Purpose

Discuss the stumbling blocks to quickly implementing a quality program for crude arriving by railcar

This will include a review of
- The importance of a Crude Quality program
- The challenges to determining good crude quality parameters
- The challenges to implementing crude quality testing
Presentation Contents

- Handling Safety
- Economics/Plant Reliability
- Railcar Transportation
- Sampling Program

- Will see these areas liberally interspersed through the presentation
Questions

- My question: Rail cars are the same as historically shipping, i.e. crude in barrels. Why do we care now about quality? What's different?
Why Crude Quality Is An Important Topic: Handling Safely

- Used to ensure the safety of personnel and environment
  - Reduce/eliminate effects of H2S and other hazardous substances imbedded in crude
- Used to help in eliminating transportation impact
  - Do not fully understand impact of co-mingling in rail cars (i.e. wax, asphaltenes)
  - Inability to keep crude mixed and warm; requires thorough understanding of impact on offloading
Why Crude Quality Is An Important Topic: Economics/Reliability

- Used to determine most economic crude purchases
- Used for planning and scheduling models, yield forecasting and financial forecasting
- Used in determining net volume for mass balance
  - Water and sediment adjustments
- May be used for quality related contract adjustments
  - Am I getting what I am paying for?
- Used to ensure the continued reliability of the refinery
  - MOC process for new crudes
  - Reduce increased cost effects of incompatibility, impurities, contaminants, waste
Challenges to Determining Quality

**Crude**
- Number of source streams and types available increasing
- Not all crude streams/types are the same, even from same region (MSW) – See following picture slides

**Sampling**
- Not all samples collection methods or container types are the same.
- Not all test methods are the same.

**Transportation**
- Only minimal data available; challenges not always the same as pipeline.
Waxy Light Crude – Same Type
Non-waxy Light Crude – Same Type
Challenges to Determining Quality Parameters

- Co-mingling in rail cars
  - Some residuals in rail cars are not crude (agglomeration of asphaltenes/waxes?) – See picture
  - One car can have three crude types
  - Loading heavies into GP in summer; some light into C&I cars

- Contaminants in rail cars
  - Additives – impact on test results fully known?
    - Scavengers (for H2S)
    - Pour Point Suppressants – lower pour point

- Sample collection
  - Variable (technique, volumes and labeling)
  - Needs to be standard for important variables such as RVP

- Some data hard to obtain - All current tests not available for all crudes
  - Cloud point – wax determination
  - Pour point below 0°C
Sludge
Challenges of rail car crude handling to Quality

- **Residuals**
  - unknown substances in rail car heels
  - flushing residual to wrong tankage when changing rail car service

- **Stratification in rail cars**
  - not good for S&W tests
  - may have impact on API test

- **Contaminants**
  - Cars viewed as trash receptacles; see picture
  - H2S Requires scavenger
    - Mixing time/requirements not fully understood
    - Industry moving to not loading if high (levels >5ppm)
Garbage in crude oil
Sampling Program

- What can be done to overcome challenges?
  - Current and Planned Future Practice
  - Challenges to new practice
Railcars and Sampling

Current practice

- Sample at delivery point only of either single rail cars, multiple rail with common product or blended offloads.
- Source sampling program is almost non-existent.
  - Only do when issues arise or concerns have been raised.
  - Rely primarily on established and sometimes outdated assays to make purchase decisions
- Operations personnel collect samples.
- Lab analysis work is by third parties
- Reactive in dealing with crude issues in rail transportation
- Use multiple transloaders, some in remote locations. No real oversight because of distance/personnel needed. List changes monthly.
- Product is co-mingled crude in rail cars and co-mingle crude at offload.
Delivery point sampling: Disadvantages

- Samples are not from a homogeneous mixture
  - Rails cars after 5-7 days delivery time have begun layering; water and sediment on bottom; light products on top.
- Sample collection points, timing or methods are not consistent, skewing results.
- Sediment and water already offloaded before the sample is obtained.
- Too late in process to address any safety issues.
  - By the time the sample is obtained all the tanks car have been opened and crude delivery to tanks has begun
  - Sample analysis not completed until after the cars have left the site.
Potential Future Practice

- Stop sampling of rail cars at delivery point unless some issue/concern calls for it
- Sample all unit trains/manifests at load points (representative sampling and % of cars)
- Possibly stopping co-mingling crude in rail cars
- Partner with Mid Continent lab to provide sample gathering, analysis and data management services
- Three tiers of samples for three API ranges
  - Parameters for Continuous monitoring
  - Expanded parameters for limited analysis
  - Limited Crude Assay for Traders/MOC developers
  - (Potential 4th) Full plant assay
Load point sampling: Advantages

- Identify issues related to safety of personnel or specification while the rail car is in transit (before delivery). This will give time to plan action from the data.
- May be able to tie quality issue to a specific load/source. Offloading multiple crudes at one time will have no data impact.
- Sampling the rail car will provide better inputs to refinery mass balance.
Load point sampling: Issues to overcome

- Transloading locations and load times not stable; must have excellent communications between traders and lab.
- Adverse weather may impact ability for techs to get to site and obtain sample; must plan for obtaining backup data.
- Transloaders need to allow testing lab to collect samples.
Review

- There are good reasons for determining the quality of the crude being purchased.
- There are challenges to rail and the current quality sampling process/practices.
- These challenges, with new ones, can be overcome.
Questions?

- My question: Same as historically shipping, i.e. crude in barrels. Why do we care now about quality? What's different?

- I hope I have answered or begun to answer it.

- Other questions?