The Crude Oil Quality Shift and Expected Future Market Response

Platts N. American Refined Product Conference
May 18th-19th

David K. Bellman

dkb@allenergyconsulting.com

www.allenergyconsulting.com

614-356-0484
About AEC

Changing Landscape – Humbling Times

Refining Economics

Potential Market Responses and Ramifications
  • Humbling Outlook

OMA
About AEC
About All Energy Consulting

- Founded by David K. Bellman with almost 20 years of energy market analysis experience.
- Recognized and published energy analyst covering the front pages of USA Today to other media outlets.
- Developed refinery and power models used worldwide.
- Recently working with Hedge Funds and Utilities in understanding and quantifying market risk relative to the futures market.
Mission at AEC

✓ Quantifying risk to empower effective decision making.

✓ Going beyond information – creating a collaborative knowledge transfer.

✓ Adding insights to energy markets today and for years to come for your success.
Changing Landscape – Humbling Times
Peak oil theorists were mistaken in their timing.

Production did not come from the expected locations.

- PADD 2 and PADD 3 ex gulf in 2000 represented <40% of production in 2000 – now represents over 60% of total US production.
Historically the crude oil feedstock into US refinery was expected to get heavier and sour.

- Many US refineries invested in conversion capacity increasing cost and complexity.
- Shale had a large impact stopping and reversing the trend of heavier and sour crudes.
• Condensate competition is global.
• Pushed out imports flowed elsewhere.
• Not only did refiners miscalculate the lightening of feedstock, but the trends for product demand.
• Distillate products have a premium over gasoline.
Ethane is currently the clear winner for petrochemical.

However much demand is coming with new ethane feed crackers.

Export of ethane began Feb 2014 at 24kbpd now over 70 kbpd.

Rejection levels are estimated as high as 500kbpd.
Pressure is building for Naphtha to find a home.
Refining Economics Changes
3-2-1 Crack Spread

- Crack spreads on absolute terms look to be soaring till recent.
- However measured based on percent on feedstock cost it has been relatively range bounded.
The drive for conversion capacity on an absolute basis is apparent.

However when compared to the feedstock cost the drive becomes much smaller.
Refining Condensate

- Condensate yields do not bode well in the current US refinery environment.
- Quality variations lead to more discounting requirements.
- US refineries built on the expectations of heavier crude oil and gasoline production.
- Condensate yields will produce more gasoline and potentially Naphtha than distillate.
- Crude oil markets know this and eventually parity will occur between the product valuations.
- Exporting will not likely solve condensate discounts.

Crude valuations come from AEC Oil Market Analysis (OMA) Platform

Confidential: No portion of this presentation may be reproduced, reused or otherwise distributed in any form without prior written consent.

All Energy Consulting

Adding insights to energy markets for your success.
Market Responses
Where will all the Condensate go?

- The two major paths are for export and building condensate splitters.
- Splitters will shift the discount from condensate to Naphtha

- Export
  - Competition
  - Shipping Cost

- Refinery
  - Adaption or Build

- Petro-Chemical
  - Potential Direct Feed
Where will all the Naphtha go?

- Naphtha is used to make gasoline or can be directed to the petrochemical industry to make Polyethylene.
- World PE plants use Naphtha while US PE plants use ethane.
- Ethane is also under pricing pressure due to shale.

Naphtha

- Export
  - Diluent
  - Petrochemical
  - Shipping Cost
- Refinery
  - Feedstock
- Petro-Chemical
  - US current ethane based

CONFIDENTIAL
No portion of this presentation may be reproduced, reused or otherwise distributed in any form without prior written consent.

All Energy Consulting
Adding insights to energy markets for your success.
Where will all the Ethane go?

- Petrochemical
- Power?
- Shipping Cost

- Large move to dispose of ethane with large PE plants proposed and pipelines being developed to move ethane to Gulf.

- Potential to lose ethane discount?
Production gains are coming.

Current rejection levels are very high due to economics and logistic constraints. Some of this will go away.

Many projects announced. High demand represents 100% announced online with low case representing 75%.

High export case contains power generation option for Caribbean and S. America island markets. 625+ kbpd potential if 100% of market generation converted to ethane. High case assumes 20%.
Ethane as a Power Plant Fuel

- The bridge fuel for LNG?
- Ethylene carriers are designed to carry most liquefied gas cargoes, including ethane, but do not have enough refrigerated on board to transport LNG.
- Storage of ethane will need to be underground in salt caverns or mined rock caverns, or above ground in fully refrigerated tanks. Same tanks similar to storing LNG.
- Ethane can be transported by rail or truck in specially designed cryogenic units similar to those used for LNG.
- The infrastructure built for ethane can easily be converted to LNG once a customer or country’s volume grows to LNG-scale economies.
- Still relatively capital intensive for islands – but in the long run more economic sense than burning oil.
Humbling Outlook

- If we realize what we know now and what we perceive the market to be can be misleading and has shown a propensity of change, we must humble ourselves to think outside the box.

- Large condensate production and the change in refinery yield and market responses likely lead to change in Naphtha markets.
  - Diluent demand could falter along with larger seasonal gasoline demand pattern which would result in volatile Naphtha prices in the year. Discounts in winter.

- Ethane production is likely to rise 500-1000 kbd over the next decade (include potential supply from ethane rejection) and market responses likely lead to change in ethane markets.
  - Ethane demand could increase significantly as the ability and use of exporting ethane become more used and accessible.
  - Ethane cracker expansion could cause greater competition among the participants.
  - Seasonal volatility in natural gas will occur more often as natural gas is used more in the power sector. Ethane rejection variability – winter time issue.

- Ethane and Naphtha spreads will be much narrower over time and potentially see seasonal flipping in value. Flexibility brings opportunities.
Multiple uses depending on client needs and desire.
Calibration

- Models have been optimized to current market performance.
- Validated by being able to reproduce 2014 results.
- 2014 crude slate includes: LLS, Mars, WTI, Eagle Ford, Olmeca, Maya, Arab Medium.

<table>
<thead>
<tr>
<th></th>
<th>EIA Actual</th>
<th>AEC OMA Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gasoline (41)</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>Diesel (32)</td>
<td>34</td>
<td></td>
</tr>
<tr>
<td>Kero/Jet (9)</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>LPG (5)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Resid (3)</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

**USGC 12 Month Yields**

<table>
<thead>
<tr>
<th></th>
<th>EIA Actual</th>
<th>AEC OMA Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>API</td>
<td>30.2</td>
<td>30.5</td>
</tr>
<tr>
<td>%S</td>
<td>1.66</td>
<td>1.67</td>
</tr>
</tbody>
</table>

**Crude Input 2014**
OMA Platform

- Enables superior customization
  - Yields to Product Price Inputs
- Easy intuitive drop downs enable on the fly graphing and calculations
- Designed to run daily
- Customized Daily to Weekly Reports
- Alerts
- Screening tools