Synthetic Crude Logistics in the Enbridge System

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System Highlights (Nominal)
Canada and United States Liquids System

- Enbridge Pipelines Inc. / Enbridge Energy Partners, L.P.
  - Complete system right-of-way 4,500 miles
  - 9,500 miles of pipeline
  - 180 pump stations
  - 561 pumping units - all electric
  - 34.5 million barrels of line fill
  - 25 million barrels of tankage in 163 tanks
## Commodities Pumped on the Enbridge System

<table>
<thead>
<tr>
<th>Natural Gas Liquids</th>
<th>Refined Products</th>
<th>Crudes</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGL</td>
<td>Various Grades of Gasoline</td>
<td>Light</td>
</tr>
<tr>
<td>ABS (Sarnia Butane)</td>
<td>Various Grades of Distillate</td>
<td>Medium</td>
</tr>
<tr>
<td></td>
<td>Aviation Fuel</td>
<td>Heavy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Condensate</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Synthetic</td>
</tr>
</tbody>
</table>

(2) (21) (47)

Total of 70 different types
## Commodity Classifications

<table>
<thead>
<tr>
<th>Viscosity (mm²/s)</th>
<th>Density (kg/m³)</th>
<th>Classification</th>
<th>Tariff Surcharge</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 - 350</td>
<td>904 - 940</td>
<td>Heavy</td>
<td>Plus 22%</td>
</tr>
<tr>
<td>20 - 99</td>
<td>876 - 903</td>
<td>Medium</td>
<td>Plus 8%</td>
</tr>
<tr>
<td>2 - 19</td>
<td>800 - 875</td>
<td>Light</td>
<td></td>
</tr>
<tr>
<td>0.4 - 1</td>
<td>600 - 799</td>
<td>Prod. &amp; Cond.</td>
<td>Less 8%</td>
</tr>
<tr>
<td>To 0.3</td>
<td>to 599</td>
<td>NGL</td>
<td>Less 10%</td>
</tr>
</tbody>
</table>

(mm²/s) = square millimeters per second  
(kg/m³) = kilograms per cubic meter
Forecast 2003

- Raw Bitumen
- Athabasca Synthetic
- Conventional Heavy
- Pentane plus
- Conventional Light

(000 BPD)

Pipeline System Configuration

Line 1
- NGL
- Refined Products
- Synthetics

Line 2
- Heavy Crudes

Line 3
- Light Crudes
- Medium Crudes
- Synthetics
- Condensates

Line 4
- Heavy Crudes
- NGL
- Light Crudes

Line 5
- Heavy Crudes
- Synthetics
- Condensates

Line 6
- Heavy Crudes
- Light Crudes
- Medium Crudes

Line 7
- Synthetic
- Condensate

Line 8
- Light Crudes

Line 9
- Light Crudes
- Medium Crudes
- Heavy Crudes

Line 10
- Condensate
- Synthetic

Line 11
- Synthetics

Other lines:
- Line 12: Light Crudes
- Line 13: Synthetic
- Line 14: Heavy Crudes, Medium Crudes, Light Crudes, Synthetics
- Line 15: Light Crudes
- Line 16: Light Crudes, Medium Crudes, Synthetics
- Line 17: Heavy Crudes
- Line 18: Light Crudes
- Line 19: Light Crudes
- Line 20: Light Crudes
Pipelining Synthetics 1

- Fully Hydrotreated bottomless (SSB, OSA, OSC, HSB, NSA, PAS)
  - Standalone batches
  - Line 1 (NGL buffers)
  - Line 13 re-injections at Clearbrook into Line 3
  - Window selection judicious
  - Line 3
  - Line 5 (light/medium) to Marysville and Ontario
  - Line 6 (light/med/heavy) Chicago and south destinations
Pipelining Synthetics 2

- **Fully Hydrotreated Heavy Crudes - bottomless**
  - Suncor OSH - high TAN forces follow up flush batch
  - Albian Heavy Synthetic (AHS) travels as ‘conventional heavy’

- **Partially Hydrotreated crudes - cracked stock**
  - Travel with buffers destined for same facility
  - Approximately 6500m³ buffer on each side
  - Segregation required at breakout locations
Pipelining Synthetics 3

- **Synbits**
  - High Tan (MKH) require flush batch for same facility
  - Others travel as ‘conventional heavy’

- **Dilsynbit**
  - new commodity type just received
Pipelining Synthetics

- New flavors/destinations require innovative thinking

- Challenges Continue..................