Agenda

- Harvey
- Price Drivers: Oil & Gas
- Polyethylene
- Polypropylene
- ABS
- Polycarbonate
- Nylon
Impact of Hurricane Harvey

Harvey hits oil & gas
Harvey Resin Impact 9/5 to 9/15

US Capacity - Hurricane Harvey

- Mt/yr
- Current Capacity
- Updated Shutdowns
- Shutdowns

HD/LDPE
LDPE
LLDPE
PP
PS
ABS
PC
PVC
PA66
PA6
PET

US Capacity - Hurricane Harvey

- Mt/yr
- Current Capacity
- Updated Online
- Offline

HD/LDPE
LDPE
LLDPE
PP
PS
ABS
PC
PVC
PA66
PA6
PET
What Drives Pricing

- Real Time Feedstock Cost
- Supply/Operating Rates/Capacity
- Demand/Global Growth/Currency
- Perception of Glut or Shortage

Always one of these Four that in many cases is driven by an “Event”
Key Oil & Nat Gas Drivers

• Supply
  o US supply from shale growing again after glut
  o More cost-efficient production from shale
  o OPEC production reduction
  o Harvey Outages of supply offset by outages of demand

• Demand
  o Global demand growth manageable
  o Energy efficiency, fossil fuel alternatives
  o Increasing US exports

• Volatility
  o Enhanced by futures market, (2018 $50-60/bbl)
  o Will ultimately play by longer term fundamentals
  o Strength of US $, Fed Rate/Monetary Tightening/Tax Reform
Putting Oil in Perspective

CRUDE OIL & NATURAL GAS

- Brent Crude Oil ($/bbl)
- WTI Crude Oil ($/bbl)
- Nat Gas ($/Mbtu)
How Does Oil v Nat Gas Impact Resins

- **Nat gas/Ethane/Ethylene** provides low cost ethylene production for PE, but reduces output of propylene, butadiene & benzene for other resins.
- **Propylene** for PP, ABS, PC & some PA66 must now be made on-purpose.
- **Butadiene** for PA66, ABS & HIPS can come up short requiring imports or on-purpose production.
- **Benzene** for PC, PA6, PA66, & ABS can come up short requiring imports or on-purpose production.
- Global difference is use of **Oil/naphtha** overseas produces less ethylene but more of everything else.
- **Supply and demand** as they relate to imports and exports on top of domestic demand is key.
• 65% of the polyethylene produced globally is from the oil by-product naphtha.

• 2015 through 2017 YTD North America’s average cost to produce and deliver PE pellet was $0.30/lb. Middle East cost is similar.

• The 2015 and 2016 YTD naphtha pellets average cost to produce and deliver is a near $0.45/lb. Oil establishes the global price floor.

• 20% of North America’s production was exported 2015 -2017 YTD to balance inventories.

• Harvey will firm prices higher for the remainder of the year in a tight market as production & logistics recover.
• For every $10.00/bbl. oil move, PE moves $.04-.05/lb. in North America.

• Exports: The naphtha pellet cost also sets the export price. Export pricing is based on the naphtha cost. Historically $.07-.10/lb. less the NA price.

• North American suppliers sell NA processors PE $.07-.10/lb. above the naphtha pellet price regardless of the low cost to produce in NA.

• The delta prevents finished product imports and allows continuous exporting to keep inventories balanced.

• The increase and decreases of oil drive the cost to produce a PE pellet from naphtha unless there is an “Event”.

• Harvey is an Event disconnecting PE from it’s oil relationship for the remainder of the year.
Polyethylene 2018 Outlook

• At least 10 billion pounds or 20% increase in PE capacity is announced through 2020.
  o 3 new plants H2 2017 (H1 2018??) for a total of 1.5B lbs.  Start-ups delayed by Harvey.
  o Polyethylene demand is expected to increase a maximum 5% a year through 2020.

• North America suppliers must compete globally to export and balance inventory.
  o 65% of the exports are to LA/Mexico which is challenged by new Braskem production

• THE QUESTION: How will North America suppliers respond to Harvey & eventual domestic over-supply having to compete with other regions?

• Harvey will drive prices up by $0.07 - 0.12/lb
• Most of that come back out by Q2 2018 to be followed by further downward pressure from oversupply offset by higher oil, putting pricing at the end of 2018 even with Q2.
• Improving monomer supply with Enterprise
  o Enterprise =1.6 Billion pounds Q4??
  o Additional domestic Propylene at least 3 years away
  o Globally substantial expansions planned

• Oil/heavy feed impact
  o Moving to light feeds removes significant propylene supply
  o Dynamics of supply & demand on propane and butane

• Export Impact
  o PGP is increasingly exportable

• New domestic PP capacity 2-3 years out
  o Incremental increases from capacity utilization & other derivatives

• Not out of the woods yet.
Propylene
• NA Producers had to be competitive to the world
  o Import resin proved to be desirable to NA processors in 2016
  o NA resin producers lost significant margin
• Debottleneck 600 million pounds plus over the past 2 years
  o Helped to keep resin inventories balanced
• No Major outages till Harvey
  o No margin expansion since early 2016
  o PGP movement since then
  o Exports grew for first time in several years
  o That is changing with Harvey due to significant production loss
Polypropylene 2018

- Harvey impact: Lost production in 2017
- Steady growth 2-3%+ annually
- Producers will try to recapture margin lost in 2016
  - NA producers will have to price to global markets
  - Margin expansion has a limit
- Global oil pricing & impact
  - 2018 oil forecasted $50-$60 bbl
- No new domestic capacity till 2019 at earliest
  - Import resin will be required at times to balance market demand
ABS 2017

• ABS demand continues strong globally
  o Spike in feeds drove prices higher early in the year
  o Recent maintenance, higher Asian feedstock & demand helped domestic producers retain margin as feeds fell in Q2.
  o Asian imports are a key factor in US market.

• Asian demand is meeting supply
  o Asian demand expansion is absorbing excess capacity
  o Supply has seen outages in feedstocks & resin
  o Asian prices at higher levels
Benzene Outlook in 2018

Benzene Price Forecast

Projected:
ABS 2018 Outlook

• ABS pricing expected to move to higher levels in Q4 following Harvey driven feedstocks with some margin growth.

• Some retraction will follow in 2018 as Asian competition is re-established at lower levels along with feedstocks.

• Oil expected to average closer to $55 than $50 in 2018 supporting higher feedstock prices.

• ABS is unlikely to return to 2016 levels unless growth rates slow considerably.
Polycarbonate 2017

• PC has seen strong demand with significant supply issues
  o Strong auto along with improving construction and GDP.
  o Sabic ERP implementation
  o Burkeville FM
  o Harvey impact on feedstocks & Baytown plant

• Feedstock spike in Q1 led to PC increases in Q2

• Lower feedstocks in Q2 did not translate to lower PC prices due to a tight market despite increasing imports.

• Feedstock declines are partially reversed by Harvey raising the specter of increases as tight market continues.
Polycarbonate Raw Material Cost

PC Raw Material Cost Movement

- Benzene
- Propylene
- PC
Polycarbonate 2018 Outlook

- PC Supplies to Improve
  - Operating rates will regain higher levels
  - Demand continuing strong at moderately reduced growth rates
  - Inventory building and production stabilization important.
- Expect select market share competition
- Imports will continue to grow as a competitive forces, subject to expansion and US$
- Some feedstock relief expected in 2018, but not to 2016 levels with producers efforts to maximize margin frustrated in more competitive segments
- Focus on specialties continues.
• Since 2016, PA 6 producers have enhanced margins.
• Late Q1 2017 feedstock prices declined, but PA 6 prices increased $0.07/lb-$0.10/lb.
• Q1 2017, RMC (*raw material cost*) were plus $0.10/lb, PA prices were plus 2-3X depending on segment.
• PA 6 producers rode the escalating feedstock wave to higher prices; however, when feedstock prices significantly declined, PA 6 producers redirected to demand related issues.
Late 2016/early 2017, Asian CPL (caprolactam) margins had become so depressed, they were below cost, prompting producers to reduce rates or shutdown units.

- CPL supplies became very tight, while demand began to increase.
  - CPL spot prices spiked up ~$1000/mt to reach ~$2300/t.
- NA CPL prices during the same time period topped the $2300/t.

NA Capacity is retracting; ROW is expanding. As more capacity comes online, CPL prices should see less volatility.
BASF announced a FM due to Harvey.
Pricing is expected higher into Q4 in a range of $0.05-$0.10/lb, but could be higher if the BASF FM is protracted.
As PA6 demand remains strong, producers will disregard the feedstock price declines.
Import competition has the potential to leverage prices lower but will likely see limited impact in 2018.
Food and medical packaging markets continue to thrive while the automotive benefits from light-weighting.
PA 66 2017

- Nylon 66 tight under strong demand.
- Dow merges with Dupont
- Radici buys out Invista engineered resins
- Auto key driver followed by construction growth
- Market is tight globally despite some expansions in Asia
- Harvey has disrupted several key feedstocks leading to FM announcements
- Expected to sustain a tight market into 2018
- Pricing increase nomination for $0.10/lb in Q4 in tight market.
PA 66 2018 Outlook

- PA66 will continue to see strong demand along with auto and GDP
  - Light weighting and temperature performance key
  - PA6 will offer competitive offsets in compounds
- Outages from Harvey moves prices higher
  - Feedstocks will pull back by Q2
  - PA66 increases will be contested in 2018 contracts pending speed of recovery in supply & every quarter thereafter.
  - Easing of demand and increasing imports likely to play a role in H2 2018.
  - Pricing is expected to reverse some of Q4 increases by mid-year with further declines tied to feedstock and demand.
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