WHAT IS HAPPENING IN THE ETHYLENE, PROPYLENE AND BUTADIENE MARKETS?

By Jessie Waldheim and Amanda Hay
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US ETHYLENE: 2018 HEADLINES
- New capacity lengthens supply
- Rising ethane costs narrow cracker margins
- Consumption increases as downstream projects ramp up
- Economics, turnarounds curtail production
- Supply/demand become more balanced in late 2018
- Further capacity start-ups scheduled in early 2019

US ETHYLENE: 2018 PRICES
- Prices falling in Q1
  - Harvey recovery, slow downstream ramp-ups
- Low point in May
  - New crackers come on stream
- Price climb during Q3
  - Ethane cost increases, production curtailments, increasing consumption
- Less volatile in Q4
  - Ethane costs ease, supply/demand more balanced

US ETHERYINE: TRENDS IN 2019
- Supply
  - Several new crackers starting up in H1
  - New crackers and expansions planned for H2
- Demand
  - Several downstream units are planned with some cracker projects
  - Export terminal expected to come on line in late 2019
US ETHYLENE: ETHANE ADVANTAGE
- Ethane costs rose in 2018 due to increased demand
- Heavier feedstock costs declined in late 2018 with crude oil values
- Ethane costs may rise again with 2019 cracker start-ups
- Ethane is limited by logistics, which may keep ethane costs volatile through 2019

ETHANE VS NAPHTHA

US PROPYLENE: 2018 HEADLINES
- PDH outages, cracker turnarounds limit production
- New PDH unit starts up, but production remains volatile
- Cracker economics, narrow margins limit propylene production
- Demand remains good despite high prices in mid-2018
- Production improves in late 2018 as cracker economics improve, refinery rates increase

US PROPYLENE: 2018 PRICES
- Price spike in January
  - Multiple propylene dehydrogenation (PDH) plant outages
- Low point in Q2
  - PDH plants start-up, demand fall-off
- High prices from June-October
  - Lower production from crackers, PDH production volatile
- Falling prices in late 2018
  - High refinery rates, increased production from crackers, good production output from PDH units

US PROPYLENE: TRENDS IN 2019
- Supply
  - New crackers, low crude bolsters production from crackers
  - Refinery rates to remain strong
  - PDH production may remain volatile
- Demand
  - Improved production, more stable pricing may spur demand
  - Heavy turnaround season in Europe may draw US exports

ETHANE VS PROPAINE MARGINS

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US PROPYLENE: NO US ADVANTAGE
- Tight market made US the high-priced region in 2018
  - Increased ethane cracking
  - PDH plant outages

- US prices moderated as production improved in Q4
  - Increased usage of heavier cracker feedstocks
  - Strong refinery production rates

US BUTADIENE: 2018 HEADLINES
- Butadiene (BD) feedstock supply tight through Q3 on production issues, shift to lighter feedslates

- New purity ethane crackers limit crude C4 (CC4), increase ethane consumption amid limited fractionation ability

- Plummeting crude futures improve cracker economics, creating length

- Improved CC4 supply, decreased buying appetite, global declines brought balance

US ETHYLENE PRICE REPORT
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**US BUTADIENE: 2018 PRICES**

- Spike of 30 cents/lb in H1
  - Lighter feeds
  - CC4 supply tight, BD tight
  - Supported by high crude futures

- Steady summer, still elevated
  - CC4 remains snug
  - Production issues in Asia

- Falling prices in Q4
  - CC4 supply lengthens
  - Global declines
  - Plummeting crude futures
  - Decreased demand

**US BUTADIENE: TRENDS IN 2019**

- **Supply**
  - New crackers, lower crude bolsters production from crackers
  - Heavier cracking economics improve in near term
  - Despite shift to ethane-purity crackers, CC4 set to lengthen

- **Demand**
  - Improved production, more stable pricing may spur demand
  - Derivative capacity additions possible if US cost position, supply improves
  - Growth in solution-styrene butadiene rubber (S-SBR); flat to declining demand in emulsion-SBR (E-SBR)