Question 12: Gasoline blending is becoming more difficult due to the increases in quality specifications; lower sulfur and benzene, for example. What changes are being made to blending facilities and operations to accommodate these changes? Please discuss tankage allocations, working inventories, online analyzer needs, procedural changes, in-line blending, etc.

MELDRUM (Phillips 66)

Blending has indeed become more difficult with the lower product specifications, but our blend methods have only experienced small evolutionary changes in response to the new specs. Most of the changes involved recertification of established methods to demonstrate compliance with the new standards. In some cases, additional analytical methods have been implemented to achieve the accuracy needed for the new, low specifications. Any revisions in tank allocation or inventory levels have been driven more by accounting principles than by product specifications.

I have some comments pertaining to the question about the online analyzers. The cost of the online IR (infrared)-type analyzer can be 1.5 to $2 million and requires attention for proper calibration. This attention depends upon the accuracy of the reference blends and knock engine performance (which is sensitive to temperature and humidity of the room where the engine is located), as well as being depend upon the existence of enough reference blends to bracket the use of an IR analyzer. The analyzer is very repeatable but only as accurate as the knock engine reference. IR methods are a secondary property of the sample, not a fundamental property. The justification of an online analyzer depends upon the blend system capability which would consider the surge capacity and holding time for possible re-blend corrections, if needed. Justification also depends on the accuracy of the system and what type of octane giveaways are being experienced in the blend method, whether it is a batch blend method or blending into a pipeline system.

There is less justification for online analyzers used in process unit control than for final certified blends. The accuracy of a process making a blend stock is less demanding when the blendstock is further processed in the blend system.

GROPP (GE Water & Process Technologies)

While gasoline blending is not a core GE competency, we do see our customers segregating tanks, increasing hydrotreating capacity, and updating in-line blending methods. We also seem to see more finished gasoline tanks that require chemical patches and blend-offs as the constraints on blending increase.

ADAMS (HollyFrontier Corporation)

We have not done much with analysis around online analyzers and online blending. Our big effort has been in managing the production of benzene in the refinery. The approach we have taken is to precut the naphtha so that we take all the benzene precursors and keep them out of the reformer. That material then goes to either an isomerization unit or a BenSat™ (benzene saturation) unit; or in some cases, it may go directly to gasoline blending. Where we have options at the refineries in the naphtha splitting schemes that we have employed, we have sometimes ended up with another component that might be a medium kind of naphtha that can go directly into gasoline blending which is segregated from the other components. That is the extent of what we have done with tanks and component management.

RONALD GROPP (GE Water & Process Technologies)

While gasoline blending is not a core GE competency, we do see our customers segregating tanks, increasing hydrotreating capacity, and utilizing in-line blending methods. We do seem to see more tanks requiring chemical additive patches or blend-offs as the blending constraints increase.

MARK ADAMS (HollyFrontier Corporation)

At HollyFrontier, our focus has been on reducing benzene in reformate and light straight-run gasoline. Pre-cutting reformer feed and isomerization of the light straight-run gasoline is the approach being taken at Tulsa and El Dorado. At Cheyenne, pre-cutting the reformer feed is all that is required.

At Artesia, the reformer feed is pre-cut, and the light straight-run gasoline goes through benzene saturation in a converted isomerization unit. At Woods Cross, the reformer feed is pre-cut, and as much light straight-run material as possible is charged to the isomerization unit; the remainder is charged to a BenSat™ unit.

Gasoline sulfur at HollyFrontier is about FCCU (fluid catalytic cracking unit) gasoline. Three HollyFrontier refineries manage sulfur by hydrotreating the FCCU feed, while the other two remove sulfur from the FCCU gasoline by post-treating. Pre-treating has yield advantages through the FCCU but may not be sufficient if blended gasoline sulfur is limited to 10 ppm by regulation.

PATRICK TRUESDALE (Emerson Process Management)

At Emerson Process Management, we are seeing that basically the flow controls of older systems no longer have the rangeability or turndown to accurately measure and control the flows in blending systems. Refiners are replacing outdated flow technology with superior technology to achieve the necessary accuracy and turndown. This is particularly important with the new RFS2 specs and increasing amounts of bio components that are required to be added to blends. In addition to improving flow measurement and control, refiners are updating their online analyzers with equipment that supports in-line blend certification. In addition, blending control and optimization strategies are also evolving to include crude blending, as well as biofuel blending.

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