Question 59: What are refiners using to define the corrosivity of high acid crude oils and how is this data obtained?

Jim Johnson (Marathon Petroleum)

In line with industry rules of thumb, Marathon considers a crude to be high acid with a whole crude Total Acid Number (TAN) above 0.5% or a side stream above 1.5%. With low sulfur crude slates the maximum TAN may be reduced, as one of our refineries that runs a predominantly sweet slate experienced naphthenic acid corrosion resulting in the TAN limit being reduced to 0.3%. Crudes are blended to the refinery TAN limit with sulfur, metallurgy and specific stream temperatures taken into account.

We recognize that TAN by itself is not necessarily a good indicator of corrosion potential, however, is readily available for each crude. The naphthenic acid content and type is the true concern in determining the corrosion potential in the higher boiling range sections of the crude and vacuum tower. From a corrosion standpoint, the TAN of the liquid hydrocarbon stream being evaluated rather than the TAN of the whole crude is the more important parameter in determining susceptibility to naphthenic acid corrosion.

We do not determine the content and type in-house; rather utilize the expertise of a third party or our vendors with their proprietary techniques. For one of our crude units that is designed for high TAN crudes with extensive utilization of 317SS in the hot circuits we have utilized third party involvement to evaluate the analytical properties and associated corrosivity of the one distillate circuit where 317SS is not utilized.

Side streams that are considered the most vulnerable to corrosion based on the metallurgy, temperature, and flow characteristics are monitored for corrosion using standard techniques. We also rely on input from our chemical vendors to assess our corrosion potential. Marathon is also a sponsor in an industry JIP to better understand the corrosion potential of naphthenic acids. While more is being learned about the corrosivity of specific naphthenic acids, we depend on unit corrosion monitoring and detailed inspection to assure reliable operation.

Eric Thraen (Flint Hills Resources)

The TAN of whole crude and crude fractions is included in our crude assay test protocol. The TAN of the crude fractions is a far better indicator of crude corrosivity than is the TAN of the whole crude.

Sam Lordo (Nalco Company)

The only way to truly define the corrosivity of a stream due to particular high acid crudes are thru processing of the crude and monitoring for corrosion or by using laboratory testing on streams distilled from the crude oil. Nalco uses a spinning autoclave that can test several metal samples under high temperature and moderate shear conditions.

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