Question 81: Has the optimum feed for light naphtha isomerization units changed given that: 1) ethanol blending reduces the octane value of other blendstocks; 2) the demand for premium gasoline is down; and, 3) ethanol blending increases RVP compliance costs? Are you removing pentane from the isomerization unit feed stream or shutting down the unit? Or, are the units still valuable for isomerizing normal hexane and saturating benzene?

KAISER (Delek Refining Ltd.)

The question is very well phrased in that the introduction of ethanol into the blend pool does tend to reduce the need to run the isomerization unit in that ethanol is a very high RVP blend component, and it has enough octane to be able to possibly offset the need for the octane boost that you're getting out of your isomerization unit. So when a refiner wants to introduce the ethanol into their blend pool, there are three likely scenarios that they'll go through in their unit operations. The first is obviously shut the isomerization unit down. And again, the ethanol stream is large enough and has enough octane to be able to overcome the octane boost that you're losing by not having run the Isom unit. Ethanol, in that case, is likely to be cheaper than the processing cost of running the isomerization feed in your unit. There can be potential drawbacks to that, and we'll talk about those here in a second.

The second move is likely to reduce the cut-point so to speak on your naphtha splitter and lighten up the isomerization unit feed. Directionally, your reformer can do a few more things with those heavier molecules with the C6s and C7s that your isomerization can't. There's probably still some incentive to upgrade the octane on your pentanes and you'll choose to run your Isom in that situation. Directionally, you get kind of a slight improvement in your overall reformate and isomerate blend pool. And if you're running petrochemical applications, then definitely the C6s and C7s, as much as possible, belong down in your reformer.

The third option is you keep going like you're going. In that case, you're probably running the isomerization unit not necessarily for octane boost, but probably for benzene destruction or other compliance reasons, in which case you'll have to make changes in other units within the refinery to accommodate the higher vapor pressure ethanol. You may be in a tight spot constrained by debutanizers in your cat or gasoline hydrotreater or some other unit. What it might mean is that during the summer, you may need to store some of your isomerate or store some of your Isom feed for offsite storage and then bring it back in the wintertime when the RVP schedule changes and you have room to blend it again.

At Delek, we let our isomerization unit idle about two years ago, which was unrelated to ethanol. We got into a situation where we had enough flexibility in our blending to be able to save the processing costs of our isomerization unit. We introduced ethanol into our blend pool. We're making 100% E10 right now. What it does mean for us is that we have some periodic storage during the summer months of our otherwise isomerate feed stream and we'll bring it back in the wintertime when our blend schedule allows.

QUINTANA (Valero Energy Corporation)
We agree with Allen that the main impact of ethanol blending will be to reduce the refinery octane requirement and constrain RVP. Furthermore, as our keynote speaker yesterday indicated, we also see essentially flat to declining gasoline demand from refineries, net of the impact of ethanol and imports in the overall pool.
As a result of this, we expect C5 Isom economics to be negative with 100% CBOB blending in the national gasoline pool, while C6 economics alone may be slightly better. However, most refineries don't have the equipment to separate C5s from C6s and with the isomerization function that occurs on the C6 paraffins through the reforming unit, there is not much incentive to necessarily build new equipment or convert equipment to provide that C6 cut by itself.
Gasoline ProcessesGasoline ProcessesLN Isomerization Feedstocks•The Renewable Fuels mandate has impacted Isomerization unit economics due to:–Reduced octane requirements in refinery CBOB (Conventional Blendstock for Oxygenate Blending) gasoline pool–Increased vapor pressure constraints, as RVP specifications must be met after ethanol splash blending at the distribution rack–Flat gasoline demand from US refineries
As such, we expect that the MSAT II requirements will likely lead to shutdown of the Isom units, and benzene that was previously saturated in the Isom unit will likely be dropped in the reformer feed, as Allen suggested will likely happen. And then, post-treating of the reformate to either extract or saturate the benzene. If saturation is the preferred option, then the Isom unit could be converted to benzene saturation alone without impacting RVP of the pool.

SUBHASH SINGHAL (KNPC)
Are there Isom units doing the octane of 91 or close with the recycle options?

HAZLE (NRPA)
Are you asking if they make 91 octane with recycle?

SUBHASH SINGHAL (KNPC)
Right.

QUINTANA (Valero Energy Corporation)
In the past, I've come across some overseas where there is integration with an absorptive separation unit on the recycle. Occasionally with the diisohexanizer recycle, you might achieve close to that, but you might be limited about 89 or 90 in most cases. In the U.S., you don't see many with this scheme.
Gasoline ProcessesGasoline ProcessesLN Isomerization Feedstocks•Each refinery's situation is unique, but in general:–C5 isomerization economics will be marginal / negative–C6 isomerization economics likely slightly better, but:•Would need additional equipment to isolate C6 species from C5 fraction –may be difficult to justify•Reforming units provide isomerization function on C6 fraction•MSAT II regulations may drive benzene containment post-reformer, leading to more C6 fraction in reformer feed–Some isom units may be converted to saturation only.

KAISER (Delek Refining Ltd.)
The Isom tip that I had experience on, we saw about 95% conversion of pentanes and about the same on hexanes. We ended up with a stabilized product of about 88 to 89 octane, but very rarely it would be on that. The TIP process is one that uses zeolite absorbent beds where you recycle the reactor product through there, absorb the normals, and recycle those back to the reactor.

Print as PDF:

Tags

Gasoline Processing

Isomerization

Year

2008

Submitter

Operator