

Houston, Texas

**2006 NPRA Cat Cracker Seminar:
Advance Program**

Westin Galleria Hotel
Houston, Texas
August 1-2, 2006



NPRA

2006 NPRA Cat Cracker Seminar: Advance Program

The biennial NPRA Cat Cracker Seminar and Exhibition will be held August 1-2, 2006 at the Westin Galleria Hotel in Houston, TX. The program of 11 workshops is organized in three topic tracks which enables attendees to focus on a particular aspect of FCCU operation or to attend workshops that cover a broader range of interests. Whether you are in Operations, Technical Service, Maintenance, Reliability, or Process Engineering, you will find a comprehensive program that meets your needs for improving your FCCU's operation and reliability.

The topic tracks for 2006 are:

- **Operations Troubleshooting** – workshops on Troubleshooting Reactor / Regenerator Operations; Catalyst Circulation and Slide Valves; Fractionation in the Gas Concentration section; and Flue Gas Treatment Technologies;
- **Process Technology** – workshops on Reactor Design Choices; Regenerator Design Choices; and Main Fractionator Design and Operation;
- **Reliability** – workshops on Key Run Limiters; Electrostatic Precipitators; Expander Overhauls; and Erosion in Riser Steam Nozzles.

The 2006 Seminar will also have a Question & Answer session with six industry experts who will address questions on process technology, rotating equipment, refractory, low sulfur fuels operations, emissions controls, maintenance work processes, turnarounds, inspections, technology choices, and operations. In addition to the planned questions, the panelists will be prepared to respond to comments and additional questions from the audience.

The exhibition will showcase the latest technological advances in FCCU equipment, catalysts, refractory, diagnostics, and reliability services by companies that specialize in FCCU equipment and technology.

The Seminar attracts experts from throughout the industry so it is an ideal networking opportunity for anyone whose responsibilities include FCCU operations.

Schedule of Events

Tuesday, August 1, 2006

11:00 am – 12:30 pm Tabletop Exhibition

12:30 pm – 4:30 pm **Q&A Session**

4:30 pm – 6:00 pm Reception and Tabletop Exhibition

Wednesday, August 2, 2006

	Track 1: Process Technology	Track 2: Operations Troubleshooting	Track 3: Reliability
8:00 am – 9:15 am	FCC Reactor Design Choices – <i>Warren Letzsch</i> Shaw/Stone & Webster	Reactor-Regenerator Operations Troubleshooting – <i>Pravin Sheth</i> ExxonMobil R&E	FCC Key Run Limiters – <i>Dave Brosten</i> Shell Global Solutions
9:15 am – 9:30 am	Break		
9:30 am – 10:45 am	FCC Regenerator Design Considerations – <i>Larry Lacijan</i> UOP	FCC Catalyst Circulation and Slide Valves – <i>Mike McKee</i> Chevron – Panel of Valve Manufacturers	FCC Electrostatic Precipitator Performance: Maintaining Reliability – <i>Martin Schiller</i> CSI Engineering
10:45 am – 11:00 am	Break		
11:00 am – 12:15 pm	FCC Main Fractionator Operations and Design – <i>Scott Golden</i> Process Consulting Services	Resolving Gas Con Problems – <i>Speaker TBA</i>	Expander Overhaul – More Than Just a Piece of Rotating Equipment – <i>John Felten</i> Shell Global Solutions
12:15 pm – 1:30 pm	Lunch and Tabletop Exhibition		
1:30 pm – 3:00 pm	Regenerator Flue Gas Treatment Technologies – Shell Oil – Tesoro		Reliability: Erosion on Riser Emergency Steam Nozzles – A Common Problem? – <i>Bill Wilson</i> BP

Cover photo courtesy ENPRO.

Q&A Panel

12:30 pm – 4:30 pm

John Albers
Reliability Engineering Specialist
ConocoPhillips
Sweeny, TX

Alan Michael Claude
FCC Senior Technology Manager
KBR
Houston, TX

Robert Dolejs
Manager, Inspection Services
UOP LLC
Des Plaines, IL

Robert Ludolph
FCC Process Specialist
Sunoco Inc.
Marcus Hook, PA

Brian McCusker
Area Operations Superintendent
Murphy Oil USA, Inc.
Superior, WI

William Schlesing
Manager, Operations
Pasadena Refinery
Pasadena, TX

Seminar Questions

Refractory

1. What commercially available ceramic tile systems exist for cyclones? What is their track record?
2. The acceptance of liquid phosphate-bonded technology has become widespread for burner blocks and quick turn-around refractory repair requirements. What has been the experience, if any, using the fast setting and rapid firing capabilities of this technology for larger gunned applications in the FCC or similar vessels?
3. What is industry experience with erosion in regenerator second-stage cyclone dust bowls and dipleg inlets? Has a root cause for this erosion been identified in your unit? Has anyone fully lined the cyclone dipleg with good results?
4. Have there been advances in cyclone lining materials and/or anchoring systems in recent years that allow greater velocities? What are the operating temperature and velocity limits of the newer materials?
5. At what inlet velocity does particle abrasion or other factors limit each stage of the regenerator cyclone's performance? How well can you correlate the average cyclone inlet velocity with time to cyclone failure as indicated by holing through and observing high catalyst losses?

Rotating Equipment

6. What types of suction screens are used in FCC main fractionator bottoms pumps? Of these what types are most effective? What are their sizes and frequency of cleaning?
7. What are the latest developments (e.g., materials, coatings, seals, flushing oil, variable speed drives) in main fractionator bottoms (slurry) pumps? What types of pumps are in use?
8. How frequently do users of FCC hot gas expanders inject walnut hulls for cleaning purposes? What other products can be used? How is the cleaning effectiveness assessed?
9. What is the experience utilizing (strobe-phased) thermography for hot gas expander blades instead of optical or digital photography?

Low-sulfur Fuels Impact on FCC Gasoline and Light Cycle Oil

10. How are refiners managing their FCC naphtha and light cycle oil when their post-treaters are down?
11. What are refiners' plans for utilizing FCC olefins now that MTBE is no longer in use? What investments in downstream processing units are being considered? How is ethanol blending going to affect this?

Process Technology

12. What are the factors that may be employed to reduce FCC dry gas (e.g., catalyst selection, process design, process conditions)? What is the magnitude of change with each of these factors?
13. For regenerators with a catalyst cooler, how common is it to idle the catalyst cooler during the run? Have there been any BFW chemistry issues leading to corrosion issues when a catalyst cooler is idled? Are there any corrosion issues on the catalyst side?
14. Does anyone employ sonic cleaning technology for cleaning waste heat or CO boilers? How does this technology compare with conventional sootblowing? Are there any other cleaning technologies out there?
15. Describe the difference in erosion patterns between a cyclone that is directly connected to a riser termination device versus a cyclone that is not directly connected to a riser termination device. What are typical methods used in the industry to deal with this?
16. How common are vortex breakers in cyclones? Have they met your expectations in both process and mechanical reliability?

Seminar questions
continue on the next page.

Seminar Questions

Controlling and Monitoring FCC Emissions

17. What factors lead to an SO₃ plume out of a FCC flue gas, wet gas scrubber stack? What moves have been made to successfully eliminate this plume?
18. What measures have been successful in reducing NO_x or NO_x precursors from regenerator flue gas, and to what extent? What unanticipated problems have occurred?
 - a. hardware/design;
 - b. process conditions;
 - c. catalyst/additives.
19. What has the experience been with the effectiveness of low NO_x burners in CO boilers? What reduction in NO_x has been observed?
20. What methods are being used to measure regenerator flue gas flows for emissions monitoring? How are these methods verified?

Turnaround / Maintenance / Inspection

21. What benefit is there to performing the entire unit decontamination at one time vs. breaking the unit up into small sections?
22. Where are pyrophoric fires likely to occur? What are the impacts related to a pyrophoric fire in the various packing/tray arrangements for FCCs? What steps are taken to prevent/mitigate pyrophoric fires?
23. What experience do you have with a risk-based method to determine if towers/exchangers are to be entered or cleaned during a turnaround? What is the longest interval seen without entry to a tower?
24. How often are feed nozzles typically replaced? What factors will allow multiple turnaround cycles without change?

25. What is your target run length between planned turnarounds? Have you achieved this target? Were you able to maintain full rate and full target conversion during this period?
26. What impact have the recent FCC environmental regulations had on maintenance requirements for existing/new pollution control systems versus historical norms? In the areas of:
 - a. I&E/analytical
 - b. Other maintenance (e.g., wet gas scrubber).

Operations Issues

27. What additional steps or modifications to FCC operations other than control equipment have been implemented to maintain environmental compliance?
28. At a recent NPRA Q&A, someone stated that about 18 ESP's (electrostatic precipitators) had exploded in refineries over the past 20 years. What has the industry learned from this? What steps have been taken to prevent future occurrences?
29. Crude can contain significant calcium naphthenate that may not be removed by conventional desalting and will find its way to the FCC. Is this a problem in the FCC? How severe is the problem? What measures are used to remove the organic calcium? Are there effective passivators for the calcium problem? What crudes are of concern?
30. Is it normal practice to add "slop oil" to fresh feed in an FCC? What are the critical points to watch and what are the problems?
31. What factors lead to salt deposition in the main fractionator tower and overhead system? What has been found to successfully eliminate laydown or remove deposits?
32. Where have you found coke in the reactor system? How much coke and what problems has it caused? What measures have been successful in reducing coke buildup in the reactor cyclones or vessel?

33. What is the minimum time required and steps to be taken prior to a complete emergency shutdown of an FCC, when all operators must evacuate the unit and all utilities will be lost? What steps are then taken upon restart to deal with cold wet catalyst, plugged nozzles, uncertain atmosphere and other problems?
34. Has it been necessary to adjust your operating procedures to minimize emissions during startup and shutdown, such as keeping the ESP energized or starting the wet gas compressor sooner to minimize flaring?
35. The reactor cool down period while removing the blind between the reactor and fractionator can be excessive, resulting in steam condensation. What procedures and/or equipment improvements have been employed to minimize the extent of cool down and/or time to pull the blind and install a spacer? How long does the whole process take for both smaller and larger FCCs and how much cool down was observed?
36. Are coke grinders or crushers being used in the FCC fractionator bottoms stream? What have been your experiences? What were the criteria used to justify their use? What impact has this had on maintenance practice for this system?
37. How can mal-distribution of air from the air grid be confirmed?
38. What techniques are available to investigate catalyst circulation problems in the spent catalyst standpipe?

**Track 1:
Process Technology**

8:00 am – 9:15 am

FCC Reactor Design Choices

Warren Letzsch
Shaw/Stone & Webster

The workshop will review reactor technologies employed in FCC units from a technical and process perspective. Reactor configuration, feed injection and control of the dilute phase reactions will all be explored. Revamps of some existing units will be considered as examples of the application of these principles.

**Track 2:
Operations Troubleshooting**

8:00 am – 9:15 am

**Reactor-Regenerator
Operations Troubleshooting**

Pravin Sheth
ExxonMobil Research & Engineering Co.

The objective of this session is to provide overview and promote discussion among participants on the subject of operations troubleshooting techniques used in FCCs, with a focus on the reactor-regenerator section. Common FCC operational problems, such as catalyst losses, cyclone failures and catalyst circulation problems, will be discussed.

**Track 3:
Reliability**

8:00 am – 9:15 am

FCC Key Run Limiters

Dave Brosten
Shell Global Solutions

This workshop will review the primary causes of FCC shutdowns using Shell Oil company examples. It will include routine limitations that impact run length duration between outages on the FCC and Shell's experiences at correction of these key issues which impact FCC reliability. These key issues include cyclone issues, feed nozzle issues, slide valve reliability issues, slurry system fouling issues, expander turbine fouling issues, coke lay down in residue operations, air grid/steam grid reliability, and other areas that have limited FCC run length. In today's world, FCC reliability is a primary profit driver.

9:30 am – 10:45 am

**FCC Regenerator Design
Considerations**

Larry Lacijan
UOP LLC

This workshop presents various FCC regenerator design features and will allow attendees the opportunity to discuss their various benefits and drawbacks, and how they might impact unit operation. Some of the features to be discussed include design temperature, spent catalyst entry style, air grid design, cyclone design, and flue gas emissions.

9:30 am – 10:45 am

**FCC Catalyst Circulation and
Slide Valves**

Mike McKee
Chevron Corporation
Panel of Valve Manufacturers

Slide valves are the primary control elements for catalyst circulation in an FCC and are critical safety equipment. According to a survey conducted by the NPRA in the mid-90s, slide valve problems accounted for about 10% of unplanned FCC downtime. A brief description of FCC catalyst circulation, slide valves and their actuators will be followed by a question and answer session. The workshop presenters and panelists will include representatives from slide valve and actuator designers/manufacturers.

9:30 am – 10:45 am

**FCC Electrostatic
Precipitator Performance:
Maintaining Reliability**

Martin Schiller
CSI Engineering

The presentation will open with a brief summary of electrostatic precipitator (ESP) theory and operating principles followed by a discussion of critical operational parameters. It will review ESP performance issues as they relate to catalyst fines, particle size and resistivity. Ammonia injection will be discussed, as well as flue gas temperature and moisture content. The goal of the presentation will be to show how "ESP Operational Reliability" can be improved and maintained.

Wednesday sessions
continue on the next page.

Track 1:
Process Technology

11:00 am – 12:15 pm
**FCC Main Fractionator
Operations and Design**

Scott Golden

Process Consulting Services Inc.

FCC main column design and operation affect unit capacity, product quality, energy efficiency, unit pressure balance and reliability. This workshop will review these areas from both a design and operations perspective. Actual case studies will present potential problem areas and opportunities for improvement.

1:30 pm – 3:00 pm
**Regenerator Flue Gas
Treatment Technologies**

There are several approaches to reducing NOx and SOx emissions in regenerator flue gas which have recently been implemented in the industry. Several refiners will describe their experience with these technologies and report what they have learned from the start-up and early operation of these units.

- SCR operations
- Wet gas scrubber operations

Track 2:
Operations Troubleshooting

11:00 am – 12:15 pm
Resolving Gas Con Problems
Speaker TBA

Track 3:
Reliability

11:00 am – 12:15 pm
**Expander Overhaul –
More Than Just a Piece
of Rotating Equipment**

John Felten

Shell Global Solutions

One element of successful FCC expander operation involves the proper planning and execution of an overhaul. This presentation will use experience gained from over 30 years of operation and maintenance of turbo expanders to discuss what should be considered when planning and executing an overhaul. Specifically, the overhaul should address not only the repair of the expander, but include upstream process equipment.

1:30 pm – 3:00 pm
**Erosion on Riser Emergency Steam
Nozzles – A Common Problem?**

Bill Wilson

BP

Recently, erosion on several riser emergency steam nozzles has been documented. The problem appears to be caused by catalyst backflow into the nozzles during normal operation, and has occurred on risers with both J-bend and Y-type connections. The operating ranges for which emergency steam nozzles must be designed present several challenges. This workshop is intended to provide a forum for discussion of these problems as well as possible solutions.

How to Register

1. Conference Registration

Log on to www.npra.org and select "Meetings", "Future Conferences", "2006 Cat Cracker Seminar" then "Register Now" or complete the enclosed registration form. Registration includes admission to the Q&A Session, table-top exhibits and Workshop Sessions. You'll save \$100 if you register by July 3! On-line registration closes July 24.

2. Hotel Reservations

Reserve your hotel on-line when you register at www.npra.org and receive an immediate acknowledgement of your reservation. Or, fill in the appropriate space on the enclosed registration form. Hotel reservation requests will be processed in the order received by the NPRA. Get immediate acknowledgement on-line but allow 3 weeks if submitted to NPRA.

The hotel requires a deposit equal to one night room rental to guarantee your room. This must be submitted with your reservation. Deposits will be refunded if the reservations are cancelled forty-eight (48) hours prior to the scheduled arrival. June 30, 2006 is the cut-off date for making hotel reservations, cancellations or substitutions through NPRA or on-line. Beginning July 7, reservations, substitutions, or cancellations must be made through the hotel directly.

3. Spouse Registration

For just \$50, your spouse can join you at the table-top exhibits as well as the included business sessions.

4. Payment

Pay by credit card, check or wire transfer. If you register on-line but wish to pay by check or wire please be sure to include your name and the meeting name with payment.

5. Travel

AVIS is the official rental car agency for the CAT. Call 800.331.1600 and refer to AWD#:B761399 to receive discounted rates.

6. Suites and meeting rooms

Call Sarah Day at 202.457.0480 or email at sdlay@npra.org.

7. Confirmation

Your registration will be confirmed via e-mail if you provided us your email address. Otherwise, your confirmation will be sent via U.S. mail.

8. Sponsorship opportunities available

Contact Lynne Schoenbeck at 202.457.0480 or email at lschoenbeck@npra.org.

Cancellation Policy:

Registration substitution/cancellations may be made on-line, faxed to 202.835.0467 or e-mailed to CAT@npra.org. Substitute conference registrations may be made in advance or on arrival with no penalty. Cancellations may be made by July 3, 2006 with no penalty. Written cancellations post-marked, faxed, or emailed between July 4 and 17, 2006 will receive a refund of fees, less a \$50 processing fee. No refunds after July 17, 2006. No telephone cancellations.

Spouse/Guest Policy:

A guest is a spouse/significant other, friend or an adult child (18 years old or older) who is not in an industry-related occupation. A co-worker, an associate or spouse who works within the industry may not use the Spouse/Guest Registration category. Guests are not permitted to work the table-top exhibit. Children under 18 are not permitted in the exhibit hall.

Fee Policy:

Eligibility for member rates is based on membership information currently on file with NPRA. If your company is not currently a member, the non-member fees will be charged to your credit card.

Registration Policy:

Those who are present at the site of an NPRA meeting and/or occupy a hotel room in the NPRA room block to conduct business with industry personnel gathered for that meeting are expected to register for that meeting and pay the registration fee, whether or not they attend a specific function.

No Suit-Casing Please:

Please note that while all meeting registrants are invited to the exhibition, any non-exhibitor registrant who is observed to be soliciting business in the aisles or other public spaces, in another company's booth, or in violation of any portion of the NPRA Exhibition Policy will be asked to leave the show floor. Please report any violations you may observe to show management.

Registration Form: CAT06

**Register on-line at www.npra.org
Register by July 3rd – Save \$100**

Step 1: Attendee Profile

Please fill out completely. Badges will be printed from this information.

Name _____

Title _____

Company _____

Address _____

Address _____

City _____ State _____ Zip _____ Country _____

Phone (Area/Country/City Code) _____ Fax (Area/Country/City Code) _____

E-mail _____

This is not a permanent address change.

Spouse/Guest Name (if attending) _____

Check here if you require special needs.
Please attach a description of your needs.

Step 2: Meeting Registration

	By July 3	After July 3
<input type="checkbox"/> Member	\$ 350 _____	\$ 450 _____
<input type="checkbox"/> Non-member	\$ 695 _____	\$ 795 _____
<input type="checkbox"/> Spouse / Guest	\$ 50 _____	\$ 50 _____

Total Amount Due _____

Name of Member Company _____
Not sure if your company is a member? Go to www.npra.org

Register by Fax:

Fax your form with credit card information to 202.835.0467

Register by Mail:

Mail your check to
NPRA
1899 L Street, NW
Suite 1000
Washington, DC 20036

Step 3: Payment Information

Payments to NPRA are not deductible as charitable contributions for federal income tax purposes. However, they may be deductible under other provisions of the Internal Revenue Code.

Check Enclosed (US Dollars only)
 Bank Transfer: Sun Trust Banks, Inc., Washington, DC
Routing #061000104 • Acct #206887906
SWIFT Code – SNTRUS3A
(Please include registrant's name.)

Credit Card
 VISA MasterCard American Express

Credit Card Number _____

Exp. Date _____

Name of person on card (Please print) _____

Signature (Required, authorizing charge & acknowledging cancellation/refund, fee, registration, & spouse policies) _____

Step 4: Hotel Reservation

Hotel Reservation requests must be accompanied by paid conference registration to be processed. Room rate is \$139 single/\$149 double occupancy at the Westin Galleria Hotel, 5060 West Alabama, Houston, Texas.

Arrival Date _____ Departure Date _____

If no dates are indicated, we will assign arrival Monday, July 31 and departure Wednesday, August 2.

Room Type: One Bed Two Beds

Number of People in Room: _____

Room Guarantee: AMEX VISA
 MasterCard Discover Diners

Credit Card Number _____

Exp. Date _____

Signature _____

Frequent Guest Number _____

Special Requests: Smoking Non-smoking
 Disability Other

Register on-line to receive immediate acknowledgement of hotel. June 30 is the final cut-off date to reserve a room. Contact the hotel directly with changes or cancellations after July 7, 2006.