen steam reformer furnace tubes by non-destructive techniques? How will these practices change as a result of the critical need for on-stream reliability in ULSD units?

101. What is your experience with high pressure testing of process units with media other than hydrogen?

102. For your hydroprocessing personnel training, are you outsourcing or developing/using your own in-house training? How are the training approaches different for training operators and engineers?

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