eurofins | TestOil

Material Identification Analysis

Machine Type:	Hydraulic System	Received:	01/18/16	**ATTN: Eurofins TestOil**
Lube Type:	Mobil Hydraulic AW 68	Report:	01/27/16	20338 Progress Dr.
Machine MFG:	Unknown	Lab No:	914344	Strongsville, OH 44149
Machine MOD:	Unknown	Analyst:	HS	(216) 251-2510
Sample Source:	Bottom			

Summary of Findings:
The sample is primarily iron and soot with a small portion of phosphates.

Background:
A sample of sludge-like debris from a hydraulic system was submitted for characterization.

Analysis:
The sample was washed with pentane and extracted in methylene chloride to produce two fractions: methylene chloride soluble and methylene chloride insoluble.

Fig. 1 (From left to right) sample as received, soluble and insoluble fraction, insoluble fraction.

The methylene chloride soluble portion, or organic portion (red spectrum), exhibited a dark brown color. The FTIR spectrum showed very little organic material was present as observed by the peak found at ~3000cm^{-1} as well as the absence of a peak at 1460cm^{-1}. The main chemistry observed were phosphates seen at 975cm^{-1}.

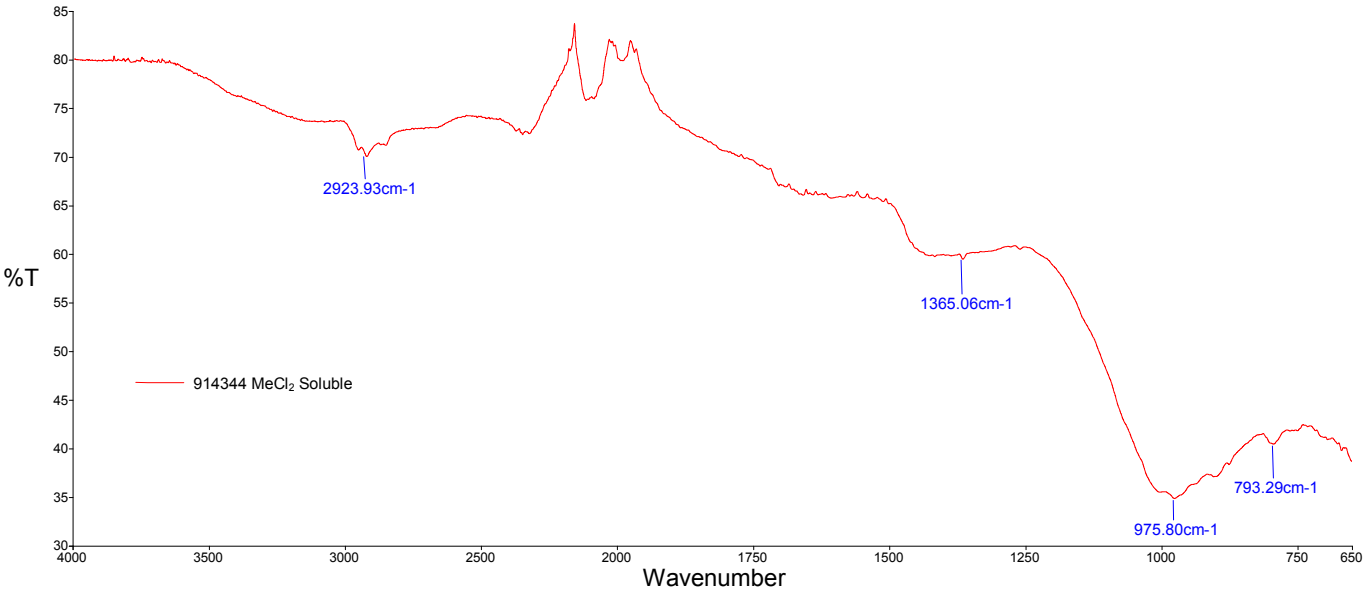

Fig. 2 Methylene chloride soluble fraction.

The methylene chloride insoluble sample, or inorganic portion (blue spectrum), exhibited a grey/black color. The grey color indicates metals which cannot be observed using FTIR spectroscopy. The black color will indicate black-body particles which will completely absorb in the spectrum, and have a propensity to scatter infrared light causing a depression in the baseline of the FTIR spectrum. In this case the depression occurs across the entire spectrum beginning at 49% transmission and ending at 33% transmission. Transmission indicates the intensity of infrared light that has passed through the sample compared to the intensity of light when it entered the sample. No chemistry could be observed due to the black-body absorbance. Therefore, testing used to verify the presence of soot and metals followed.

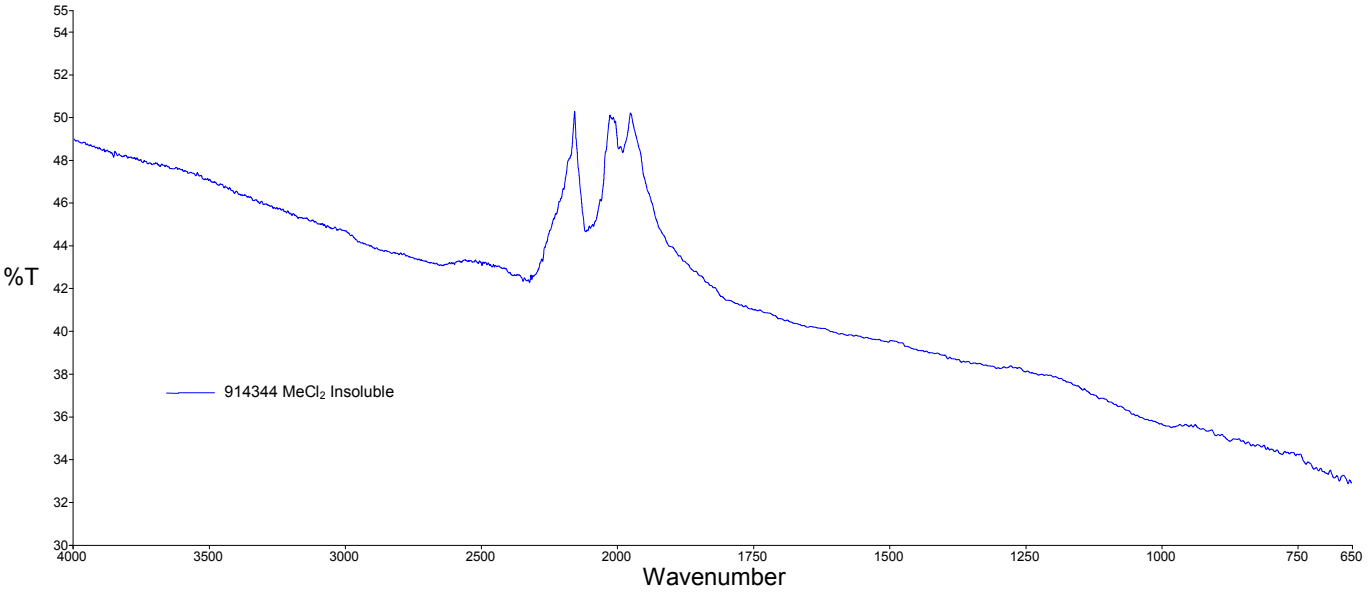

Fig. 3 Methylene chloride insoluble fraction.

Filter paper chromatography was used to verify the presence of soot as the black-bodied particles. A portion of the sample was placed on filter paper, and then was eluded with toluene to reveal the true color. The chromatogram showed finely divided material seen at the center of the sample, and surrounding black color indicating soot.

Fig. 3 Chromatograph of the soot.

The methylene chloride insoluble portion was then subjected to x-ray fluorescence (XRF) testing for elemental analyses which showed iron as the primary metallic chemistry.

Element	**Concentration**
W	[0.00] %
Fe	92.00%
Co	[0.00] %
Ni	[0.10] %
Cu	[0.20] %
Zn	[0.20] %
Na	[1.90] %
Mg	[0.30] %
Al	[1.00] %
Si	[0.00] %
P	[0.90] %
S	[0.30] %
Cl	[0.03] %
K	[0.00] %
Ca	[0.30] %
Mo	[0.30] %
Ag	[0.00] %
Cd	[0.02] %
Sn	[0.07] %
Pb	[0.00] %
Ti	[0.00] %
V	[0.00] %
Cr	[0.60] %
Mn	[1.50] %
Ba	[0.20.] %
Sb	[0.00] %