

Cat Cracker Seminar 2018

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GENERAL SESSION

9:00 am – 11:00 am

FCC: Driven by Competition, Fueled by Trial N/A

Phillip Niccum, Senior Vice President
Process Engineering,
KP Engineering, LP

The oil industry has seen three major events in the last three years. The unlocking of unconventional oils to refining through fracking, unrestricted oil production lowering the price of crude by 50%, and the crude export ban lifting from the U.S. The net impact has been a re-emergence of gasoline as the premier fuel in the U.S. and other markets. This presentation will look at global market shifts, implication for each PADD in the U.S., and maintenance activities that continue to maximize the value of the FCC operations.

Translating Crude Mix, 1 Macroeconomics, and Regulatory Issues to the Future Demands of FCC

Steve Gim, Regional Tech Services
Manager - Americas,
BASF Corporation

FCC, the classic gasoline machine in North American refineries, has been making a comeback lately, after years of declining capacities. It followed the latest upswing in domestic gasoline consumption and opportunistic exports of gasolines at a historical level. This presentation will examine the impact of changes in FCC feeds resulting from the latest resurgence of tight-oils in the \$60 plus crude oil world. The impact of regulatory factors, including IMO regulations, Tier III standard, and renewables, on the FCC product mix and their potential solutions will also be discussed.

Q&A SESSION

A panel of industry experts from AFPM member companies will respond to questions that were received in response to an industry-wide call for questions. One or more of the panel members will respond to each question and then time will be allowed for follow-up questions from the attendees who may also offer their comments and advice after the panel has responded. A transcript of the session will be distributed to all meeting attendees at a later date.

The questions are divided into the following categories:

1. Process
2. Mechanical

Process Panel

12:30 pm – 2:30 pm

1. What is the philosophy regarding catalyst unloading during non-normal operation, such as after a unit trip or unplanned maintenance period, sometimes called hot standby or safe-park mode? At what point is the catalyst unloaded to prevent wet catalyst? How long should the catalyst stay in the unit, should it be continually circulated, and what are the best practices/safeguards for this type of operation?
2. Aside from testing shown on vendor e-cat reports, what tests of FCC catalyst can be performed to troubleshoot fluidization problems?
3. What experience do you have switching between steam, air or nitrogen to fluidize regenerated catalyst standpipes? What was the temperature and quality of the steam? What was the layout of the fluidization nozzles?
4. To ensure validity of LOPA barriers (SIS SIL) certain SIS valves (e.g., feed bypass valve) need to be tested on a frequency shorter than a turnaround cycle. What are recommended practices for validating correct function of SIS final elements on the run?

5. What are recommended practices for interlocking equipment protective systems (main air blower, electrostatic precipitator, wet gas compressor) with the FCC SIS?
6. How do you manage abnormal situations and changes in combustibles to safely operate ESP? What equipment is utilized to protect the ESP and what reliability issues are associated with that equipment?
7. What are the typical targets and analyses performed on the make-up water and circulating water for flue gas scrubbers, and at what frequency are the analyses performed?
8. Discuss your experience with the continuous monitoring and/or the calculation of ammonia slip to the flue gas stack. What are the strengths and weaknesses of your approach or of your equipment for controlling the amount of slip?
9. What is considered "best practice" on the FCC water wash program (fresh vs. recycle water), starting at the FCC overhead, through to the gas plant? What typical wash water rates or ratios along with injection(s) location are used to manage the concentration of corrosive components such as, H₂S, and/or hydrogen cyanide?
10. How can continuous process modeling, and the Industrial Internet of Things be used to optimize FCC performance in real time? What key metrics should these systems monitor?

see next page for Process Panelists

8:00 am – 8:50 am

Track 1: Trends and Innovation

Coming Challenges for the FCC: Impact of the International Maritime Organization on Refining 15
KBC Advanced Technologies, Inc.

Track 2: Process and Operations

Increasing Resid Processing with Catalyst Technology at PES Pt. Breeze 25
Philadelphia Energy Solutions Refining and Marketing, LLC
W. R. Grace & Co.

Refiners are continually challenged to improve profitability through feedstock flexibility, which often means processing heavier feeds with increased resid content. We will describe how the partnership between PES and Grace, as well as the tailored catalyst solution, contributed to the overall improvement in refinery profitability.

Track 3: Maintenance and Reliability

Digital STO: Deliver On-time with Transformative Real-time Management 42
Mobideo

A discussion of digitalization tools that will transform your ability to manage the unexpected in real-time. With a good plan in place your ability to manage in real-time is the difference between on time and on budget STOs and a "train wreck." In as little as 6 weeks, you can improve adherence to schedule, manage delays and discoveries, and automate reporting. Learn more in this fast paced session.

Track 4: Cat Cracking Essentials

Troubleshooting Catalyst Losses in the FCC Unit 56
BASF Corporation

This presentation will explain the fundamental principles of catalyst losses such as fluidization, cyclone system components, catalyst properties, and the difference between attrition and cyclone malfunction. By understanding where and how cyclones can fail, as well as the mechanisms of attrition, refiners can prevent a unit shutdown by troubleshooting the cause of losses early and making the proper operational changes quickly.

9:00 am – 9:50 am

Track 1: Trends and Innovation	Simulation as a Tool for Learning from Historical FCCU Operations 78 <i>CPFD, LLC</i>
	<p>This presentation and discussion is focused on how simulation is used to capture lessons learned from current and historical FCCU operations as a means to accelerate the learning process and rapidly deepen the knowledge base of FCC engineers and technologists. Multiple case studies will be presented from both North American and international refiners, where simulation was used to understand and mitigate issues such as erosion, emissions, afterburn, and catalyst losses.</p>
Track 2: Process and Operations	Minimizing FCC Main Column Bottoms Product 92 <i>Process Consulting Services, Inc.</i>
	<p>The International Maritime Organization has announced a global 0.5 wt% sulfur limit on marine fuels that will go into effect in 2020. Refiners will need to minimize or eliminate components that are currently blended into high sulfur marine fuels. This presentation will discuss minimizing main column bottoms product by maximizing LCO and/or HCO products.</p>
Track 3: Maintenance and Reliability	Streamline Inspection with Advanced Digital Imagery 110 <i>Quest Integrity USA, LLC</i>
	<p>One of the nation's largest mid-west refiners was challenged with having to visually inspect and catalog over 400,000 individual contact points. In an effort to improve safety and reduce cost, Quest Integrity was asked to develop a work process that would minimize elevated work, enhance the level of reporting and implement a system for easily managing large amounts of inspection data. This presentation will discuss the solution they developed using laser imaging, robotic cameras and industrial drones to capture high-resolution imagery suitable for close visual inspection in place of personnel working in confined or elevated spaces.</p>
Track 4: Cat Cracking Essentials	Particle Attrition: Mechanisms and Methods to Determine Attrition Indices N/A <i>Particulate Solid Research, Inc.</i>
	<p>Particle attrition can be a major issue in using catalyst particles in fluidized beds and circulating fluidized beds. Particles tend to break down via two mechanisms – abrasion and fragmentation. Hear how PSRI's attrition jet cup was used to measure the attrition indices of two different catalyst particles separately and those of a known composition of different blends. These results will shed light on what would be the resulting attrition index of a known cocktail of blended catalyst if the attrition indices of the individual components are known.</p>

10:00 am – 10:50 am

Track 1: Trends and Innovation

**Gathering Tacit Knowledge from Your Best Operators |
Standard Work During the Great Shift Change** 128

Innovatia

This presentation will focus on methods for capturing tacit information from the front line during day-to-day operations by utilizing mobile devices tied to standard operating procedures.

Track 2: Process and Operations

FCC Regenerator Catalyst Loss Case Study 140

Tracerco

Marathon Petroleum Corporation

This presentation will summarize the investigation of erratic catalyst loss problems for a Marathon FCC unit, including Tracerco diagnostics and inspection findings.

Track 3: Maintenance and Reliability

Vibration Assessment of FCCU Piping 150

Stress Engineering Services, Inc.

Due to very high process temperature, piping in FCCUs is lined with refractory material. Piping is necessarily designed to be flexible to limit stresses induced by thermal cycling. A combination of piping flexibility, high process flow rates and flow obstructions can lead to cracks in welds and refractory material due to excessive vibrations. Case studies in FCCU vibration will be presented.

Track 4: Cat Cracking Essentials

The Impact of Feedstock on FCC Yields and Performance 181

W. R. Grace & Co.

The FCCU is commonly referred to as the trashcan of the refinery since most undesirable and opportunity feedstocks are normally sent there to be processed. While FCC engineers may not be able to choose their feed, a greater understanding of feed properties and their effect on yields and performance aids in troubleshooting unit shifts and optimizing unit operation. This presentation will examine FCC feedstock sources, feedstock characterization, the effects of boiling point and hydrocarbon type on yields, and the impact of feed impurities. The application of tools to predict the impact of feeds on the unit will also be covered.

11:00 am – 11:50 am

Track 1: Trends and Innovation

Reactor Vapor Line Isolation Valves 202

Chevron
TapcoEnpro, LLC

Many owners struggle to quantify procurement of equipment that provides efficiencies in operation and maintenance environments. This presentation will describe situational events that lead owners to procure equipment for isolation and control of normal and non-normal operations that improve “on stream” availability while providing additional safety related hardware that limits personnel exposure during extremely difficult isolation of FCC units. A specific case of application and installation by Chevron will be discussed.

Track 2: Process and Operations

STORM Clears the Way for Improved FCCU Process Safety 211

Shell Global Solutions U.S.

Situational Training for Operator Response to Mitigate (STORM) was launched approximately eight years ago as part of a multifaceted plan to improve Shell’s process unit safety. It includes a review of threat identification and mitigation strategies with our Unit Operators and Production Support staff around known hazards and abnormal situations to improve competencies.

This presentation will be a demonstration of an actual FCCU STORM session, engaging the audience in lively discussion as well as sharing program details.

Track 3: Maintenance and Reliability

FCC Reactor Stripper Troubleshooting 225

Monroe Energy, LLC

In FCCU’s, reactor strippers perform the important function of removing any residual hydrocarbon from the catalyst prior to the regeneration phase. This is important because excess hydrocarbons in the regenerator take up air capacity and increase the temperature of the regenerator, which will lead to a lower cat-to-oil ratio and decreased unit performance. This presentation will discuss Monroe Energy’s Trainer refinery’s multiple problems with the reactor stripper extensive troubleshooting.

Track 4: Cat Cracking Essentials

Utilizing Your FCC Additives Toolkit in Unexpected Ways 236

Johnson Matthey
Marathon Petroleum Corporation
Parkland Refining

Most FCC engineers and operators know how to use FCC additives to improve their operation. The use of ZSM-5, SOx reduction additives, and CO promoter is well established in most refineries today. The purpose of this session is to bring attention to non-obvious ways of taking advantage of additive technologies. This session will be divided into two parts. In each part, a refiner will share how they took advantage of different FCC additives to improve their profitability and flexibility in innovative ways.

1:30 pm – 2:20 pm

Track 1: Trends and Innovation

Monitoring the FCCU with Simulation Modeling 253
Albemarle Corporation

Kinetic simulation models are powerful tools to aid the decision making process. Modeling increases the user's understanding of their unit, reducing risks when making process changes. This is one of the main reasons the use of simulation models is growing. During this presentation, we will share practices, hints, techniques and tips using real refinery data sets and hope after learning these tips, refiners will be better able to leverage simulation models as decision making tools that can minimize the risk when making changes on the FCCU.

Track 2: Process and Operations

Increasing FCC Olefin Production - Major Equipment Systems 279
Process Consulting Services Inc.

This presentation will highlight major effects of C3/C4 olefin driven reactor effluent changes and review strategies for circumventing potential unit limits downstream of the reactor. The focus will be avoiding brute force solutions such as adding a new parallel wet gas compressor to deal with increased compressor loadings. All the examples presented have been implemented over the last 25 years.

Track 3: Maintenance and Reliability

Improving the Reliability of an FCC Hot Gas Expander 302
Elliott Group

This case study examines the rerate of a poorly performing non-Elliott hot gas expander operated by a U.S. refiner. Due to excessive blade erosion, along with severe steam cutting of the airfoils and disc, the machine required extensive maintenance every two to two-and-a-half years, well below the five-year maintenance run the user required. Elliott Group was contracted to retrofit a flowpath that would resolve the reliability issues and allow the expander to operate for the desired five-year operating campaign.

Track 4: Cat Cracking Essentials

Safety Forum 320

2:30 pm – 3:20 pm

Track 1: Trends and Innovation

Improving Worker Safety Through Mobile Devices N/A
Total Safety U.S., Inc.

Advances in mobile technology provide an avenue for stronger protections for workers in permit-required confined spaces, as well as lone workers who operate in hazardous environments.

For employees in confined spaces, established improvements like Centralized Confined Space Monitoring (CCSM) are clearly more effective than the traditional hole-watch process. A more recent technology - lone-worker or man down - draws on the power of mobile devices to keep workers safe, no matter where they operate. Hear how bringing CCSM and lone-worker technology together can mean even better safety and regulatory outcomes.

Track 2: Process and Operations

Expediting Catalyst Removal and Unit Chemical Clearing N/A
USA DeBusk LLC

Discussion on removing catalyst from the FCC unit while it is at an elevated temperature (1250°F) during the LOTO and blinding phase of unit turnover to maintenance as well as increasing operation yield speed on unit de-inventory. Additionally, utilizing technology to clean the unit of hydrocarbons during the same phase to expedite the turnover of both the catalyst side and oil side of the unit to maintenance shifts ahead of current procedures will be discussed.

Track 3: Maintenance and Reliability

Electrostatic Precipitator Power Supply Upgrade on a FCC N/A
Babcock & Wilcox

Changes have occurred in the types of power supplies used today on electrostatic precipitators (ESP). This presentation discusses the three types of high voltage power supplies available for powering an ESP and the advantages and disadvantages of each.

Track 4: Cat Cracking Essentials

FCC Yield and Energy Optimization 326
UOP – a Honeywell Company

Regardless of the technology or process, all refiners strive to maximize yields and optimize utilities and energy usage. In the short term, existing assets must be utilized to achieve these goals via operational changes. In the long term, installation of state-of-the-art internals and equipment (revamped or new) along with new operating conditions can unlock additional potential. This presentation will touch on various methods of short-term optimization with a deeper look at steam usage. It will also cover various long-term solutions including a few case studies.

Additional Paper

Husky Energy FCC Fire and Explosion 343
Mark Wingard