

# Measurement of TAN at Devils Tower

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*Devils Tower (GOM) Crude*

*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  $\pm 11.7\%$  and reproducibility % of mean (same sample tested by different lab) is  $\pm 44\%$ .**

# NAPHTHENIC/CARBOXYLIC ACID

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- 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

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- **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**

# SOLUTIONS

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- **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**