Crude Oil-by-Rail
Presentation for COQA

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Company Overview

- 2,500 employees
- >75% possess technical degrees
- 520 Technical Diplomas
- 756 Bachelor Degrees
- 192 Masters Degrees
- 30 PhDs

50 Locations
18 Laboratories
12 Outsourced Laboratories
12 Service Centers

Receiving and Processing:
- 2,300,000+ samples/yr
- 41,000,000+ results/yr
Serving our core markets

Energy

Environment

Food

Pharma, DNA, & Forensic Testing
Maxxam: Delivering Analytical Services and Solutions

Energy

- Oil and gas analysis
- Fuels testing
- Field sampling mgmt
- Source & ambient test
- Mobile laboratory
- Tailings characterization
- Pilot plant analysis
- Laboratory outsourcing
- Core analysis
- Education & training
- R & D

Environment

- Soil and Groundwater Testing
- Contaminated sites analysis
- Environmental forensics
- Analytical services for EIA and regulatory monitoring
- Ecotoxicology & ARD
- Ultra trace contaminant analysis (Air/HRMS)

Food

- Microbiology
- Food-borne illness investigations
- Shelf life testing
- Food chemistry
- Nutritional labeling
- Residue testing

Pharma, DNA, & Forensic Testing

- Forensic DNA testing
- Only outsourced lab for RCMP forensics
- Other Forensic Testing
- Animal DNA based parentage verification
- Paternity and immigration DNA testing
- Equine doping control
- Expert Witness Testifying

#1 in Canada in all the markets we serve

June 5, 2014
maxxam.ca
A member of the Bureau Veritas Group of companies

- 61,400 employees
- 140 countries
- 400,000 clients
- 1,330 offices and labs
- 8 global businesses
Maxxam Analytics joins Bureau Veritas Group of Companies

- January 2014 – Maxxam Analytics formally joined Bureau Veritas
  - Global leader in testing, inspection & certification (founded in 1828)
  - Operations in Canada & United States
    - ACME Labs (geochemical and assaying lab)
    - OTI Canada (Inspection and Testing)
    - Inspectorate Americas (Inspection and Testing)
- Strong alignment on company values: integrity, ethics, data quality, impartial counsel, customer focus and safety!
Canadian Crude-By-Rail Overview

Rail Loading Terminals in Western Canada

Operating Distribution Centers
Under Development
Future Development
Canadian Crude-By-Rail Overview

- Majority of the current transloading facilities are Manifest load locations
  - Most are truck to rail, some pipe/tank to rail
- Number of current Unit Train facilities in development for operation in the next 6 months (USDG Hardisty, Torq Tranloading Kerrobert) or operational (Canexus Bruderheim)
Canadian Crude-By-Rail Overview

- Lots of Options for Canadian crude-by-rail commodities:
  - Light Sweet Crude (Bakken, MSW, MGL etc.)
  - Light Sour Crude (PLS, LSB etc.)
  - Heavy Sour (SH, LLB, LLK etc.)
  - Oilsands derived bitumen
    - Synbit
    - Dilbit (15 - 25% diluent)
    - Railbit (7 - 14% diluent)
    - Neat Bit (0 - <5% diluent)
Regulatory Framework: Transport Canada
– Protective Direction 31

- Protective Direction 31 release by Transport Canada – October 17, 2014
- Focus is on Crude Oil transported by Rail
  - The requirement is focused on rail transportation but includes road transport for Transportation of Dangerous Goods (TDG)
- Requirements for TDG testing and Safety Data Sheet (MSDS) requirements
  - States Classification 3 Packing Group 1 for all crude oil unless supported by safety data sheet
  - Infers new/updated safety data sheets (MSDS) required for products after July 7, 2013
Transport Canada – Crude Oil Classification Recommendations

- Transport Canada released on January 31, 2014 recommendations for Crude Oil Testing and Classification through a Canadian Association of Petroleum Producers (CAPP) Working Group

### Analytical Parameters – TDG/MSDS

<table>
<thead>
<tr>
<th>Parameter for UN 1267</th>
<th>Procedure</th>
<th>TDG</th>
<th>Recommended for MSDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Boiling Point</td>
<td>D86</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Flashpoint</td>
<td>D93M/D56/D3828</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Viscosity</td>
<td>D7042</td>
<td>Required</td>
<td>Recommended</td>
</tr>
<tr>
<td>Physical State</td>
<td>Visual</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Appearance/Odor</td>
<td>Visual</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Simulated Distillation</td>
<td>D7169</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Light Ends</td>
<td>$C_{10}^-$ by GC</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Density</td>
<td>D5002</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>D6377</td>
<td>Required</td>
<td></td>
</tr>
<tr>
<td>H$_2$S (liquid phase)</td>
<td>D5623</td>
<td>Required</td>
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</tr>
<tr>
<td>Pour Point</td>
<td>D5853</td>
<td>Recommended</td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:** Majority of these parameters can be impacted by sampling due to light end component loss through sampling, container selection and subsampling.
Crude-by-Rail Challenges – Representative Sampling

- **Sample** - a portion extracted from a total volume that may or may not contain the constituents in the same proportions that are present in that total volume.

- **Sampling** - the steps required to obtain a sample for analysis that is representative of the contents of any pipe, tank, or other vessel.

- Crude oils are usually nonhomogeneous - concentration of entrained water is higher near the bottom of the vessel (ie. trucks).

- Sample point availability on rail cars are not consistent if present at all.
Important Considerations During Sampling for Crude-By-Rail

- Prevent the loss of any constituents (i.e. light ends)
- Do not add or contaminate the sample during sampling process
- Store the sample container in a cool, dry place
- Avoid exposure to direct sunlight
- Label the samples and deliver in the containers in which they were collected
- Adjust sampling frequency to match the anticipated variability in the data (truck loading vs. pipeline or tank connected locations)
Crude-By-Rail Challenges – Sample Handling

- **Representative samples** of crude oils are required for the determination of parameters used for establishing standard volumes, prices, and compliance with regulatory specifications.

- Tank car sampling requirement - Sample the product after the car is loaded or just before unloading:
  - example: Envirobox or at custody transfer meter.

- Care and effort are required to maintain compositional integrity of samples from collection to testing:
  - including sample transfer from container to analytical apparatus.

- **Recommended sample containers:**
  - 2 - 300 or 500 cc HP Cylinders
  - 2 - 1 liter metal cans & 1 – 1 liter plastic bottles
**Areas of Challenges**

- Coordination and organization of sampling events to coincide with loading events
- Sample coordination is extremely dynamic
- Sampling – location and sample container selections
  
  - Sample point identification and definition of suitable sample points for consistency from each loading locations (i.e. EnviroBox – mid flow)
  
  - Need to match the sample container to the analytical parameter for sample integrity through entire process (sampling to instrument)
  
  - Need to match the sample technique to sample container
Field Services Locations – Deployment to Sampling Locations

Maxxam deployment locations:
Grande Prairie, Edmonton, Fort McMurray, Red Deer, Stettler, Medicine Hat and Estevan
Crude Oil-By-Rail Program Management

- **Keys to Success**
  - Strong Dedicated Program Management Approach
  - Continuous communications
    - Daily, weekly and monthly
    - Logistics coordination with loading events and the rail terminals
  - Flexibility
    - Ability to mobilize quickly to sites
  - Monitoring and Review
    - Quality Cross checks for data evaluation
    - Quarterly Program Review and Oversight

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Conclusions

- Canadian Crude-by-Rail industry is rapidly growing
- Lots of opportunities and options for commodity types
  - Manifest vs. Unit Trains
  - Light Sweet to Heavy Sour and Syn/Dil/Neat Bitumen
- Regulatory framework is currently in development through Transport Canada/CAPP
Thank you
Questions & Discussion

COQA Presentation

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