“Life is a Batch” – Supply and Quality Challenges on the KMC Pipelines

CCQTA / COQA Meeting June 19, 2012
Presentation Outline

• KM and KMC Overview
• Express / Platte, Trans Mountain, and Puget Sound Description
• Batch Sequencing
• Throughput Ratios
• Challenges
  – Capacity
  – Segregation
  – Quality
• Solutions
  – Batch Sizing and Staging
  – Buffers and Transmix
  – Common Streaming
  – Merchant Storage
  – Firm Service Agreements
  – Expansion
• Summary
FACT SHEET

- Kinder Morgan is the largest midstream and the fourth largest energy company in North America.
- We own an interest in or operate approximately 75,000 miles of pipelines and 180 terminals.
- Largest natural gas transporter and storage operator in the U.S. with more than 62,000 miles of pipelines.
- We are also the largest provider of contracted natural gas treating services and also the largest storage operator.
- Largest independent transporter of petroleum products in the U.S.
- Largest transporter of carbon dioxide (CO2) in the U.S.
- We are also the second largest oil producer in Texas.
- Largest independent Terminal owner/operator in the U.S.
- Only oilsands pipeline serving the West Coast in Canada.
Largest midstream energy company & fourth largest energy company in North America
About Kinder Morgan Canada (KMC)

• KMC operates a number of pipeline systems and terminal facilities in Canada including:
  – Trans Mountain Pipeline
  – Puget Sound Pipeline
  – Westridge Marine Terminal (Port of Vancouver)
  – North 40 Terminal (Edmonton, AB)
  – Express & Platte Pipeline
  – Trans Mountain Jet Fuel
  – Vancouver Wharves
  – Cochin Pipeline
Kinder Morgan Canada

- Operator of 4 Pipeline Systems
- Trans Mountain is sole Pipeline from Alberta to West Coast
- Puget Sound Pipeline receives volumes off TMPL mainline for deliveries to Washington State
- Express is largest line to PADD IV
- Platte serves large PADD II market
## System Capacities and Throughputs

<table>
<thead>
<tr>
<th>Pipeline</th>
<th>Capacity</th>
<th>Throughput</th>
<th>Apportionment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trans Mountain</td>
<td>300,000</td>
<td>Maximum</td>
<td>70%</td>
</tr>
<tr>
<td>Puget Sound</td>
<td>180,000</td>
<td>137,000</td>
<td>0</td>
</tr>
<tr>
<td>Express</td>
<td>280,000</td>
<td>205,000</td>
<td>0</td>
</tr>
<tr>
<td>Platte</td>
<td>163,000</td>
<td>Maximum</td>
<td>80%*</td>
</tr>
</tbody>
</table>
Express - Platte

- The Express system consists of two crude oil pipelines – the Express pipeline and the Platte pipeline. This 2700-km (1,700-mile) integrated oil transportation network connects Canadian and U.S. producers to refineries in the Rocky Mountain and Midwest regions of the United States.

- **Express Pipeline System**
  In operation since 1997, the Express pipeline receives a variety of light, medium and heavy crude oil produced in western Canada at Hardisty, Alberta, a rapidly growing Canadian oil hub, and delivers them to markets in Montana, Wyoming, Utah and Colorado. The Express pipeline interconnects with the Platte pipeline system at Casper, Wyo.

- **Platte Pipeline System**
  In operation since 1952, the Platte system transports crude oil from Casper, Wyo., to Wood River, Ill. While entirely located in the United States, the system is operated by Kinder Morgan Canada.
TMPL System Map
Trans Mountain Pipeline

- Only pipeline system in North America that transports both Crude Oil and Refined Products
- Custom blending for refineries
- Services Terminals and Refineries in central British Columbia, Vancouver, and Washington State (via Puget Sound Pipeline)
- Services other markets via Westridge Marine Terminal (California, US Gulf Coast and Asia)
- Only pipeline from the Oilsands to the West Coast of Canada
- In operation since 1953
Puget Sound
This pipeline system connects with Trans Mountain’s mainline system at Sumas, British Columbia on the International Boundary. It delivers Canadian crude oil to refineries in Ferndale and Anacortes on the West Coast of Washington State.

System Facts:
- In operation since 1956
- Ships light and heavy Canadian crude oil to various Washington State refineries
- Length: 105 km (65 miles)
- Size: 406 - 508 mm (16 to 20-inches)
- Capacity 180,000 b/d
Express Batch Pipeline System

Light Sweet / Synthetic Crude

Medium Crude

Heavy Crude

Light Sweet / Synthetic Crude
Express Commodities (2011)

- Light: 73%
- Medium: 24%
- Heavy: 3%
Ex Casper Injections (2011)

- 92% Canadian Crude
- 13% Canadian Heavy
- 8% Canadian Light
- 79% US Domestic Medium
Ex Guernsey Injections (2011)

47% Canadian Crude

43%

38%

10%

9%

- Canadian Heavy
- Canadian Light
- Domestic Heavy
- Domestic Light
TMPL Commodity Throughput (2011-12)
## Commodities vs. Critical Staging Tanks

<table>
<thead>
<tr>
<th>Pipeline</th>
<th>Tanks</th>
<th>Commodities</th>
<th>Pending</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trans Mountain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Edmonton)</td>
<td>19</td>
<td>72 approved - 37 routine</td>
<td>6</td>
</tr>
<tr>
<td>Puget Sound</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Sumas)</td>
<td>6</td>
<td>Blends assigned to Refineries</td>
<td></td>
</tr>
<tr>
<td>Express</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Hardisty)</td>
<td>6</td>
<td>33 approved - 25 routine</td>
<td>5</td>
</tr>
<tr>
<td>Platte</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Casper)</td>
<td>12</td>
<td>37 approved - 18 routine</td>
<td></td>
</tr>
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</table>
Challenges

- System capacity
- Segregation requirements
- Quality degradation
Making It Work

• Batch sizing and staging
• Buffers and transmix
• Common Streaming
• Merchant Storage
• Firm Service Agreements
• Expansion
Batch Sizing and Staging

• Batch sizes limited to tank capacity
  – Do not have the ability to receive directly due to rate differentials
    a) TMPL mainline into Puget Sound
    b) Enbridge into Express at Hardisty
    c) Express into Platte at Casper
• Segregation by material grade – optimal for tank utilization rates
• First in / First out - batches landing are pumped out in the order received
• Enforcement of hold time policy
Buffers and Transmix Management

- Maximize batch volumes
- Increase flowrates / Reynold’s Number i.e. better to have turbulent flow vs. laminar
- Adjacent products should have good miscibility (mix well)
- Optimize batch line-up for compatibility
- Use buffers where appropriate
Buffers and Transmix Management

• Buffers should be small, compatible with adjacent batches, generally of a low viscosity
• Buffers are placed between two products to protect at least one of the products from degradation
• Ideally sized to avoid mixing of the two adjacent materials
• Issues with buffers include:
  – Difficult to find a good economic “universal donor”
  – Require their own storage and injection facilities at each staging location
  – May require segregation or special handling at destination location
Common Streaming

- By combining commodities with similar properties and value, we can reduce tank requirements
- May require some Equalization
- Examples:
  - MSW
  - Light Synthetics
Merchant Storage

- Tank shortages can be mitigated through the use of Merchant Storage
- Tanks are not Regulated
- Can be contracted for long term requirements
- Allow flexibility ie. Can direct volumes to various destinations or hold for more favourable market conditions
Merchant Storage

- Edmonton North 40 Terminal (9 tanks – 2,125 kbbls) in service 2008
  - Connected to Trans Mountain, Enbridge, and Suncor Edmonton Refinery
- Edmonton Trans Mountain (9 tanks – 3,400 kbbls) in service 2013
  - Connected to Trans Mountain, Enbridge, Shell Scotford Refinery
Trans Mountain Edmonton Tank Farm

North 40 Terminal (Merchant Storage)

TMPL Regulated Storage
Firm Service Agreements

- Express Pipeline volumes are under long term contracts and guarantee space
- Platte Pipeline is a common carrier
- Trans Mountain is a hybrid - common carrier on mainline, Westridge Dock is Firm Service to a limit of 50 kbbl/day
- TMX – new pipeline adjacent to Trans Mountain will be Firm Service Agreement
Trans Mountain Expansion (TMX)

- Firm commitments from Expansion Open Season completed May 2012
- New tolls reflect scope, expansion costs & throughputs
- Anticipate expansion in-service late 2017

**Existing**
- 2006 225,000 bpd
- TMPSE+ **75,000** complete (‘08) 300,000 bpd

**Next**
- TMX **+450,000**
- 750,000 bpd (2017)
Tankers in Vancouver

- Today: Aframax tanker capacity, 650,000 bbls
- Future: Suezmax tanker capacity, 1,000,000 bbls, savings $1.50/bbl
- Port Metro Vancouver supportive of Suezmax capability
- New Nav. Aids
- New Training for Vessel Pilots and Tug Captains
- Supporting BCIT Testing and simulation
- 2nd narrows channel dredging
## Summary

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<th>Solution</th>
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<td>Segregation</td>
<td>Batch Staging, Common Streaming, Merchant Storage</td>
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<td>Quality</td>
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Conclusion

• When it comes to the transportation of petroleum we face many challenges
• Through a suite of strategies we can overcome many of these obstacles
• In the pipeline “Life is a Batch”, but together we can make it better!