



March 2006

## **Oilsands Bitumen Processability Project**

The National Center for Upgrading Technology (NCUT) is sponsoring a project focusing on understanding of the role and impact of quality on oilsands bitumen processability.

Targeted streams for this investigation include raw bitumen as well as pipelined commercial products such as dilbit, synbit and possibly neat synthetics.

Initially, quality issues for investigation will not be limited and may include issues associated with:

- Salts and solids removal from undiluted bitumen
- Metals and contaminant estimation/measurement in upgrader feed
- Synthetic and diluent quality concerns
- Product storage, segregation and commingling during transport
- Refinery desalting, hydroprocessing, waste water treatment, process fouling, and refined product quality concerns

This work should be of interest to producers, pipeliners and refiners. The goal is to establish a multi-sector technical group capable of representing all segments of bitumen processing (cradle to grave).

The project group is scheduled to meet for the first time in late early April 2006 to review a list of quality issues, identify key/common areas for follow up and develop a work plan for the remainder of the year. Project scope and deliverables will also be discussed and established during upcoming meetings.

If you are interested in participating, please contact one of individuals listed at the end of this document.

Regards,

Andre Lemieux  
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Project Coordinators



## **Quality Issues For Bitumen**

Raw bitumen contains over 50% pitch. This heavy fraction, traditionally earmarked for asphalt production, will now be used as upgrader feedstock. Contaminants like salt, solids, metals and asphaltenes, will accumulate in the heavier fractions and may lead to downstream processing problems.

As an example, refiners attempt to remove salts and solids from feedstock using desalters. For most refiners, their equipment was designed to operate on lighter crudes. In the past, pushing these units from light crude to heavy has been a challenge. Treating oil sands bitumen increases that challenge and a number of concerns have been raised around the ability to clean and process diluted bitumen.

Salt and solids content in raw bitumen can vary from 100 to 1000 ppm. The final content in commercial bitumen will vary significantly depending on the processes and diluents used to produce the transported commodity.

On average, a refinery processing 100Kbbls/day of crude receives over 5 tons/day of salts and solids. Management of this material in the refinery is critical since downstream impacts include;

- corrosion of distillation equipment
- fouling of process equipment
- increased demands on waste disposal facilities
- limiting of crude throughputs in response to brine quality issues
- reduction of catalyst life
- affecting product quality
- restricting feedstock options

At this point in time, S&W and density are the key “quality” variables for the producing community. These specs are dictated by pipelines and exist for reasons of custody transfer. They are not quality specs and are of limited use to refiners.

Unfortunately there is a lot of room within the S&W spec to increase the solids content of crude. The minimum measurement (0.05%) represents 500 ppm or 17K pounds/day of solids for the 100Kbbls/day refiner. At this point in time there is no specification or limit on salt content in bitumen.

While there are legislative controls for waste management options in the production area, there are essentially no controls for waste transport in pipelines. Furthermore, waste management options in the production



industry are seriously handicapped by unfavorable economics (free or even crude value when injected into the pipeline vs. the cost of waste disposal). Hence the perspective that “as crude prices increase, crude quality decreases” becomes well founded.

A coordinated effort to quantify the full impact of salts, filterable solids, metals, commercial additives, nitrogen, sulfur types and other potential contaminants in oil sand bitumen would be beneficial to all sectors.

### **Challenges To Obtaining Quality Data**

As a rule, refiners do not readily discuss plant operational issues with competitors. Therefore, studies on the impact of crude oil contamination within refineries have been limited to high profile issues like organic chlorides and phosphorus where multi-plant incidents have been clearly identified and industry based initiatives have led to some recognition of the problem. Many “quality issues” are deemed to be site specific and are not well accepted by the production industry.

Presently there are limited volumes of diluted bitumen being delivered to US refiners and the material tends to be run as a blended feedstock to the crude unit. Processing problems attributable to Canadian bitumen tend to be anecdotal in the absence of sufficient experience to establish good “cause and effect” correlations.

This problem is further compounded by the limitations of existing test methods. Most crude oil test methods were originally developed for light crudes and over the years have been applied to heavier feedstocks without a proper understanding of matrix effects. The prospect of now using these same methods to test bitumen is of great concern. The Canadian Crude Quality Technical Association (CCQTA) is presently funding a project entitled “Heavy Oil Manual”, spearheaded by the Alberta Research Council. This project is intended to identify test method limitations in heavy oils and provide recommendations to the industry on method improvement.

Finally, attempts by producers to obtain quality estimates on future production by testing pre-production core samples is also problematic. While this practice is common place for all new leases, the challenges of getting a good representation of contaminant levels in extracted oil samples is seriously underestimated.



## **Incentive To Work Together**

For the refining industry, environmental pressures will continue to be at the forefront. Factors such as restrictions on local waste management options, compliance with ULSD and low sulfur gasoline requirements, and government pressures to achieve green house gas reductions, provide increasing challenges to refiners. When combined with operational issues like increased run lengths, maintaining catalyst life cycles (eg. ULSD), and the prospects of heavier feed, the need to provide direction to the production industry on contaminants and problematic materials in crude is critical.

For the production industry many companies face the challenge of upgrading their own production or that of others. Potential quality issues have surfaced and are being addressed on a “one of” basis. A coordinated activity involving all sectors could benefit producers by:

- providing a vehicle to pool resources
- providing a single point of contact for industry quality concerns
- vet testing protocols, work activities and results of “off site” quality initiatives, and
- ensuring that efforts to address site upgrader quality issues do not result in dilbit contamination and downstream refinery issues.

Last but not least, is the issue of marketing and transporting oilsands bitumen. In the absence of a good understanding of the technical issues of crude oil quality, there is a tendency to overreact and adopt stringent guidelines for product selection and segregation. This issue surfaced recently with Total Acid Number “TAN”, where concerns over processing crudes with TAN numbers greater than 1, lead to discussions of oilsands dil/synbit segregation from other heavy crude oils. This would have been a logistic nightmare for Enbridge and a serious economic hardship to Canadian Association of Petroleum Producers (CAPP). Both CCQTA and CAPP have ongoing projects addressing this issue.

The project’s first goal will be to bring the right people together to identify key quality issues and provide credible direction to industry initiatives. This is the mandate of associations such as the CCQTA and the US based Crude Oil Quality Group (COQG). The COQG recently established a Canadian Crude Oil Sub-Committee to keep abreast of Canadian crude quality issues and initiatives. While both groups have ongoing activities in the area of crude quality, it could be argued that their biggest success has been overcoming the traditional economic barriers to joint project work resulting in a willingness on the industry’s part to accept recommendations as credible.



## Project Goals

The main objectives for the project group will be to:

1. Create a technical resource to address anticipated and identified processability issues associated with producing and refining oilsands bitumen
2. Function as a technical support vehicle for all sectors of the industry
3. Establish a recognized group to address future quality issues

## Project Protocol

Following is an overview of how this project is expected to proceed:

1. Identify interested stakeholders and contacts within the refining and production sectors
2. Determine key/common quality issues for bitumen upgrading and refining
3. Agree on a list of key contaminants/issues
4. Establish a project scope and deliverables
5. Develop a sampling/testing protocol to confirm and quantify contaminants and impacts
6. Vet testing protocol, upgrade with more input
7. Complete testing, review results and provide recommendations

## Next Steps

Interested parties should communicate with contact personnel listed below. A preliminary meeting will be held in early April 2006 to review a list of quality issues and develop a work plan for the remainder of the year.

Project participants will be asked to supply a list of quality issues for review at the meeting. To facilitate technical discussions within this multi sector group, commercial issues should be avoided until the project group's operating framework has been established.

## Contacts

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