Sulphur & Petroleum Coke Markets
More important than you might think!

Calgary | September 13-16, 2010
OUTLINE

1. How is refinery/upgrader reliability linked to byproduct markets?
2. Market size & sectors
3. The byproduct dilemma – inelasticity defined
4. How does the market balance?
5. Future market trends
6. Financial contribution of sulphur/petcoke to the refinery
7. The value of reliability
MARSULEX: WE KNOW SULPHUR & PETCOKE!

Provides a wide range of services to a very prestigious customer base across North America, including:

- Petcoke cutting and handling services
- Spent acid regeneration
- Acid gas and sour water/ammonia processing/sulphur recovery
- Molten sulphur forming
- Flue-gas desulphurization integrated with Ammonium Sulphate fertilizer

www.marsulex.com
TSX symbol: MLX
REFINERY RELIABILITY CHAIN

Within the Refinery Fence
- Engineering design
- Safe operations
- Operating excellence
- Preventative maintenance
- Reliability

External Factors
- By-product logistics
- By-product marketing
BITUMEN AND SYNTHETIC CRUDE COMPOSITION

Bitumen
- 20% Distillate
- 30% Gas Oil
- 50% Resid
- 9.5° API
- 4.7% Sulphur

Upgrading
(per million barrels of SCO produced)

Synthetic Crude (SCO)
- 20% Naptha
- 50% Distillate
- 30% Gas Oil
- 33° API
- 0.13% Sulphur

Sulphur
- 6,000-7,000 tonnes

Petcoke
- 55,000-60,000 tonnes
## SULPHUR & PETCOKE FROM CANADIAN BITUMEN
### 10 Year Growth Trend

<table>
<thead>
<tr>
<th></th>
<th>2010</th>
<th>2020</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bitumen (bbls/day)</strong></td>
<td>1.5MM</td>
<td>2.9MM</td>
</tr>
<tr>
<td><strong>Sulphur (tonnes/yr)</strong></td>
<td>3.6MM</td>
<td>7.0MM</td>
</tr>
<tr>
<td><strong>Petcoke (tonnes/yr)</strong></td>
<td>31.8MM</td>
<td>61.5MM</td>
</tr>
</tbody>
</table>
Where does most of this sulphur go today?

- **Elemental Sulphur**: Gas: 31%
- **Sulphuric Acid**: Smelters: 27%
- **Oil Sands**: 3%
- **Oil**: 30%
- **Other (Mined)**
GLOBAL SULPHURIC ACID CONSUMPTION
2009 World Sulphuric Acid Supply & Demand

Total demand: 191,368 (Thousand tonnes H₂SO₄)

- Industrial: 27.5%
- Phosphoric Acid: 49.1%
- Uranium: 1.7%
- Nickel: 1.3%
- Copper: 5.2%
- SSP: 7.9%
- Ammonium Sulphate: 7.3%
SULPHUR – INELASTICITY DEFINED
Sulphur Spot Price Comparison

$ Per Tonne FOB BUK

200 400 600 800

2006 2007 2008

FOB Vancouver
WORLD SULPHUR BALANCE
(million tonnes)

Source: FRC
US SULPHUR BALANCE
(million tonnes)
Total Market Size: 95MM tonnes/year
PETROLEUM COKE MARKETS – FUEL GRADE

Typical Pet coke End Users

**North America, Japan, Europe**
- 5-10% blends in conventional coal fired power plants
- Cement Plants that burn coal
- Power plants with CFBB *
- Power Plants with IGCC **

**China, India, rest of developing world where air regulations are less stringent**
- Anywhere coal is burned

* Circulating Fluidized Bed Boiler
** Integrated Gasifier with Combine Cycle
Delivered petcoke price must be less than delivered coal price on a per BTU basis
DELIVERED PRICES COMPARISON
Petroleum Coke vs. Steam Coal

Japan - >2%S vs. Aussie Coal
PETROLEUM COKE
Balancing the Market

- Not quite as tricky as Sulphur given that the fuel grade coal substitute market is very large

- Trend to watch for is the intersection between increasing tighter SO₂ regulations by governments with industries’ ability to meet these regulations with higher sulphur content fuel sources
COKING IS PRIMARY HEAVY OIL CONVERSION PROCESS TO PRODUCE DISTILLATE PRODUCTS

USA Refining Capacity (millions barrels/day)

<table>
<thead>
<tr>
<th>Process</th>
<th>Capacity (millions barrels/day)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>CDU</td>
<td>17.4</td>
<td></td>
</tr>
<tr>
<td>Coking</td>
<td>2.8 (16%)</td>
<td>34%</td>
</tr>
<tr>
<td>FCC</td>
<td>5.9 (34%)</td>
<td></td>
</tr>
<tr>
<td>Hydrocrk</td>
<td>1.5 (9%)</td>
<td></td>
</tr>
</tbody>
</table>

- FCC technology geared to gasoline production—typical units are 20-30 years old
- Cokers and hydrocrackers are principal paths to maximize diesel/distillate production
- Typical coker units are less than 10 years old
- 50 MM TPY of petcoke produced in USA (~100 lbs per barrel)

Source: Cambridge Energy Research Associates
PETROLEUM COKING CAPACITY WORLDWIDE
Million Metric Tons (WET) Per Year

9-10% CAGR
## ECONOMICS OF HEAVY OIL/ COKING USA REFINERY

<table>
<thead>
<tr>
<th>ASSUMPTIONS/INPUTS</th>
<th>CONVENTIONAL - 150,000 bpd</th>
<th>HEAVY OIL - 150,000 bpd</th>
</tr>
</thead>
<tbody>
<tr>
<td>API crude feed</td>
<td>29.9°</td>
<td>18.5°</td>
</tr>
<tr>
<td>Total net energy</td>
<td>483 MMBTU/bbl</td>
<td>399 MMBTU/bbl</td>
</tr>
<tr>
<td>On-purpose H2</td>
<td>45 MMSCFD</td>
<td>100 MMSCFD</td>
</tr>
</tbody>
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## YIELDS

<table>
<thead>
<tr>
<th></th>
<th>CONVENTIONAL - 150,000 bpd</th>
<th>HEAVY OIL - 150,000 bpd</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vacuum bottoms</td>
<td>18 vol%</td>
<td>45 vol%</td>
</tr>
<tr>
<td>Volume % distillate/diesel</td>
<td>26.8 vol%</td>
<td>34.7 vol%</td>
</tr>
<tr>
<td>Gasoline</td>
<td>52.3 vol%</td>
<td>37.9 vol%</td>
</tr>
<tr>
<td>Sulphur (@$30/MT)</td>
<td>120 MTPD</td>
<td>340 MTPD</td>
</tr>
<tr>
<td>Petcoke (@$50/ST)</td>
<td>1227 STPD</td>
<td>3135 STPD</td>
</tr>
</tbody>
</table>

## ECONOMICS

<table>
<thead>
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<th>CONVENTIONAL - 150,000 bpd</th>
<th>HEAVY OIL - 150,000 bpd</th>
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</thead>
<tbody>
<tr>
<td>Crude</td>
<td>$75/bbl</td>
<td>$60/bbl</td>
</tr>
<tr>
<td>$ Gasoline/diesel</td>
<td>$2.15 gasoline/$2.55 diesel</td>
<td>$2.15 gasoline/$2.55 diesel</td>
</tr>
<tr>
<td>Combined coke/sulphur revenues</td>
<td>$70 MM/yr</td>
<td>$200 MM/yr</td>
</tr>
<tr>
<td>Profit before tax</td>
<td>$825 MM/yr</td>
<td>$1,425 MM/yr</td>
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