Positioning for What Comes Next in the Energy Feedstocks and Chemical Industry

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Feedstock cost has traditionally been the most important and complex long-term decision determinant.

Crude Oil - Vs - Natural Gas (Naphtha Vs NGLs)

Source: IHS Markit
Global base chemical capacity will increase by 118+ million tons, 2018 – 2022
Asia-Pacific (led by China) will add 60%; N. America – 20%; Middle East – 10%

World base chemical annual capacity growth by location

Source: IHS Markit © 2018 IHS Markit
We expect capital spending to rise by an average of 21% annually between 2017 and 2020, to reach an estimated $136 billion (onshore drilling and completion only).

- Spending will grow at a faster clip than growth in well counts due to more complex wells, drilling in more expensive areas, and slowly inflating service costs.
Chemical industry in a sustained and unprecedented peak earnings cycle

- Steady global economic expansion driving growth across most markets
- Oil volatility, reduced Chinese reinvestment, and constrained capital and delayed investment decisions
- Strong margins or economic pull-back creates the potential for major overbuild post-2021

Chemical Industry weighted average cash

Real GDP

<table>
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<th>Percent change</th>
<th>2016</th>
<th>2017</th>
<th>2018</th>
<th>2019</th>
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</table>

Source: IHS Markit © 2018 IHS Markit
Critical factors: A timeline of importance

Capital efficiency in a country is currently a significant topic in the industry

Low Capital Cost
Technology Availability
Feedstock Advantage
High Demand
Infrastructure/Logistics
The desired competitive position takes on another global dimension

China investment location factor 0.57 vs. USGC, due to:

- Efficient construction methods
- High construction productivity
- Low skilled labor cost
- Extensive domestic equipment manufacturing capabilities

Market drivers are expected to close this advantage over time
Crude-Oil-Chemicals Driving Forces

Hengli Petrochemical, Zhejiang, Henyi and Shenghong: To back integrate their PET-PTA production by configuring refinery to produce maximum PX

- Hengli’s project aiming trial production at end of 2018
- Zhejiang project 1st phase is only a few months behind Hengli’s

Saudi Aramco: To better monetize its oil assets to produce more chemicals which have higher value and growth than transportation fuels

Crude to “more” chemicals could be very significant industry “disruptor”
Global naphtha cracker chemical production capacity ranking

Naphtha steam cracker capacity ranking

Source: IHS Markit

© 2018 IHS Markit
For example, you can see that imported ethane to China will change the competitive picture.

Reference: Naphtha in USGC

Coal-based is now disadvantage

Reference: Naphtha in China

China imported ethane–based is now the most competitive

Source: Process Comparison and Cost Tracker (PCCT)
Final Thoughts

➢ Chemical industry will likely carry strong profit momentum into the early 2020’s.
➢ Strong demand and limited new supply are driving an extended upcycle to record length.
➢ Cautiousness is occurring for geo-political reasons
➢ Converting lowest cost molecules to high value products by leveraging technology developments – especially revolutionary ones
➢ Integrating physically, upstream and downstream
➢ Decreasing Capital Intensity: through scale, simplicity and location

AND...

Important sustainability issues focused on carbon, water and plastics remain top priorities for the industry.
Questions