Question 46: What is the panel's experience with in-line blending and in-line certification? What are the main differences between in-line blending and certification?

Greg Harbison (Marathon Petroleum)

For clarity, a common definition of “in-line blending” is required. Marathon defines in-line blending as a system that pumps multiple blend components from individual tanks, which are typically “live” (either receiving or capable of receiving components from a process unit or pipeline delivery) into a header. The header generally contains static mixing to ensure homogeneity of the blend. The header is lined up to a finished product, or “certification” tank. Often, property analyzers are used to adjust the blend recipe as the blend is being made. Some of the more common analyzers used are octane (engine or NIR), RVP, sulfur, and distillation. Computer control schemes can be configured to adjust the blend recipes, based on the analyzer readings and target values for given properties. Manual adjustments to the blend recipes can also be made by gasoline blending operators, if computer control is not available. It is common to have routine check samples sent to the refinery control laboratory to both verify the on-line analyzer results and also compare the blend results to the expected values from the blend recipes. The final tank blend is subsequently certified by the refinery control lab. Marathon has in-line blenders at many of our refineries.

In contrast, blending can be completed in a batch-wise manner (sometimes referred to as “splash”-blending), by pumping pre-determined volumes of individual components into a tank, and then circulating the entire tank prior to certification testing. On occasion, Marathon utilizes a variation of this approach when “re-blending” a tank to correct an off-spec result.

In-line certification occurs when blending analyzer results are used rather than laboratory results to characterize the finished product. This process presumes adequate mixing in the blend header, a homogenous blend in the tank, and applies the aggregate results of the blend (typically through an integrative computer control scheme) to the entire batch. Without in-line blending, in-line certification is not possible, although in-line blending is possible without in-line certification. To certify a blend in-line using an analyzer, a rigorous statistical comparison of in-line versus laboratory results is required to prove a strong correlation between results. Federal regulations (40 CFR) contain a list of which properties may be certified in-line and define the requirements for demonstrating compliance with applicable specifications. Road octane (AKI) is generally regulated by individual states, not by the federal EPA, and doesn’t fall under the jurisdiction of 40 CFR. The states typically have adopted some version of ASTM D4814 for octane testing. To in-line certify octane via analyzers, pipeline carriers / customers must approve the alternate test method, generally with the same burden-of-proof (strong correlation between analyzer and laboratory results) for the refineries. With any in-line certification process, a program to routinely verify analyzer results is necessary. Marathon has developed corporate guidelines for the use of on-line analyzers in certification testing.

In-line certification can be used on individual properties alone, which then requires laboratory testing for the remaining properties, or it can be used for all properties of the blend, potentially allowing “live”

exports from the blend header to a product pipeline. Several Marathon refineries in-line certify some properties of the finished blends. Marathon does not live blend to product pipelines.

In-line blending can have several advantages to batch-wise blending:

•As mentioned, if coupled with in-line certification for all properties, it provides the opportunity to blend directly to a pipeline, which in turn would reduce finished tankage requirements for the refinery. This can reduce a refinery's working capital load, by not having to carry as many tank bottoms levels.

•There is much tighter precision / less specification give-away on the blend properties, as the computer control schemes quickly and easily adjust the blend recipes in real-time.

•On-line analyzers used for in-line blending can help detect changes in component make-up / properties, via shifts in the aggregate properties of the blend, allowing for larger-scale recipe adjustments to correct for the changes.

•Blending and certification times can be reduced, as the blends are generally on-spec the first time, and do not require re-blends. There are, of course, some inherent risks associated with in-line blending and certification:

•When shipping "live," analyzer malfunctions / failures can result in releasing off-spec product.

•If not shipping "live," minor analyzer malfunctions / shifts may result in unexpected re-blending requirements. For example, in a batch blending operation, it is possible that sufficient "cushion" was built into the blend recipes to allow for changes in the component make-up. However, with analyzers automatically adjusting blend recipes to drive closer to a spec limit (e.g., RVP), it is possible that a blend which was thought to have finished on-spec actually comes back off-spec. Then, re-testing and/or re-blending may be necessary, which may result in shipment delays and additional cost.

John Clower (Chevron)

At the Richmond Refinery, we blend gasoline in-line from multiple component tanks to a finished product tank. The tail line, finished gasoline, product has multiple analyzers that are monitored by operations continuously.

F1 and F2 are monitored by engine analyzers and are certified by the state for on-line tank release, allowing for zero "giveaway" on octane.

Five separate analyzers exist for RVP, aromatics (including benzene), olefins, sulfur, and distillation. These non-certification analyzers are confirmed by the lab twice per shift. The product tank final must include laboratory analysis of these five components.

Print as PDF:

Year

2010

Submitter

Licensor

Operator

Vendor