Grease Analysis - Glossary of Terms

1.) Ferrous Debris Level (Follows method as described in ASTM D7918)

Ferrous debris level (ppm), which is a way to measure wear concentration, is monitored by the FerroQ Ferrous Wear Analyzer. This instrument determines the ppm concentration of ferrous debris of all sizes present in the sample using an inductive coil. This is used as a general flagging device for the lab to detect high wear levels. Report location: **Wear Data**.

2.) FT-IR (Follows method laid out in ASTM D7418, modified)

Fourier Transform Infrared Spectroscopy (FT-IR) is used to fingerprint the molecular bonds in the grease. An IR beam is passed through a thin grease film and the resulting absorbance spectrum is used to characterize the organic components of the grease. By comparing the in-service sample to the baseline, oxidation, grease mixing, and organic contamination (including water) may be detected. Report Location: **Image, "FTIR spectrum"**

3.) FT-IR Conformation

This index value is a numerical representation of the comparison between the FTIR spectrum of the sample and the provided baseline. The index ranges from 0-1.00 where 1.00 represents a perfect match between the spectra. Values above 0.900 are generally seen for non-identical matches that are still the same grease product, and the lower values will indicate increasing deviation from the baseline, which could be due to changing properties of the same grease, the introduction of contamination, or grease mixing. Report Location: **Contamination Data**

4.) Grease Thief Colorimeter (Follows method laid out in ASTM D7918)

Grease Thief Colorimetry utilizes a patent-pending method to measure light absorbance in the visible range (400 nm to 700 nm) under controlled repeatable conditions. The compare function is used to display an image of the sample and the baseline side-by-side, along with a delta E value. The delta E value measures the difference between the LAB values of the sample and the baseline. This method can validate observed appearance changes in greases and trend darkening due to aging or overheating. Report Location: **Image, "Color Index"M**

5.) Grease Thief Die Extrusion Test (ASTM D7918)

The consistency of grease is determined by measuring the load required to force the grease through an orifice of know dimensions at varying speeds. The consistency of the grease is compared to the new baseline grease. Drastic increases or decreases in the consistency correspond to severe thickening or thinning of the grease, which could indicate abnormal operating conditions or compromise reliability. GTS load values (*GTS1, GTS2, GTS3*), which are Force (g) readings of grease extraction at three different speeds, are averaged and compared to the baseline to provide a *GT Index* that is 100 for new samples. Report Location: **Consistency Data and Image "Die Extrusion"**

6.) Rotating Disc Emissions (RDE) Spectroscopy (ASTM D6595, modified)

RDE is a type of Atomic Emission Spectroscopy where the grease is dissolved in reagent grade organic solvent and vaporized in a sample chamber. The atoms are excited with an electric arc and the light patterns emitted are compared with the known patterns of 26 different elements. This test analyzes wear and contaminants. All results are recorded in parts per million (ppm). The detection limit for particle size using RDE analysis is six microns and smaller. Report location**: Wear Data, Contamination Data, Oxidation Data.**

7.) Grease Moisture Analysis (Grease analysis follows method laid out in ASTM D7918: ASTM D7546; ASTM D6304)

Grease Moisture Content may be obtained by several different methods including Karl Fischer Titration (modified ASTM D6304 oven method) and Vapor Pro (ASTM D7546/ASTM D7918). Results are recorded as parts per million (ppm). Report location: **Contamination Data**.

8.) RULER (ASTM D7527)

The RULER measures the Remaining Useful Life of the anti-oxidant additive package by Linear Sweep Voltammetry. A voltage sweep is applied to the sample and the current is measured. The results are reported as a percentage of the concentration found in the baseline grease (*RUL % Peak 1, RUL % Peak 2, RUL % Peak 3*). Included in Advanced Test Slate. Report location: **Oxidation Data and Image "RULER".**

Grease Analysis - Glossary of Terms

9.) Analytical Ferrography (ASTM D7684; ASTM D7690, modified)

Analytical Ferrography involves microscopic inspection of the wear particles to determine if the particles are an accumulation of normal wear or large severe wear. It is recommended as an add-on test when wear levels are elevated or abnormal conditions are suspected. Included in Advanced Test Slate. Report location: **Analysis Comments and Images.**

10.) Grease Rheology (DIN 51810, modified)

Grease Rheology is used as an advanced test to examine the consistency of grease. Using the cone and plate rheometer, force measurements may be used to determine oscillation stress, recoverable compliance and G' values. *G'*: Elastic stress in phase with strain, this is a measure of the structure of the grease or its dynamic rigidity. Comparable to GTI Index value for consistency or the grade of the grease. Unit- Pa. *Oscillation stress*: Sometimes referred to as the Yield Stress, the Oscillation Stress corresponds to the transition point from elastic to plastic deformation. Unit- Pa *Recoverable compliance*: Evaluation of a material's deformation under a steady stress. Percent recovery, unitless. Included in advanced test slate. Report location: **Consistency Data and Images "Shear Flow and Recoverable Compliance"**

11.) Microbial content (ASTM D7687)

Cellular-ATP is an indicator of metabolically active microbial contamination within a sample. The cellular-ATP is extracted from the sample and measured using a bioluminescence enzyme assay. The assay generates measurable light proportional to the concentration of cellular-ATP present in the sample This value is reported in pg ATP/mL. *Add-on test*. Report Location: **Analysis Comments**