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# Quality Adds to Domestic Crude Variety

## Tighter pipeline specifications required.

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**Data Sources for This Publication**  
EIA  
CME Group  
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### Higher Delivery Costs

Several quality issues have surfaced in the shipping and terminaling of U.S. crude from wellhead to refinery as the volume and variety of domestic shipments have increased in the shale era. The growing need to export crude has introduced another dimension to the midstream quality challenge. This note looks at how midstream infrastructure operators are paying more attention and producers and shippers are facing higher costs to deliver better-quality crude to refiners.

### Russian Interference

Crude quality hit the headlines recently when contamination of the Russian Druzhba pipeline system threatened supplies to multiple European refineries for the next several months. That incident was apparently caused by the unplanned injection of high levels of organic chlorides into the Soviet-era pipeline system that delivers Urals crude. Quality has also been an issue in the United States, albeit on a lesser scale. Bloomberg reported in April on complaints from buyers that excess levels of hydrogen sulfide rendered several crude cargoes delivered from the federal Strategic Petroleum Reserve unusable.

### Day-to-Day

Aside from obvious contamination issues, day-to-day crude quality is always front of mind for refiners. In a November 2018 note ([Quality and Location Count for WTI Contracts](#)), we described how the joint operators of the 850 thousand barrel/day Seaway pipeline (Enterprise Products and Enbridge) from Cushing, Oklahoma, to Houston tightened quality specifications for benchmark West Texas Intermediate crude delivered to their terminals in Cushing. That tightening was done in conjunction with changes to the CME Nymex delivery specifications for light sweet crude futures delivery at Cushing that came into force for January 2019 deliveries onward. The changes were designed in part to address buyers' remorse for cargoes of domestic sweet crude blended at Cushing that contained unwanted metals. These crudes had been blended to an older, looser CME Nymex specification that only considered API gravity and sulfur content. Our analysis in that November note also covered specifications for two new Houston WTI contracts that are designed to improve quality to meet the needs of overseas buyers. In both those cases, the quality concerns focused on WTI crude delivered from the West Texas Permian Basin.

Attention to crude quality has recently focused on variations in output streams from shale basins.

**West Texas Light**

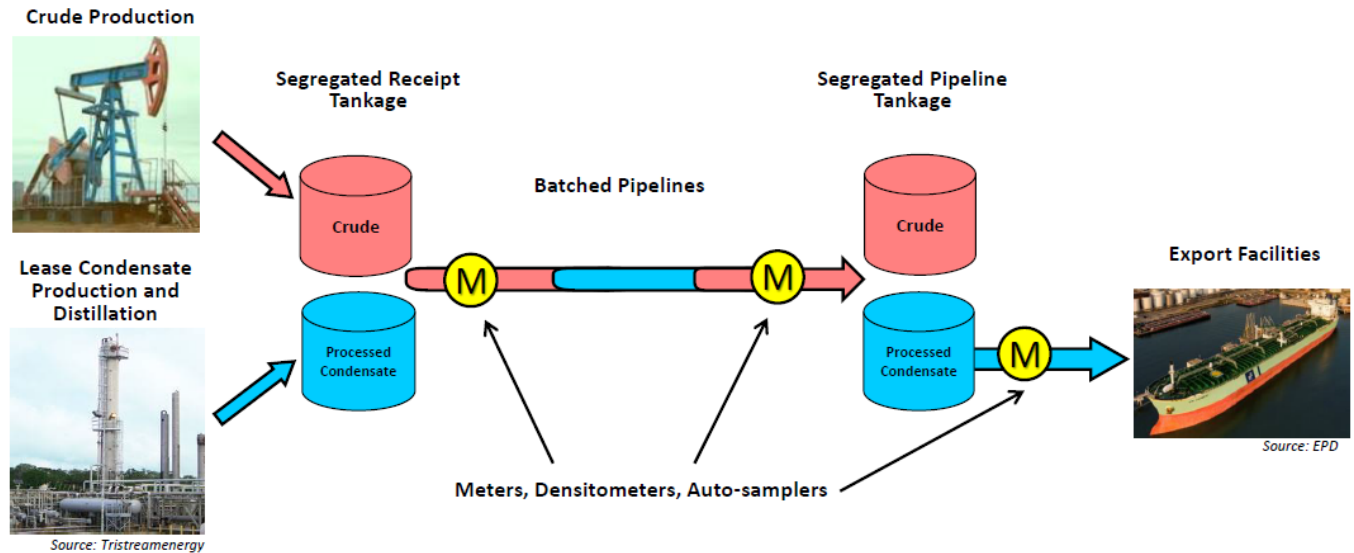
A prominent example is Permian WTI, which is normally required to meet a density specification of between 36 and 44 degrees API before acceptance onto long-haul pipelines out of the basin in West Texas. Production from the New Mexico Delaware sector of the Permian has a higher API gravity, meaning it is lighter than standard WTI. In the past, pipeline operators blended lighter crude with heavier output from the Midland basin to keep the common stream within spec. Volumes of lighter crude from the Delaware are now overwhelming that blending solution, with S&P Global reporting that up to 25% of crude production from the region is now lighter than the pipeline WTI specification. As a result, long-haul pipeline operators are now segregating lighter crude with a maximum 48 API gravity into a West Texas Light stream that is batched and shipped separately. Crude with API gravity over 50 is being shipped separately as West Texas condensate.

**Multiple Grades**

This isn't a new phenomenon for Permian pipelines, which have always accommodated different-quality streams by separating WTI from its heavier and higher-sulfur sister, West Texas sour crude. Condensate crude has also been separated out in the South Texas Eagle Ford basin from heavier grades since the early days of shale. The challenge comes in the logistics associated with shipping an increased number of streams out of a basin. Different crude qualities need separate, dedicated storage tanks at both the origin and the destination of the pipeline. That requirement increases shipper costs and can delay transportation waiting for specific grade batches to be shipped. There are also losses associated with crude at the front and back of each batch that gets mixed en route. Nevertheless, many existing and nearly all new pipelines are now handling multiple crude grades to address tighter quality requirements from buyers.

**Segregation**

If necessary, crude segregation can be customized down to individual batches from a specific customer tank at the pipeline origin to a designated tank at the destination — it's just costly. As an example, during 2014 and 2015, Enterprise demonstrated its capability to ship specific batches of processed condensate for export on its Eagle Ford crude pipeline from South Texas to Houston. The requirement arose before Congress lifted the crude export ban, when the Department of Commerce permitted the export of condensate that had been processed through a stabilizer to change its classification from crude to refined product. The processed condensate needed to be segregated all the way to market to satisfy U.S. Customs that it hadn't been mixed with unprocessed material. Exhibit 1 shows how Enterprise accomplished the segregation of condensate from regular crude on the same pipeline.

**Exhibit 1** Pipeline Segregation of Processed Condensate

Source: Enterprise Product Partners, November 2014 presentation.

Today's Permian crude segregation isn't typically as complex, since it's cheaper to batch crude from multiple shippers meeting a general quality specification such as WTI or WTL. That facilitates larger batches and allows crude to be comingled in tanks at the origin and destination. The downside is that shippers don't receive the exact crude they delivered to the pipeline, but their customers are assured a pipeline specified quality. Larger producers, such as Pioneer in the Permian, can aggregate crude batches and lease enough tankage to guarantee the integrity of their crude all the way to the export dock. Smaller producers are dependent on pipeline specifications to govern quality.

The alternative to batching crude to segregate quality on a pipeline is the common stream. This approach establishes a standard specification for incoming crude and then mixes everything together without batching. To reflect the reality that crude quality varies widely across a basin, this often results in a looser set of specifications to accommodate a broader range of material. Operated without further testing or measurement, a common stream system can be exploited by unprincipled or undisciplined players to inject poor-quality crude to the detriment of all. That's what happened in the Druzhba case. In the U.S. and in Western Canada, common stream systems are more likely to be operated with a quality bank, where producer inputs are tested and measured against the quality of the common stream. Shippers then pay a penalty or receive a credit based on whether the injected quality is below or above that of the common stream. The quality bank satisfies shippers that they didn't lose value but fails to create value for the receiving refiners.

**Producer Impact**

Although crude segregation helps the buyer to receive a quality crude, it doesn't always help the producer. In the case of WTL, sellers get a lower price because the market discounts lighter grades that are less attractive to refiners. Argus Media is (we believe) the only price-reporting agency currently making daily assessments of trading in WTL crude for delivery at Midland in the production region of the Permian. Since its reporting started at the end of March, it has assessed Midland WTL at an average discount to Midland WTI of \$1.68/barrel. That represents a loss that producers wouldn't previously have incurred if their lighter crude were blended into the more valuable WTI stream. Condensate values are even lower, although specific export markets have developed for these grades (see our September 2018 note, [U.S. Condensate to Replace Sanctioned Iranian Barrels?](#)).

**Refiner/Market Impact**

Delivering consistent crude quality presents logistic challenges to the midstream in pipelines and at terminals and docks. The big benefit of the added cost goes to refiners, which get a known entity delivered month after month. Winning that quality battle is a large part of developing U.S. crude export brands that are welcomed in international markets. As dock facilities are built out and larger volumes loaded, term buyers are needed to ship the growing U.S. production surplus. Those term buyers will be easier to attract and retain if they receive consistent quality. As the battle heats up to find markets for growing U.S. exports, quality is a critical element supporting prices in a competitive market. ■■

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