
Question 70: What is your method for measuring naphthenic acid [TAN (total acid number)] in FCC feed? Is this method affected by VABP (volume average boiling point) or Concarbon (Conradson carbon) content? Do you have data that validates an appropriate integrity operating window (IOW) trigger level? If above the trigger level, what is your recommended corrective action (extra inspection, change crude/slate, etc.)?

BOUGRAT (Honeywell UOP)

In terms of TAN number, we typically recommend the standard test method UOP 565, which can be found through the ASTM (American Society for Testing and Materials) website. If not, you can contact one of your UOP representatives to obtain a copy of the test method. This test method represents a potentiometric analysis that helps determine the TAN number not only for FCC feedstocks, but also for general petroleum products and distillates. When analyzing FCC feedstocks, the key concern is normally whether or not the sample will need a chloroform-toluene-2-propanol blend as the solvent. This step simply helps ensure that all of the components typically found in the FCC feedstock can be fully dissolved. The safety requirements for any chloroform handling should be followed by the lab personnel. However, this type of testing is not typically performed for FCC feedstocks, and I do not have any direct customers who perform this testing on a routine basis for FCC service. This type of testing is more often applied to crude or kerosene cuts.

There are certainly integrity windows associated with this type of feed property. However, UOP does not have any direct guidelines or correlations tied to the feed TAN since other feed properties and contaminants generally govern the main conversion, fouling and catalyst management strategies. It should be noted that for this particular lab analysis, inorganic acids, organic acids, mercaptans, and thiophenols generally yield a response to the analysis. However, their respective salts do not; so, you have to take this tendency into account and really determine what type of components you are seeking or what components you expect to find in the feed.

For naphthenic acids, it is frequently desired to include the salts in the final measurement. Therefore, our procedures also include the lab method referenced within the UOP 565 for determination of sodium naphthenate salts. The detection range for the acid number is typically about 0.002 to roughly 5 mg of KOH (potassium hydroxide) per gram. Higher concentrations can be accommodated, but we have not observed any acid number values outside of this range for FCC feedstocks.

After Eric's response, we would like to open this topic to the floor to see if any of you have direct experience with this type of testing, if you use it on a regular basis, if there are any lessons learned, and/or if there are any Best Practices that you can share with the industry.

THRAEN (Flint Hills Resources, LP)

At Pine Bend, the FCC feed is 100% hydrotreated, but the TAN monitoring process is used throughout the upstream crude units and gas oil hydrotreaters. The method for measuring TAN is ASTM D664. FHR Pine Bend has restrictions on TAN included in the refinery operation planning and scheduling tool. Predicted feedstock TAN and actual TAN are monitored. Normal operation will stay within these parameters. High TAN feedstocks may be blended down in TAN using lower TAN feedstocks. Unplanned TAN excursions, if they occur, are investigated to determine their root cause. A feedstock management system evaluates all opportunity feedstocks and requires reliability and process approvals.

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