Processing Today’s Crudes

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How MPC is Positioned

- Stand alone company since 6/2012
- Refining and Transportation Network Concentrated in Mid-Continent
- 7 Refineries from Michigan to Texas
- Able to process wide crude slate, with light end processing capability
- Access to Shale Crude/Condensate (Bakken, Eagle-Ford, Utica)
- Access to Canadian Bitumen
## MPC Refinery System

<table>
<thead>
<tr>
<th>Published Capacity (MBCD)</th>
<th></th>
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<tbody>
<tr>
<td>Canton</td>
<td>80</td>
</tr>
<tr>
<td>Catlettsburg</td>
<td>242</td>
</tr>
<tr>
<td>Detroit</td>
<td>123</td>
</tr>
<tr>
<td>Galveston Bay</td>
<td>451</td>
</tr>
<tr>
<td>Garyville</td>
<td>522</td>
</tr>
<tr>
<td>Robinson</td>
<td>212</td>
</tr>
<tr>
<td>Texas City</td>
<td>84</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,714</strong></td>
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</tbody>
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- MPC is 3\textsuperscript{rd} largest US refiner
  - VLO (1,904 MBCD)
  - XOM (1,856 MBCD)
  - P66 (1,590 MBCD)
- Garyville
  - 3\textsuperscript{rd} largest in US
  - 12\textsuperscript{th} largest in World
- Galveston Bay
  - 5\textsuperscript{th} largest in US
  - 17\textsuperscript{th} largest in World
Positioning for Today’s Opportunity

- Detroit Heavy Oil Upgrade Project
  - Completed in 2012, providing ability to process higher concentration of Canadian Crude.

- Commissioning Condensate Splitters for 60,000 bpd of Utica Condensate at Canton/Catlettsburg.

- De-bottlenecking Robinson for additional light crude capacity.

- 65% Light Crude throughput in 2013
  - Canton, Catlettsburg, Texas City can process 100%
  - Robinson 100% in 2016
  - Galveston Bay Refinery (2013 purchase) eliminated Foreign Sweet Crude, replaced with Domestic Sweet and Canadian Crudes
Today’s Crude? (Opportunity)

- Shale Crudes
  - Low Sulfur / Low TAN
  - High Paraffin
  - Variable Quality
  - H2S Scavengers
  - Phosphorous
  - Drilling Mud

- Heavy Canadian
  - High solids content
  - High Asphaltenes
  - High Sulfur / High TAN
Opportunity Crudes
Problems Experienced

- **Shale Oil**
  - **Low Sulfur / Low TAN**
    - Sulfur is very low, concern that naphthenic acid attack can still occur. Specific issues noted in resid circuits.
  - **High Paraffin**
    - Heavy Wax fouling in Raw Crude circuits
    - Heavy Paraffins contribute to hot preheat fouling?
  - **Variable Quality**
    - Gravity range noted 30-60 deg
  - **H2S Scavenger Usage**
    - Amine Salt Formation in Crude OH
  - **Phosphorous Fouling**
    - Noted in foulants sampled throughout Crude Unit.
      - Fracing fluid / Scale inhibitor?
  - **Barium Sulfate Fouling**
Opportunity Crudes
Problems Experienced (cont.)

- Heavy Crude
  - High Sulfur / High TAN
  - High Solids loading
  - Low Gravity / High Viscosity

- Combined
  - Asphaltene Destabilization
    - Preheat fouling
  - Rapid emulsion builds
Summary

- Today’s Crude is what brings an economic opportunity – Today
- Position refineries for the future while processing Today’s crudes
- Recognize that Opportunity Crudes bring other Opportunities
- Strong Support of and Participation in Technical Associations is important