

# Opportunity Crudes Survey Questions for Refiners

Survey was conducted from October 2010-February 2011

For the purpose of this survey, unless otherwise stated, opportunity crudes are defined as those with a TAN of >0.5 mg KOH/g oil and/or an API of <26° and a sulfur content of >1 wt%. Examples include Grane, Maya, and Cold Lake Blend.

1. Have your refinery's plans concerning the use of opportunity crude changed in the past 2-3 years?

*Please select one*

- Yes, my refinery plans to process a **greater** percentage of opportunity crudes
- Yes, my refinery plans to process a **lower** percentage of opportunity crudes
- No significant change in plans {skip to question 3}
- Do not know {skip to question 3}

2. What has been the main factor(s) in the change of plans concerning opportunity crudes? *Please select all that apply*

- Carbon legislation
- Global economic recession
- Price discount of opportunity crudes
- Increase in renewable transportation fuel (e.g., ethanol, biodiesel)
- Crude accessibility or supply security
- Shift in demand (e.g., from gasoline to diesel due to increasing popularity of diesel cars and upcoming low-sulfur bunker fuel regulations)
- Other (please specify): \_\_\_\_\_

3. Would your refinery be more or less likely to process a greater amount of opportunity crude if the crude is more thoroughly upgraded upstream resulting in a decreased discount but an easier-to-process crude? *Please select one*

- More likely
- Less likely
- No impact
- Depends on the type/method of climate legislation implemented
- Do not know

4. What type(s) of opportunity or unconventional crude does your refinery process (or plan to refine in the near future)? *Please select all that apply*

- High-TAN crude (e.g., Grane)
- Heavy, sour crude (e.g., Maya)
- Synthetic crude oil (e.g., Syncrude Sweet Blend)
- Canadian DilBit (e.g., Cold Lake Blend)
- Canadian SynBit (e.g., Christina Lake Blend)
- Canadian SynDilBit (e.g., Western Canadian Select)
- Orinoco extra-heavy crude (e.g., Cerro Negro)
- Brazilian crude (e.g., Roncador)
- Other (please specify): \_\_\_\_\_
- None of the above; my refinery does not process opportunity crudes {skip to question 14}

5. What is your refinery's general approach to handling opportunity crudes? *Please select one*

- Blend opportunity crude with a better-quality crude to reduce overall TAN, sulfur content, etc. to stay within current limits
- Install a new process unit(s) to upgrade the crude
- Retrofit/adjust existing units to handle lower-quality crudes
- Other (please specify): \_\_\_\_\_

6. Approximately what percentage of your refinery's crude slate is made up of opportunity crudes? *Please select one*

- <5%
- 5-20%
- 21-35%
- 36-50%
- 51-65%
- >65%
- Do not know

7. Has your refinery performed (or planned to perform) any major equipment revamps to expand the ability to handle opportunity crudes? (For example, revamping the FCC to handle feeds with higher CCR content.) *Please select one*

- Yes
- No
- Do not know

8. Which of the following process units does your refinery currently have or plan to install in the near future? *Please select all that apply*

- Vacuum distillation unit
- Visbreaker
- Coker
- Deasphalter
- Gasifier
- Resid FCC
- Resid hydrotreater
- Resid hydrocracker
- None of the above

9. What are the primary issues/barriers to blending and processing more opportunity crudes at your refinery? *Please select all that apply*

- Accessibility of opportunity crudes
- Crude compatibility
- Corrosion problems
- Fouling issues
- Reduction in product yield
- Increase in coke make
- Increase in hydrogen consumption
- Increase in energy use/CO<sub>2</sub> emissions
- Variability of crude quality

10. If implemented, do you see any of the following greenhouse gas (GHG) regulation methods as significantly affecting your refinery's ability to process opportunity crudes? *Please select all that apply*

- Carbon cap-and-trade
- Carbon tax
- Low Carbon Fuel Standard (life cycle approach)
- Requirements to use Best Available Control Technology
- Other (please specify): \_\_\_\_\_
- I do not see GHG regulations affecting my refinery's decision to process opportunity crude

11. Which (if any) of the following strategies does your refinery employ to mitigate the increase in energy intensity and CO<sub>2</sub> emissions associated with processing opportunity crudes? *Please select all that apply*

- Carbon offsets (e.g., plant trees)
- CO<sub>2</sub> capture and sequestration (CCS)
- Cogeneration or polygeneration
- Computer-aided energy management system
- Coprocessing of biofeeds
- Emissions credit trading
- Energy benchmarking
- Renewable Energy Generation (to supplement conventional utility supply)
- Other (please specify): \_\_\_\_\_

12. If implemented, how will legislation that puts a price on carbon emissions (i.e., carbon cap-and-trade or carbon tax) affect your refinery's decisions when it comes to revamps and upgrades? *Please select one*

- Revamps/upgrades will favor **hydrogen addition** processes (e.g., hydrocracking)
- Revamps/upgrades will favor **carbon rejection** processes (e.g., coking, SDA, FCC)
- Other (please specify): \_\_\_\_\_
- Carbon legislation will not impact my refinery's revamp/upgrading decisions
- Do not know

13. If implemented, how will legislation that takes into account the life cycle emissions of fuels (i.e., Low Carbon Fuel Standard) affect your refinery's decisions when it comes to revamps and upgrades? *Please select one*

- Revamps/upgrades will favor **hydrogen addition** processes (e.g., hydrocracking)
- Revamps/upgrades will favor **carbon rejection** processes (e.g., coking, SDA, FCC)
- Other (please specify): \_\_\_\_\_
- Carbon legislation will not impact my refinery's revamp/upgrading decisions
- Do not know

14. If your refinery does **not** plan to process opportunity crudes, what is the main reason? *Please select one*

- Processing issues are a major concern (e.g., fouling, corrosion)
- Accessibility or reliability of opportunity crude sources is a problem
- Carbon legislation or environmental concerns
- Lack the capital to upgrade the refinery to handle opportunity crudes
- Not enough incentive to process opportunity crudes
- Company policy excludes use of opportunity crudes
- Other (please specify): \_\_\_\_\_
- Does not apply [my refinery processes opportunity crudes (or plans to)]