EPC Operations Committee Meeting Minutes

Time: 2:30 – 3:30 pm
Date: 11-30-21
Location: virtual
Attendance:

Patty Summers (Zeochem)
Jenny Heinlein (Dow)
David Dutschmann (ExxonMobil)
Richard Rolke (Dow)
John Dillon (Dow)
John Cahill (LyondellBasell)
Ali Abbaspour (UOP)
Dan Euhus (ShinTech)
Mark Whitney for Vik Balasubramanian (Linde)
Ryan Chun (Evonik)
Miguel Moldonado (Tecnip Energies)

Agenda:

- Anti-Trust statement – Patty
- Update on 2022 Conference (April 10 – 14, San Antonio, TX)
- Update on abstracts – review of abstracts / order of papers

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."

<u>Meeting Minutes</u>

Main Committee:
No update.

Papers Discussion:

Sponsors:

- Notify the authors that their papers were accepted
- Make sure the authors know that both a presentation and a paper are required
- Presentations should be ~20 minutes (if in person) – 15 minutes if virtual
- Presentations and papers should not have "Confidential" (etc.)
- Include paper ID on title slide and front page of paper

Timeline:

- Need to get schedule from AICHE on requirements
- Need draft presentations by March 1st (share with committee via sponsor)

- Need papers by: TBD, likely to be on or around the date of the conference
- Plan to attend in person if presenting (April 10 – 14, San Antonio, TX)

Summary: Six abstracts below in order of the session.
All abstracts are entered into the system with the exception of the ExxonMobil abstract which we will have soon.

1. ExxonMobil: use of simulators for training and preparing for start-up (Operator)
2. Promising Chemical Treatment Approach for 1,3-Butadiene Fouling (DK)
3. Increasing Butadiene Unit Run-Length and Reliability with Advanced Antifoulant Technology (Suez / Braskem)
4. Revamp of YNCC No. 2 Ethylene Plant (Joint EPC/Operator)
5. Benchmarking Study of Caustic Tower Operation and New Analytical Method for Red Oil Polymer (Suez)
6. CO_2 Reduction for Steam Cracking Furnaces By Full Hydrogen Firing (Technip)

Paper 1. ExxonMobil: use of simulators for training and preparing for start-up – David says this is still on track. He hopes we will have the approved abstract by the end of this week. Sponsor: David Dutschman

Paper 2. id# 639184: Promising Chemical Treatment Approach for 1,3-Butadiene Fouling

Sponsor: Jenny Heinlein

Henrique Silva1, Tatiana Barbosa2, Fabio Rios3, Williane Carneiro3 and Zaelma Matos4, (1)Customer Application Engineering, Suez Water Technologies & Solutions, Cotia, SP, Brazil, (2)SUEZ Water Technologies & Solutions, Camacari, Brazil, (3)Braskem S. A., Camacari, Brazil, (4)Braskem S.A., Camaçari, Brazil

At Braskem's Camaçari site, in a Nippon Zeon design plant, 1,3-butadiene is produced by extractive distillation with dimethylformamide (DMF) used as solvent. Since longer campaigns have been desired, the treatment of the extraction section has become more challenging, especially due to its historical issues with widespread polymerization at the bottoms of extractive towers.

This paper recaps the general mechanisms involving fouling on butadiene extraction and how SUEZ and Braskem are working together to control severe fouling on the system with a promising inhibition chemical program currently used. Then some positive preliminaries results will be shown.

This process is featured by high temperature at the bottoms of the extractive distillation towers. Hence, this environment is severe enough to easily foul rubber and sheet forms of polybutadiene on economizers, reboilers and on tower's chimney trays. OH-TEMPO chemical additive is commonly used in this system with the function of inhibit this phenomenon, but for large runs purposes this approach may be not enough. To improve inhibition efficiency, a new synergic blend of OH-TEMPO with a specific antioxidant has been used covering critical areas of the process and responding better than the previous chemical used.

Paper 3. T4 639372: Increasing Butadiene Unit Run-Length and Reliability with Advanced Antifoulant Technology Be sure we minimize the sales pitch. Sponsor: Patty Summers

In recent years, ethylene producers have made significant progress to reduce costs and increase productivity by increasing the time between plant turnarounds. This is increasing the need for improved run-length and reliability of the butadiene section of the olefins complex. Fouling control in the extraction section of the butadiene process is one of the most important challenges limiting run-length and reliability.

This paper discusses the fouling mechanisms in the extraction section and the challenges faced by butadiene producers to control fouling. Best practices and case studies are presented that show how improved fouling control can increase run length and reduce maintenance & energy costs. One case history focuses on improving control of stripper column pressure drop. The second case history discusses how pump strainer cleaning frequency can be improved with better fouling control and how this improvement is correlated with performance of the recovery heat exchanger and stripper reboiler. In both cases, improvements in monitoring and control of fouling provided the olefins complex with better predictability of planned outages.

First Presenting Author
Presenting Author
Review
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Paper 4. Revamp of YNCC No. 2 Ethylene Plant
Sponsor: Miguel Moldonado

Muhammad Imran, Lead Process Engineer, Technip Energies Process Technology, Chang-Seok Park, Process Manager, Yeochun NCC Co. Ltd., etc

Abstract: Yeochun NCC Co., Ltd (YNCC) Ethylene Plant No. 2 is located near Yeochun, Korea. The plant No. 2 ethylene technology was licensed by Technip Energies Process Technology (formerly Stone and Webster) in 1992. The original capacity of this plant was 350 KTA of polymer grade ethylene with the equipment designed for capacity of 450 KTA (based on 8,000 operating hours per year). YNCC#2 revamped plant on various occasions to 543 KTA. In 2009 Technip Energies Process Technology performed a feasibility study to identify the bottlenecks and required scope of modifications. The objective was to increase the operating capacity of the plant from 543 KTA to 859 KTA. In 2018, YNCC decided to implement 859 KTA expansion and contracted Technip Energies Process Technology to provide Basic Engineering Package (BEP) and Ethylene Technology Licensing for the planned capacity, as well as efficiency increase for YNCC No. 2 Ethylene Plant. This important plant revamp had many challenges due to the large capacity increase of ~160% from the current capacity.

This paper will discuss the various revamp techniques and construction challenges in this large capacity increase. Few examples are:

- Addition of two 192U furnaces and a gas turbine on a tight plot space.
- All three major compressors (Cracked Gas, Ethylene Refrigeration and Propylene Refrigeration) had a foot print replacement on the same foundation.
- High capacity trays were used in many towers.
- Parallel towers were added for few services where required capacity increase was beyond capacity limit of the high capacity trays.
- Efforts were done to minimize the parallel equipment addition due to the limited availability of the plot space. Many equipment were therefore replaced on the same foundation instead of adding a parallel equipment.

YNCC along with its construction partners Daelim and Hanwha successfully completed the construction in December 2020 and plant was started up and achieved the targeted ethylene production in January 2021.

Paper 5. id# 639298: Benchmarking Study of Caustic Tower Operation and New Analytical Method for Red Oil Polymer Sponsor: Dan Euhus

Joop Dees, Customer Application Engineering, SUEZ Water Technologies & Solutions, 's Heer Arendskerke, Zeeland, Netherlands and Steven Imbert, SUEZ Water Technologies & Solutions, Herentals, Belgium

Process streams in ethylene units contains acid gases, like carbon dioxide and hydrogen sulfide, as a result of cracking and coking/decoking reactions in the furnaces. The acid gases are typically removed in the caustic tower, which is integrated into the charge gas compressor. Other components, like aldehydes and ketones, are present as contaminants in the cracked gases and can polymerize under basic conditions to form aldol condensation polymer. The polymer can deposit on the internals of the caustic column and in the downstream spent caustic process like tankage, caustic stripper and/or wet air oxidizer. The fouling can have a huge impact on the overall plant performance.

The fouling has a significant effect on the efficiency and reliability of the caustic column operation and is heavily affected by operational process parameters. A global benchmarking study identified the most important parameters such as temperature profiles, caustic strengths, and aldehyde content. The process conditions were then simulated in the laboratory to better quantify their impact on polymer formation.

A new analytical method was also developed for quantifying the red oil polymer during the laboratory work and the results favorably compared with the traditional manpower-intensive analytical method (polymer extraction with solvent). The new method has now been deployed to the field, where it reduces the analysis time from several hours to minutes and has shown to be very accurate.

Paper 6. T4 639321: CO2 Reduction for Steam Cracking Furnaces By Full Hydrogen Firing
Sponsor: Ali Abbaspour.

Abstract: When firing fuel gas as generated within the cracker, the steam cracking furnaces emit about 90 to 95 percent of the plant's total CO_2 emissions. One option to reduce CO_2 emissions from the cracking furnaces is to increase the hydrogen content in the fuel gas. By switching to firing 98 vol.% hydrogen fuel gas, CO_2 emissions from the furnace stack can be reduced by about 95 percent for liquid crackers (typically 10 vol.% H_2 in fuel gas) to 85 percent for ethane crackers (typically 85 vol.% H_2 in fuel gas).

Due to the difference in fuel gas characteristics when moving to firing high hydrogen content fuel gas the flue gas mass flowrate decreases, the firebox efficiency increases, the heat load into the furnace convection section decreases and the adiabatic flame temperature increases. When revamping existing furnaces, next to the adequacy of the firing system, there will be consequences on the furnace run length and superheated high pressure steam production and the revamp strategy needs to be adopted accordingly.

This paper discusses the design considerations when firing high hydrogen content fuel gas. The effect on the cracking furnace performance such as run length and SHP steam production, will be further explored and the adequacy and considerations on the convection section will be discussed. In addition, the impact on the burner design will be touched upon. Technip Energies is developing and testing burners suitable for hydrogen firing. The results from both the large capacity LSV® bottom burner and side wall TSWB® burner firing full hydrogen are presented.
First Presenting Author
Presenting Author
Review
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Next Meeting: Tuesday, February 15th, 2022 2:30pm – 3:30pm VIRTUAL

Plan on Face-to-Face meeting in March 8th – 10:30 to 1:00 (with lunch)
Need a host 😊