EPC Operations Committee Meeting Minutes

Time: 1:00 – 2:00pm CDT
Date: 11-28-2023
Location: virtual
Attendance:

Last Name	First Name	Company	Email	Positions	11/28/2023
Baker	Greg	Ineos	greg.baker@ineos.com	Member	
Balasubramanian	Vikranth	Linde	vikranth.balasubramanian@linde.com	Member	X
Cagnolatti	Claire	Retired	golsutigers7882@gmail.com	Member	
Carr	Chris	ExxonMobil	Christopher.j.carr@exxonmobil.com	Member	
Chepda	Alain	Total	alain.chepda@totalenergies.com	Member	
Dillon	Andrea	Dow	andillon@dow.com	Member	
Dillon	John	Dow	JJDillon@dow.com	Member	
Edwards	Jeff	CP Chem	EDWARDS@cpchem.com	Member, Director	X
Euhus	Dan	Dow	deuhus@dow.com	Member, Chair	X
Gilder	Tim	Shintech	tgilder@shin-tech.com	Member, Director	
Gonzales	Abraham	Oxy	abraham_gonzales2@oxy.com	Member, Director	X
Lawrence	Joseph	Motiva	joseph.lawrence@motiva.com	Member	
Maldonado	Miguel	Technip	miguel.maldonado@technipenergies.com	Member	X
McVicker	Bryan	ExxonMobil	bryan.mcvicker@exxonmobil.com	Member	X
Miller	Andy	BASF	andy.miller@basf.com	Member	
Miller	Russell	Nova	russell.miller@novachem.com	Member	
Mudd	Mallory	Dow	mmudd@dow.com	Member, Director	X
Odewale	Samuel	CP Chem	ODEWAS@cpchem.com	Member	X
Pena	John	Nova	john.pena@novachem.com	Member	X
Radtke	David	Honeywell UOP	david.radtke@honeywell.com	Member	X
Shelton	Marty	Eastman	martyshelton@eastman.com	Member	X
Singh	Gurwinder	LyondellBasell	gurwinder.singh@lyb.com	Member	X
Summers	Patty	Zeochem	patty.summers@zeochem.com	Member, Interm Vice-Chair	X
Wang	Harry	Shell	harry.wang@shell.com	Member	X

Agenda:

- Anti-Trust statement – Dan
- Membership updates
- 2024 Meeting Updates

Anti-Trust Statement:
"No activity of the Committee shall involve the exchange, collection or dissemination of information among competitors for the purpose of bringing about or attempting to bring about any understanding or agreement, written or oral, formal or informal, express or implied, among competitors with regard to costs, prices or pricing methods, terms or conditions of sale, distribution, production quotas or other limitations, on either the timing, or volume of production, or sales, or allocation of territories or customers."

Meeting Minutes

Membership:

2024 Meeting:

Operations Session Papers Selected

- Patty Summers Champion
  Current Trends – Global Olefins
  Jeffery Nichols, Solomon Insight, Dallas, TX
  Abstract Text:
  The past two decades have witnessed considerable change within the global olefins market. That change has not been confined to any single characteristic, either. Facility size, energy efficiency, turnaround duration and cost, and feedstock composition are just some of the areas which have marked notable dynamics, both regionally and globally. In addition, regulatory pressures related to greenhouse gas emissions, carbon footprint, and overall sustainability have encouraged significant modification to both design and operation of facilities.

  As global leaders in benchmarking and performance improvement, HSB Solomon Associates, LLC (Solomon Associates) have compiled and summarized data to exhibit global and regional trends related to the following:
    - Turnaround key indicators, including durations, intervals, and relative costs
    - Energy efficiency, including Solomon's proprietary energy intensity and energy sustainability indices (EII and ESI)
    - Olefins plant reliability
    - Maintenance costs

  Solomon Associates will also present commentary and insight relative to these areas.

- John Pena Champion
  Ethane Feed Vaporizers Startup Difficulties
  Samraat Paul, Andre Bernard and Manuel Dreise, NOVA Chemicals, Corunna, ON, Canada
  Abstract Text:
  Changes in configuration and operating conditions of parallel ethane feed vaporizers integrated with the ethylene refrigeration system resulted in startup difficulties. While one of the exchangers was vaporizing and superheating the ethane feed stream, the other one seemed stalled. Fouling was initially speculated as the problem cause. However, this predicament was initiated by the exchangers outlet vapor to liquid transition that resulted in a hydraulic imbalance between the 2 exchangers. The condensing side of the exchanger's outlet is characterized by vertical pipe risers, which ties into a long horizontal header. Different liquid accumulation rates between the 2 risers and/ or preferential liquid back flow from the horizontal header to one of the risers caused the vapor supplying the exchangers to follow the path of least resistance, hence stalling one of the exchangers. This paper discusses how operating data complemented with process simulations was used for identifying this problem along with the proposed solution. A review of typical project workflow is also discussed to highlight potential design pitfalls that could result in similar situations.

- Bryan McVicker Champion
  TLE Water Quality: Leveraging Cross-Organizational Collaboration to Improve Chemistry Control and Increase Steam System Reliability
  Anna Akker1, Jacob Tilley2 and Carl Peterson2, (1)ExxonMobil Technology and Engineering Company, Houston, TX, (2)Veolia Water Technologies & Solutions, Houston, TX
  Abstract Text:

A Transfer Line Exchanger (TLE) is used to rapidly cool steam cracking furnace effluent while generating high pressure steam. Due to extreme conditions present in the TLE's and potential for challenging water circulation, the TLE's often experience steam drum chemistry reliability issues. Poor steam drum chemistry can lead to furnace equipment damage and downstream turbomachinery issues, ranging from inefficient operation to potential ethylene cracker shutdown. Therefore, maintaining TLE water chemistry control is a vital component of overall ethylene plant reliability.

Water chemistry quality control can be complex due to shared ownership and responsibility within an operating organization and with a water chemistry partner. Building a successful partnership relies on having standard, agreed upon quality control practices, effective collaboration, and clear communication between teams.

This presentation intends to discuss, with a case study, how cross organizational troubleshooting can be leveraged to improve TLE reliability through tightened chemistry control and efficient, collaborative response to upset events.

- Chris Carr Champion
  Learnings from Cold Box Core Exchanger Replacement on Existing Unit
  William Butler, ExxonMobil Technology and Engineering Company (EMTEC), Beaumont, TX
  and Robert Witt, ExxonMobil Technology and Engineering Company, Beaumont, TX
  Abstract Text:
  Beaumont Chemical Plant required replacement of a cold core exchanger due to a long-term fouling issue. The fouling caused high DP and poor heat transfer leading to lost recovery of valued molecules. Graphs of this will be included. This is a brazed aluminum heat exchanger (BAHX) inside of a perlite filled cold box.

  The first attempt to purchase a new core used a non-OEM exchanger supplier but the exchanger had to be disposed due to manufacturing issues. The site then utilized another vendor and successfully manufacture the new core. There were multiple learnings due to the fact that neither vendor provided an identical replacement in kind for a 30+ year old exchanger. Details will be provided on some of the technical quality checks and design evaluations.

  Installation was successful without issues. A general overview of the process, typical hold points, inspections, leak testing, and findings will be provided. Discussion of the perlite changeout typical process and safety concerns will be included.

  Base improvements were made during the outage to prevent future fouling. The paper will discuss some standard cold box exchanger protection elements.

  The old exchanger was dismantled by cutting in a fabrication shop to determine the root cause of the fouling. Multiple cuts were made on the old exchanger over the course of three days. This was a unique experience and pictures will be provided. The shop work helped identify particulates as the source of the exchanger performance issues. This method of troubleshooting may have a low probability of success depending on the choice of cuts on the exchanger pieces. Learnings from the process will be provided. The cutting required a lot of senior technical people observing and discussing the issues to find the fouling in the cut exchanger pieces.

Post start-up performance on the new core exchanger was very good and returned the unit back to design performance. Graphs of the performance change will be provided.

- Miguel Maldonado Champion

  Feed Flexible Furnaces: What Are the Advantages, Constraints, and Considerations?

  Huynh Pham, Furnace Technology, Technip Energies, Houston, TX

  Abstract Text:

  In the ethylene industry, cracking furnaces are typically designed for dedicated feedstocks. The designs of the radiant coil in the firebox, as well as the coils of the convection section, are catered to the feedstock to be cracked. Furnace designs have become flexible enough to fully crack a gaseous feedstock or a liquid feedstock.

  Because of the constantly varying costs of feedstocks, ethylene plant owners may purchase an array of gaseous and liquid feedstocks. Sometimes this is a usage of products from the owner's refineries or the import of liquefied petroleum gas (LPG).

  Grassroot designs of today's plants require furnace counts with large ethylene production capacities to meet their needs. Distribution among these large capacity furnaces becomes difficult, when typically the furnace loading is of one type of feedstock. In a revamping design, increased cracking results in increased recycle cracking. However, the recycle flow is not substantial enough to load one of the new higher capacity furnaces. Such was the case at YNCC plant #2 where two (2) new feed flexible 192U were designed and installed at site.

  The YNCC#2 plant feedstocks ranged from Heavy Naphtha to light gas feedstock, including the recycle ethane. The furnace design allowed for simultaneous cracking of the liquid feedstock and the gaseous recycle ethane in the same furnace. The design encompasses the practice of independent cell operation (ICO) where different feedstocks can be cracked in the different cells, to which one of the cells can also be in decoking mode – independent cell decoking (ICD). Even further, when needed, the recycle ethane can be cracked in just a quarter of the furnace by using Quad-cracking, where only half of one cell is cracking a particular feed. With all the considerations to be feed-flexible, the furnace was also designed with the Gas Turbine Integration (GTI). The furnace convection section heat integration design allows the furnace burners to be capable of utilizing ambient air as well as gas turbine exhaust as the combustion air source.

  This presentation will discuss the considerations that went into the design of the 192U feed-flexible furnace while incorporating the use of GT exhaust and address the furnace availability concerns when the other recycle gas furnaces are decoking.

- Vikranth B Champion

  Procedural Automation – Best Operator Always Available Reliably

  Stephan Hazzam, Advanced Operations Services, Linde, Munich, Germany and Parth Shah, Advanced Operations Services, Linde, Dresden, Germany

  Abstract Text:

  Ramping and switchovers during frequent transitions in petrochemical plants involve manual field and panel operator activities. Normally the ramping of setpoints and turning of automatic valves are executed manually based on standard operation procedures. These manual operations if not performed properly can have an impact to downstream process units and lead to off-spec products, less production time, lower energy consumption and unnecessary GHG emissions. In worst case they can even trigger process upsets.

An automation of these activities by the Automatic Sequence Transition module in an integrated Advanced Process Control System leads to more consistent and reliable operation. The variations during cracking furnace transitions (e.g., standby to cracking or decoking) due to less experienced operators can be mitigated by help of this kind of automation to achieve optimized olefin production.

This paper explains the potential of this solution, architecture, and challenges especially on a brownfield projects and lessons learned.

Papers NOT Selected

- First Out
  Chemical Treatments: Start up Best Practices to Ensure Safe and Reliable Operation
  Joice Boll, Global Technical Support, DORF KETAL, Houston, TX and Mikhail Knis, North America Sales, Dorf Ketal, Houston, TX
  Abstract Text:
  An Ethylene Plant being commissioned for the first time or resuming operations after maintenance requires attention to details, including with the chemical injection systems. The Plants could differ to some extent, depending upon various factors like licensor design, capacity, feedstock, etc. However, all of them will require chemical treatments, and hence, will have to start up the injection systems safely and reliably, to avoid (or at least minimize) technical and safety challenges.

  During the design and construction of a new unit, the evaluation of the right injection points is key for best results during operation. Considerations on the right metallurgy and type of injection quills are critical for the pipeline corrosion protection and performance of the chemical treatment. During the pre-commissioning phase, it is also important to have a prudent planning in place, based on each unit different need. Some units would require an off-line passivation before the feed start up, and some would require treatment after the plant is running at intermittent / continuous basis.

  Unique challenges are generally observed during the initial few days of start-up, such as emulsions, pH fluctuations, contaminations. Following a strategic and organized set of procedures, including contingency plans, can increase the reliability of any process plant commissioning and start-up. A diligent plan can also help to achieve the plant stabilization earlier and hence improve profitability, considering that all the best practices were in place and the related personnel is equipped well to handle atypical situations.

  All the above-mentioned points are very important for a successful plant start up and operation. The paper will focus on the best practices to be followed, prior, during and just after to start-up on the chemical injection systems, to ensure a safe and reliable operation.

- Too Narrow for 2023 – Consider for 2024?
  Best Practices for Extension in Isoprene Unit Reboiler Run Length
  Danilo Souza1, Fernanda Amano2, Marcella Silva3 and Gustavo Arthur3, (1)Process Engineering, Braskem, Camaçari, Brazil, (2)DORF KETAL, Sao Paulo, Brazil, (3)DORF KETAL, Camacari, Brazil

Abstract Text:
The criticality of processing a stream rich in unsaturated compounds in the C5 range is well known, due to its high potential for polymerization. This happens because of the presence of very unstable monomers in the stream. The fouling formation in the Isoprene Unit, more specifically in the Feed preparation section, is dominated by the mechanism of diolefin polymerization via free radicals, driven by the high concentration of these unsaturated compounds in associated with specific thermodynamic and mechanical conditions of the system. It's a fast mechanism that consists of chain reactions steps known as initiation-propagation-termination. The polymerization reaction process worsens at higher temperature conditions in the system since the greater the temperature rise, the more intense the formation of free radicals that will enhance polymerization in the bottom region of the heavy removal column and its reboilers.

The formation of fouling, resulting from the polymerization process, which deposits in the internal region of the reboiler tubes in the form of a film, leads to a reduction in the efficiency of this equipment and, consequently, a reduction in run length times, making frequent interventions necessary for cleaning and maintenance. Aiming to improve the performance this equipment, a series of measures were implemented by Braskem Team. Operationally, a strict quality control of the feed and column operation was established, along with measures during unit shutdown, to avoid compromising performance during the unit startup. Furthermore, with the same objective, the chemical treatment strategy was changed, for a more comprehensive treatment.

The modifications were successful in increasing the reboilers run length, with an addition of 2.5 times the operating time of the heat exchangers.

- Consider for Operations or Feedstock/Contaminants in 2024?

  Advances in Purification of Refinery Off-Gas Streams - Including a New Lead-Free Arsine Adsorbent

  Allan Hatami, ADSORBENTS, UOP, A HONEYWELL COMPANY, HOUSTON, TX, Stephen Caskey, Honeywell UOP, Des Plaines, IL, Rodrigo Lobo, Honeywell, Des Plaines, IL and David Radtke, Honeywell UOP, Houston, TX

  Abstract Text:
  Refinery off-gas streams derived primarily from fluid catalytic cracking units (FCCU’s) and Coker units have historically been sent to fuel gas systems, but these light hydrocarbon rich streams can be a cost advantaged feed stock for steam crackers (ethylene plants). Prior to being fed to the fractionation section of a steam cracker, removal of a variety of contaminants is required to meet ethylene plant product specifications or result in downstream deactivation of selective hydrogenation or polymerization catalysts.

  Adsorbents are cost effective and efficient means of removing many of these problematic contaminants including arsine, mercury, chloride, oxygenates, sulfur compounds and more. The adsorption systems can be operated in either regenerative or non-regenerative mode. Honeywell UOP with its extensive adsorption technology expertise, field service capabilities, broad adsorbent product portfolio and commercial experience in refinery off-gas treatment can offer solutions to these purification demands.

Honeywell UOP has developed new materials for application in refinery-off gas streams. A lead-free arsine removal adsorbent has been patented. The new arsine removal adsorbent, free of environmentally problematic lead oxide, has been field tested at a major olefins producer in Asia and is now available for use.

In this paper we will discuss:

- Contaminants of concern in refinery off-gas streams fed to steam crackers.
- Appropriate adsorbents for each purification service with case studies and resultant attainable contaminant effluent specification.
- Optimum treater operating guidance.

- Consider for New Technology for 2024?
  Improving Plant Availability in Steam Cracker Units - Non-Intrusive Flow Measurement Under Harshest Process Conditions
  Ingo Nickel, FLEXIM Flexible Industriemesstechnik GmbH, BERLIN, Germany
  Abstract Text:
  Non-invasive ultrasonic flow meters are increasingly used in ethylene production due to their accurate and reliable measurement capabilities. They utilize sound waves to measure flow rate without the need for physical contact or interruption of the process flow. Compared to traditional invasive methods, they are highly efficient and cost-effective, as they can be installed during the process without waiting for a shutdown. They also mitigate safety hazards associated with traditional measurement methods, such as leaks.

  This technology allows for continuous monitoring of volumetric and mass flow rates, enabling operators to detect changes or abnormalities in the process flow that could indicate potential safety hazards.

  In steam cracker units, measuring the flow rate of quench oil can be challenging due to various factors, including high temperatures, high pressures, viscosity, fouling, corrosion, and large pipe diameters. Non-invasive ultrasonic flow meters can address these challenges by operating at high temperatures and pressures, accurately measuring highly viscous fluids, due to the design with no moving parts which reduces fouling. They can also measure flow rates in large pipe diameters.

  Overall, the use of non-invasive ultrasonic flow meters is an important advancement in process efficiency and safety in ethylene production.

- Consider for Rotating Equipment or Reliability for 2024?
  Flow Measurement: Influence of the Pressure Tapping Diameter on Reliability and Accuracy
  Emerentino Quadro, Olefins Process Engineering, Braskem S.A., Camaçari, BA, Brazil, Vinicius Sena do Nascimento, Instrumentation departament, Braskem, Camaçari, Brazil and Lucas de Carvalho Cesar, Plant Operation, Braskem, Camaçari, Brazil
  Abstract Text:
  In the current highly competitive ethylene market, energy efficiency is a key issue. Since the charge gas compressor (CGC) in a steam cracker unit is an intensive energy consumer, the energy efficiency of this machine should be monitored and optimized frequently, especially during periods of low plant capacity occupancy, when CGC recirculation is required for surge prevention. To achieve this optimal operating point, there are several best practices, such as (i)

controlling the fouling accumulation by injecting an appropriate wash oil and controlling the outlet temperature below an upper critical value, (ii) minimizing the CGC backpressure, (iii) reducing the concentration of polymer initiator compounds (mainly oxygenated compounds) in the charge gas and (iv) adjusting the recirculation flow rate to the minimum required to prevent surge. This last point is the focus of the present work. The first step to optimize the recirculation flow rate is to measure the charge gas flow rate reliably and accurately. After several years of operation (by the way, the ethylene units runlength have become longer and longer), often occurs a fouling accumulation inside the pressure tapping of the measuring devices for the charge gas (orifice plates, venturis or annubars). This fouling accumulation often leads to a complete or partial blockage of these tapping and, therefore, to a deviation of the flow indication and an unnecessary recirculation of the flow (or, worse, to a real surge phenomenon). Based on our operational experience, the robustness of the charge gas flow rate measurement for fouling service could be achieved by increasing the diameter of the pressure tapping. Increasing the diameter of the tapping from 0.5” to 2” has been successfully implemented at Venturis in terms of reliability. However, could this change result in a lack of flow rate measurement accuracy for venturis or orifice plates with radius taps (D and D/2)? What does the standard ISO -5167 say about this? The objective of this study is to clarify these points using Computational Fluid Dynamics (CFD). To this end, the Finite Volume Method (FVM) is used to apply the conservation laws (mass/momentum/energy) governing fluids in a 3D nonstructured grid, k-epsilon realizable model parameters for turbulence modelling and the steady state assumption is applied.

Proposed Joint Session w/ Environmental and Sustainability – Ethylene Plant Flare Operations in a Post-Ethylene MACT World

- This one is good to go. I will be accepting all papers later today and scheduling a discussion with co-chair and paper presenters in December.

March 24-28, 2024 Spring Meeting in New Orleans Hilton Hotel and NOLA Convention Center

Planned Meetings:

January 18, 2024 1:00 – 2:00 pm. Champion Updates
February 6, 2024 1:00 – 4:00 pm. Review of Presentations (possibly Face-to-Face) at UOP in Houston
March 5, 2024 1:00 – 4:00 pm. Final Reviews

AIChE Schedule:

November 11, 2023	Abstract Call Closes
December 8, 2023	Chairs Accept/Reject Abstracts
January 8, 2024	Draft Program Available for Review
January 15, 2024	Program goes live!
March 10, 2024	Paper Submission Closes
March 24-28, 2024	2024 AIChE Spring Conference

(Main Committee Schedule)

Meeting dates for the 2023-2024 cycle were discussed and agreed upon by the Committee as follows:

- June 15, 2023
- August 10, 2023
- October 12, 2023
- December 7, 2023
- February 1, 2024