Polyethylene Update

Plastic News Financial Summit
Mike Burns, VP of Polyethylene Markets
Mike Burns has over 26 years in the plastics industry. Before joining RTi in February 2002, he spent more than 12 years at H. Muehlstein and Company, Inc., 3 years as the Extrusion Polyethylene Product Manager in U.S. and Canada, as well as over 9 years’ experience in buying and selling Polyethylene, Propylene, Polystyrene, and recycled materials.

Mike manages over 6 billion pounds of Polyethylene transactions for over 40 RTi clients. His global information network and pricing benchmarks has provided clients with a competitive advantage, saving millions dollars for his clients over the last 14 years at RTi.

Mike is considered by many one of the foremost experts in the Polyethylene resin markets. He is invited to speak regularly about PE market trends and is regularly quoted in industry magazine such as Plastics News and Plastics Technology.
RTi Overview

- RTi is a technical consulting firm that provides clients with strategic solutions to support direct resin purchases and paper packaging products.
- RTi does not sell or buy resins.
- RTi’s focus is on achieving best in class pricing using our 17 years in business knowledge and 10 billion pounds of pricing benchmarks.
- RTi initiates proven short and long term resin strategies to achieve the best price and keep the best price during volatility.
- RTi delivers the best real-time polyethylene market information to keep you ahead of your supplier and your competition.
Today’s Discussion

- Drivers: The Pieces to the “Puzzle”
- PE Fundamentals
- Oil and Naphtha
- Plastic film markets influence
- Polyethylene cost models
- Naphtha impact on North American prices
- Market Review, Update and 2016 Outlook
RTi Market Drivers: The Pieces of the Puzzle!

- **Supply** and **Demand**
- **Crude Oil / Naphtha**
- **International Market**
- **Exports**
  - Secondary Market
  - Supplier Actions
  - Pricing Benchmarks
  - Producer Operating Rates / Inventory
- **Feedstocks** – Natural Gas, Ethylene and Ethane
The Missing Piece of the Puzzle

- Unplanned or extended outages
- Weather - hurricanes, floods, and freezes
- Export “dumps”
- Global events
- OPEC production levels
PE Basics

- 65% of the polyethylene produced globally is from the oil by-product naphtha.

- 2015 and 2016 YTD North America's average cost to produce and deliver PE pellet was $0.30/lb. The 2015 and 2016 YTD naphtha pellets average cost to produce and deliver is a near $0.45/lb.

- 20% of North America’s production was exported 2015 and 2016.

- YTD 20.4% of production has been exported.

- Presently North American suppliers must export over 20% of the production to balance inventories.

- At least 10 billion pounds or 20% increase in capacity is announced through 2020.

- Polyethylene demand is expected to increase a maximum 5% a year through 2020.
Oil and Naptha

- **Naphtha** is an intermediate hydrocarbon liquid stream derived from the refining of crude oil.

- The feedstock naphtha has a close 10:1 ratio with oil; it moves very close the oil movements.

- Every $2.00/bbl. change in oil prices equals approximately $0.01/lb. in the cost to make a pellet from naphtha. Every $10.00/bbl. oil move is parallels to $0.04-$0.05/lb. change in North America.

- The increase and decreases of oil directly affect the cost to produce a PE pellet from naphtha.
The Plastic Bag Market Influence

- Nearly 40% of the polyethylene resins sold is used for film applications; retail bags, garbage bags, food packaging, construction, medical supplies, etc.
- Cost to produce a retail bag, grocery bag or can liner in China/Southeast Asia and deliver to a North American city is $0.25/lb. over their cost of resin.
- The cost to produce a retail bag, grocery bag or can liner in North America and deliver to North American city is also $0.25/lb. over the cost of NA resin.
- North America suppliers need to keep film production in North America.
- **When the price delta exceeds 10%, retailers buy from China/SEA.**
NA Integrated: Supplier Cost Model

- Cost to produce ethylene formula
  
  Ethane $0.26/gl. x .43 = $0.11

- Cost to produce polyethylene formula
  
  Ethylene Cost $0.11  
  Conversion $0.12  
  Freight $0.03+  
  BRC Delivered pellet $0.26 - $0.30/lb.

Middle East costs are very similar to North America
SEA Resin Cost Model

- Cost to produce ethylene formula
  
  Naphtha $500 + $250 = $750/MT or $0.34/lbs.

- Cost to produce polyethylene formula
  
<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Ethylene Cost</td>
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<tr>
<td>Conversion</td>
<td>$0.12</td>
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<tr>
<td>Freight/Bag</td>
<td>$0.04</td>
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<tr>
<td>Delivered pellet</td>
<td>$0.50/lb</td>
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Oil establishes the Global selling Floor!
Naphtha’s Impact on the Global Price

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

• North American suppliers sell NA processors PE $.07-$1.0/lb. above the naphtha pellet price regardless of the low cost to produce in North America.

• The delta prevents finished product imports and allows continuous exporting to keep inventories balanced and destroying NA demand.
PE is Over Supplied Globally

- North America suppliers must compete globally to export and maintain a balanced inventory. 65% of the export is to Latin America/Mexico which will soon be challenged by the new Braskem production.

- North America PE suppliers maintain a very good price discipline with very high margins, over $0.30/lb. in 2015, 2016, and 2017. SEA and China suppliers have historically sold just above zero margins or below margin.

- THE QUESTION: How will the low cost North America suppliers respond to the over supply having to compete with other over supplied regions?
# PE Inventory

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<tr>
<th></th>
<th>HDPE</th>
<th></th>
<th></th>
<th>LDPE</th>
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<td>Apr</td>
<td>Mar-Chg</td>
<td>3-Yr Avg</td>
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<td>Days of Inventory</td>
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<td>5.8</td>
<td>28.4</td>
<td>47.9</td>
<td>4.9</td>
<td>41.4</td>
<td>38.8</td>
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<td>Demand Rate</td>
<td>78%</td>
<td>-7%</td>
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<td>-4%</td>
<td>90%</td>
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<td>Operating Rate</td>
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<td>Exports</td>
<td>24%</td>
<td>7%</td>
<td>20%</td>
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<td>7%</td>
<td>23%</td>
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<td>4%</td>
<td>22%</td>
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PE Inventory Cumulative Draws/Gains

Source: ACC/RTI
PE Exports as a Percent of Production
PE Exports by Region

Plastics News
FINANCIAL SUMMIT
PE Market Update

- May prices declined $.03 lbs.
- Chinese bag manufactures are soliciting distributors in North America for new finished bag orders; mostly t-shirt bags and can liners. The current price delta will allow this aggressive action to proceed.
- Resin suppliers will have to respond to imported finished good prices to maintain inventories.
- New lower export prices are not being accepted, resulting in a very inactive export market.
- With the exception of one month, over the past ten years the price of PE has not declined in July or August. There are no factors that have driven this trend, only speculation due to the lack of summer activity.
• **Asia**: Prices steadied this week. Buyers continue to be cautious of demand and are only committing to local inventories. Prices for commodity resins are near $0.50/lb.

• **Latin America**: May export prices are down $0.03/lb. from April. Exports prices are consistently below $0.50/lb.

• **Europe**: Contract ethylene is expected to fall as much as $0.02/lb. in June. Buyers have been maintaining lower inventories with the potential for further price decreases.
Feedstocks Notes

- **Ethylene:** The market continues to hold up near $0.30/lb. with mostly heavy buying activity from very few suppliers. New PE start-ups could keep prices at this level until ethylene production starts in the fall.

- **Naphtha:** Prices continue to track with oil and are near $500/mt as oil prices moved slightly higher in late May.
RTi PE Outlook

Suggested Action Strategies

- **30 Days:** Higher inventories and good production will apply additional potential downward price pressure in June and July. Buy as needed and aggressively in the secondary markets. Delay purchases as long as possible.

- **60/90 Days:** It is reasonable to expect $0.03/lb. price erosion in the next 60-90 days.
2017 Forecast

- The RTi naphtha resin cost model illustrates that every $10/bbl. price movement above or below $50/bbl. will increase or decrease the PE price $0.04-$0.05/lb.
Crude Oil and PE Price Moves

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<td>$80</td>
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$/bbl

$/lb