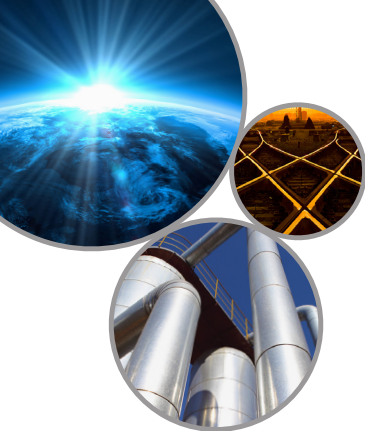


Thursday March 23, 2017

## Technology Seminar

- 8:15am **Welcome Remarks**  
 Don Bari, Vice President, Chemicals Technology & Analytics, IHS Markit and Dr. Jeffrey S. Plotkin, Vice President of Training & Education, IHS Markit
- 8:30am **R&D Trends – The Arc of Petrochemical Industry Process Technology Evolution**  
 Dr. Jeffrey S. Plotkin, Vice President of Training & Education, IHS Markit  
 The petrochemical industry has been on a long, never ending journey of developing cheaper and cheaper process technology for manufacturing useful products from very basic raw materials. This cost efficiency march has not always been in a smooth straight line and has often involved baby steps, side-steps, back-tracks, stumbles and every once in while great leaps. This presentation is intended to briefly track this arc of petrochemical process development with an eye to setting the stage for our esteemed speakers participating in the technology seminar.
- 9:00am **Advantaged Technology and Application of Methanol to Fuel and Chemicals**  
 Dr. Kezhi Lin, Marketing Director, SEG (Sinopec Engineering Group)  
 Methanol is one of the most important chemicals. SEG can provide methanol to olefin and methanol to gasoline technologies with partners based on it's advantages of more than 50 years engineering experiences on fluid bed technologies. SEG is open to cooperate with international partners to provide total solutions for clients.
- 9:30am **STAR Process® Technology – Advanced On-purpose Propylene Production**  
 Dr. Sascha Wenzel, Head of Sales Dehydrogenation, Thyssenkrupp Industrial Solutions  
 The STAR process® technology of Thyssenkrupp Industrial Solutions (TKIS) is used for the production of propylene and butylenes by dehydrogenation of propane (PDH) and butanes (BDH), respectively.  
 Especially propylene shows continuous growth driven by the demand for polypropylene (PP) and other derivatives. It is assumed that propylene production will increase from 100 to 120 million metric tons per year till 2022. In the same period the share of on-purpose technologies like PDH or metathesis will increase from approx. 15% to over 30% (Source: IHS Inc., 2013).  
 The STAR process® with a licensed capacity of more than 1.7 million tons per year is one of the leading on-purpose technologies.
- 10:00am Question & Answer
- 10:15am Break
- 10:30am **Advances in Oxidation Technology of Butene to Butadiene**  
 Dr. Xiankuan Zhang, Chief Scientist, SABIC
- 11:00am **Ethane in NGL Separation – to Reject or to Recover?**  
 Dr. R. J. Chang, Senior Global Managing Director, Process Economics Program, Oil, Mid-Downstream and Chemicals, IHS Markit  
 The competitive NGL-based feedstocks have spurred a new wave of investment in ethane-based ethylene production in North America, including seven expansion projects of existing crackers, six new steam crackers under construction, and eight crackers in feasibility stage. These new projects require additional ethane supply of about 11 million tons of ethane by 2018 and another 11.1 million tons beyond 2018 for the eight crackers in the feasibility stage. Whether the midstream companies will be able to meet this growing demand depends on pipeline availability, exports, and most importantly NGL separation and fractionation economics. This presentation examines the ethane separation economics to determine when a midstream company will reject ethane (including it with methane for fuel use) or recover it as a petrochemical feedstock to get an assessment of future supply-based techno-economics analysis.
- 11:30am **Cost-Efficient Methanol Production by Means of Topsoe Autothermal Reforming**  
 Dr. Esben Lauge Sorensen, Senior Technology Specialist, Haldor Topsoe  
 The leading methanol technology licensor Haldor Topsoe recently released a completely new route to methanol production. The new route eliminates the need for a steam reformer and thereby brings vast economic and operational benefits. The technology and its implications on project economics and implementation are presented.
- 12:00pm **Disruptive Technology in the Olefins Value Chain**  
 Andrea Redford, Vice President – Petrochemical Licensing, Siluria  
 Siluria Technologies is changing the way basic chemicals and fuels like ethylene, propylene, and gasoline can be made. The company's natural gas fed catalytic processes are compatible with existing petrochemical and refinery infrastructure, translating to lower costs, feedstock flexibility, and superior scalability than steam cracking or other on-purpose routes.

3/8/2017



- 12:30pm Question & Answer
- 12:45pm Lunch
- 1:45pm **The Dynamics of Global Plant Construction Location Factors**  
Edward Glatzer, Managing Director, Technology and Analytics Group, Oil, Mid-Downstream and Chemicals, IHS Markit  
In discussions with IHS Markit clients in recent years, one of the topics that they bring up most frequently has been the rapid change in relative construction cost levels between different locations. Much of this cost fluctuation can be attributed to recent wide swings of exchange rates for most global currencies, but other factors such as labor rate changes, are also impactful. In light of this, IHS Markit developed a methodology to independently calculate and update our country location factors to reflect the ongoing reality in relative capital costs and cost competitiveness.
- 2:15pm **New Cost-Effective Membrane Systems for Petrochemical Component Separation**  
Dr. Hannah Murnen, VP Business Development, Compact Membrane Systems  
Compact Membrane Systems has developed a membrane that is highly effective at separating olefins and paraffins. The membrane has advantageous performance characteristics (flux and selectivity) and has demonstrated stability for >300 days. Use of the membrane provides significant economic benefit over existing separation methods in numerous petrochemical and refining applications.
- 2:45pm **Cost Competitive Single-Step Conversion of Fuel Grade Ethanol to Renewable Propylene (or Isobutylene) and Hydrogen**  
Dr. Jonathan O. Smith, Director of Chemical Development, Gevo Inc.  
Gevo Inc., a Bio-Fuels company, has developed a novel robust mixed metal oxide catalyst that selectively converts fuel grade/hydrous Ethanol to high purity Propylene in mass yields of 37% (80% of theoretical) along with Hydrogen such that 10 million gallon per year (30 KTA) ethanol provides 11 KTA propylene and 3.2 MM SCFD Hydrogen. Economic sensitivities are discussed.
- 3:15pm **Design and Synthesis of a New Catalyst for the Polymerization of Propylene**  
Dr. Jianjun Yi, Director, PetroChina Petrochemical Research Institute  
In the polypropylene industry, phthalate-based catalysts are used widely because of their advantages in comprehensive performance. However, phthalates were found to be potentially harmful for health. It is necessary to develop novel phthalate-free catalyst with high activity and excellent stereoregularity. The new catalyst PSP-01 with new structure sulfonyl compounds as electron donor, instead of phthalates, was successfully synthesized and developed by our laboratory. The catalyst PSP-01 exhibits excellent catalytic performance, and is commercialized. Series of polypropylene products with high performance were developed, and used in the various walks of life.
- 3:45pm Question & Answer
- 4:00pm Break
- 4:15pm **Process Intensification in the Chemical Industry “You must unlearn what you have learned”**  
Dr. Richard Charlesworth, Managing Director, Chemicals Consulting, IHS Markit  
Over the last 50 years, the pace of technological innovation in electronics and computing has been phenomenal. The same cannot be said for the chemical industry that uses the same basic process units albeit with improvements in capacities, catalysts and technology routes. This presentation will review the concept of process intensification for chemical plant, what process units could be intensified, the potential benefits, the barriers and the current players in this area of innovation.
- 4:45pm **Syngas Fermentation Processes**  
Don Bari, Vice President, Chemicals Technology & Analytics, IHS Markit  
Fermentation technology is being developed using microorganisms called acetogens that have the ability to convert synthesis gas (syngas) components to multi-carbon compounds such as ethanol, 2,3-butanediol, acetate, butyrate, butanol, and lactate. Unlike conventional thermochemical processes, such acetogens do not require specific H<sub>2</sub>:CO ratios for converting the gas into chemicals. This paper examines syngas fermentation technologies, stage of development and their potential commercial scale economics.
- 5:15pm Question & Answer/Closing Remarks