Measurement of TAN at Devils Tower

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A Case Study in TAN Measurement
ASTM D664

- ASTM D664 measures the total acid number (TAN) which is defined as the amount of KOH (Potassium Hydroxide) of a standard concentration needed to titrate a specific volume of oil.
- However, the test was designed for lubricant oils, not crude oil and does not represent a true measure of corrosivity.
- Also, the repeatability % of mean (same sample tested by the same person at the same lab) is ±11.7% and reproducibility % of mean (same sample tested by different lab) is ±44%.
NAPHTHENIC/CARBOXYLIC ACID

- The presence of these types of acids in crude oil causes the most concern for refiners as they cause severe corrosion at high temperatures.

- Tests that measure these organic acids directly are expensive ($700-$5,000) and are not the common industry standard, but provide a true measure of corrosivity.
  - Measure Naphthenic Acid specifically using:
    - Horvath-Gumulka (SGS Proprietary Test)
    - Naphthenic Acid Titration (Baker Petrolite Test)

- The results for Devils Tower show that the Napthenic/Carboxylic (NAN/CAN) content to be \( \approx 1.0 \) mg KOH/mg lower than TAN which can translate into additional value per barrel.
DEVILS TOWER TAN TESTING

• In early testing, sample preparation was not consistent, leading to varying content of water and additives which can affect TAN
• Multiple labs were utilized, which exposed an apparent bias of TAN results by lab
• Even after a consistent sample preparation and TAN testing procedure was developed, there was still considerable scatter in the data
• This lead to direct testing of Napthenic acid for more consistent results and a better indicator of relative corrosivity
For most accurate repeatability when measuring future TAN’s, a handling procedure must be followed to achieve a consistent sample and result.

- The procedure must include water washing and demulsifying the sample and then heating and centrifuging it.
- Ensure the latest standard is being used – currently ASTM D664-06.
- A NAN/CAN test must be run periodically to determine the true organic acid content.