

CHEVRON CONCERNS OVER PROPOSED INTEGRATED IR METHOD FOR EVALUATING MACK-T10 OIL OXIDATION

- **The Presence of Soot in Used Engine Oils Complicates the Interpretation of Results**
- **Both Oil and Soot Undergo Oxidation During Test. Both Contribute to Carbonyl Absorbance in the 1800-1665 cm^{-1} Region.**
- **Complications from Soot Apparent from Controlled Oxidation / Soot Addition Expts.**



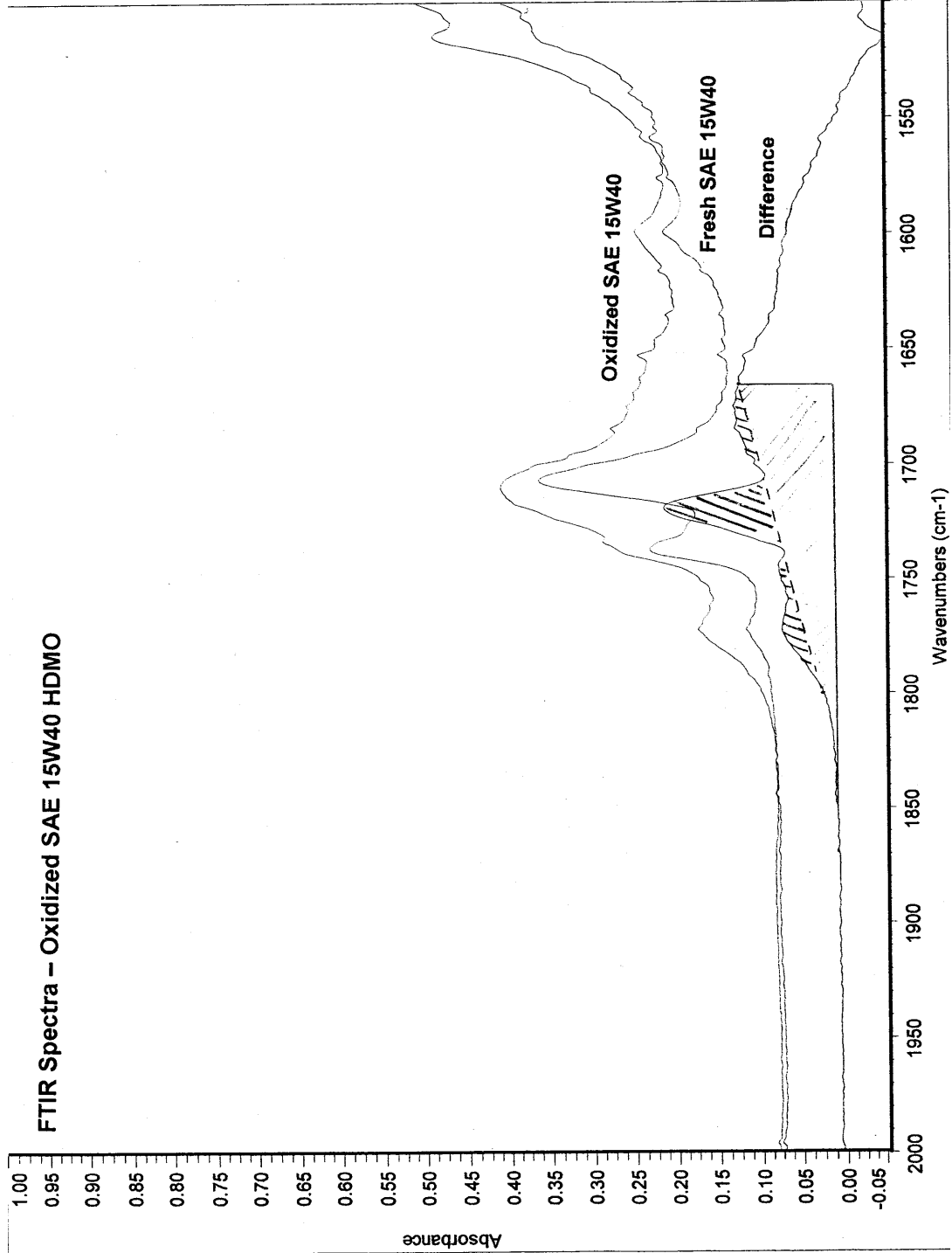
CONTROLLED OXIDATION / SOOT ADD. EXPERIMENTAL DESCRIPTION

- **Commercial SAE 15W-40 HDMO Oxidized under the following conditions:**
 - Oil heated to 340°F in a closed/stirred glass tube with metal naphthenate catalyst added.
 - O₂ uptake controlled volumetrically - stopped after addition of 1 liter O₂/100 grams oil
- **Duplicate Oxidation Experiments conducted with “Soot” Additized Oil**
 - Fresh Oil spiked with 2% - 6% commercial carbon black
 - Carbon black [Raven 1040, Columbian Chemicals Co.] chosen to resemble engine soot [part.size 28nm; SA = 100 M²/gram; ρ = 0.19 g/cc; pH [D1512] = 2.8]



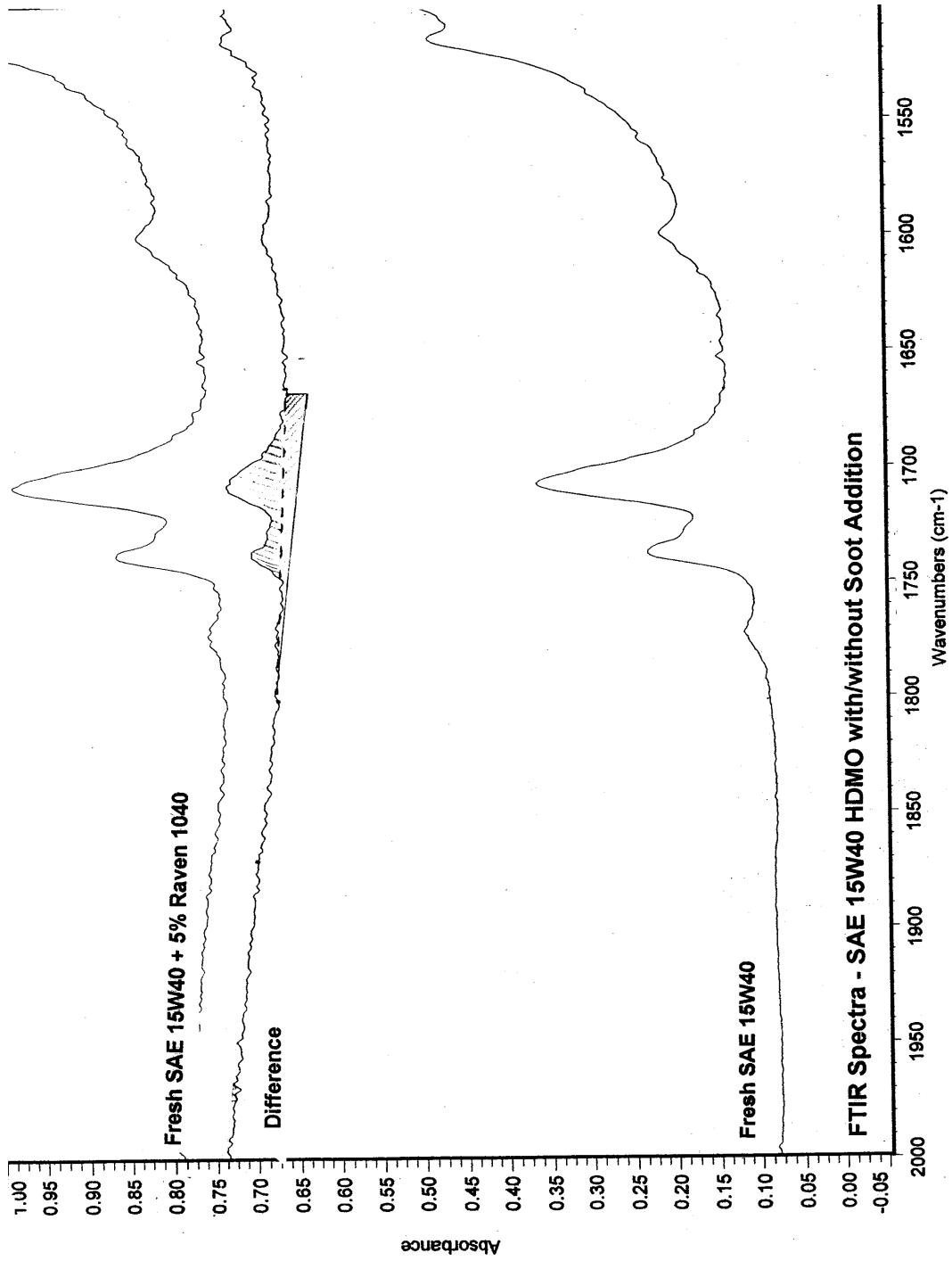
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Lubricants



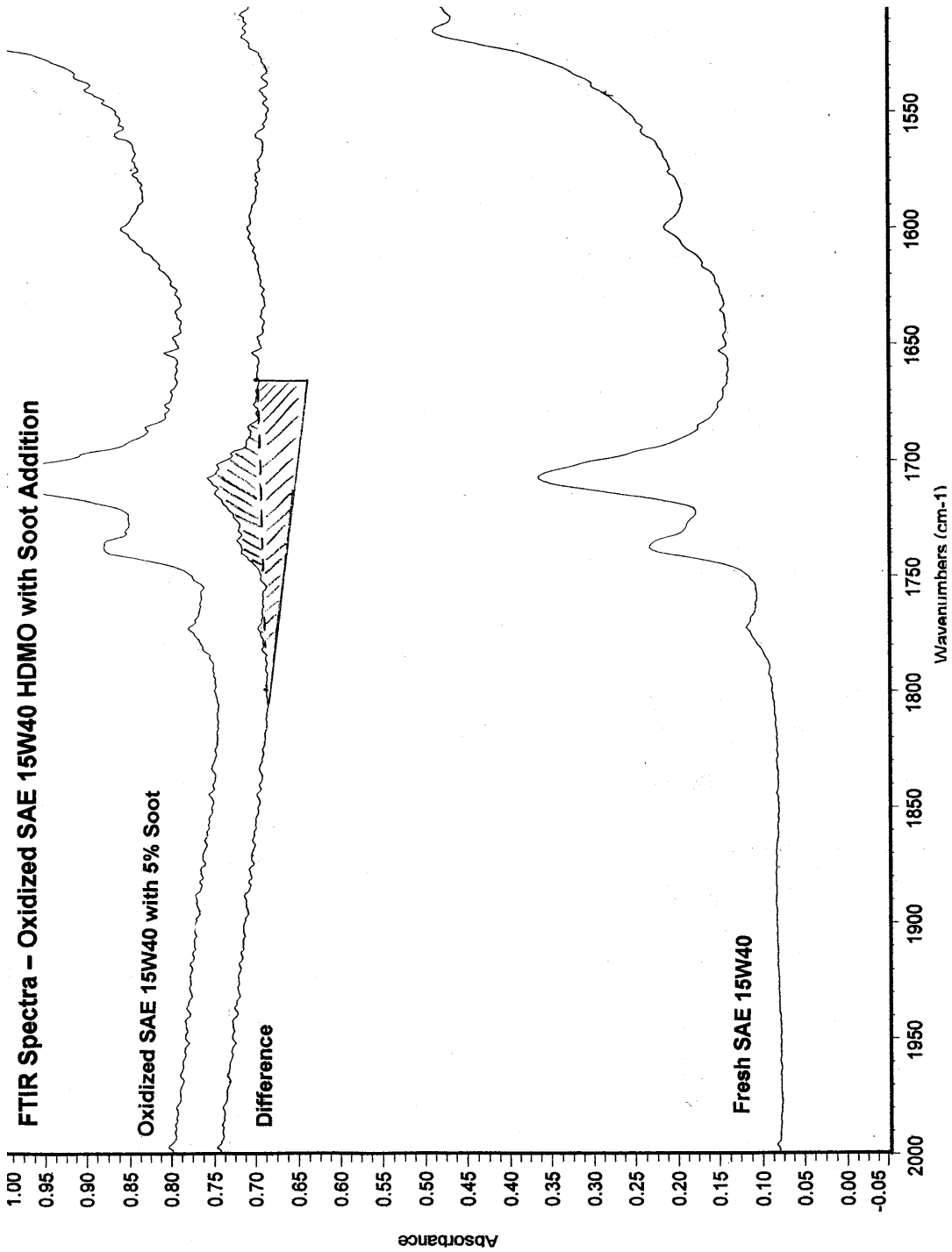
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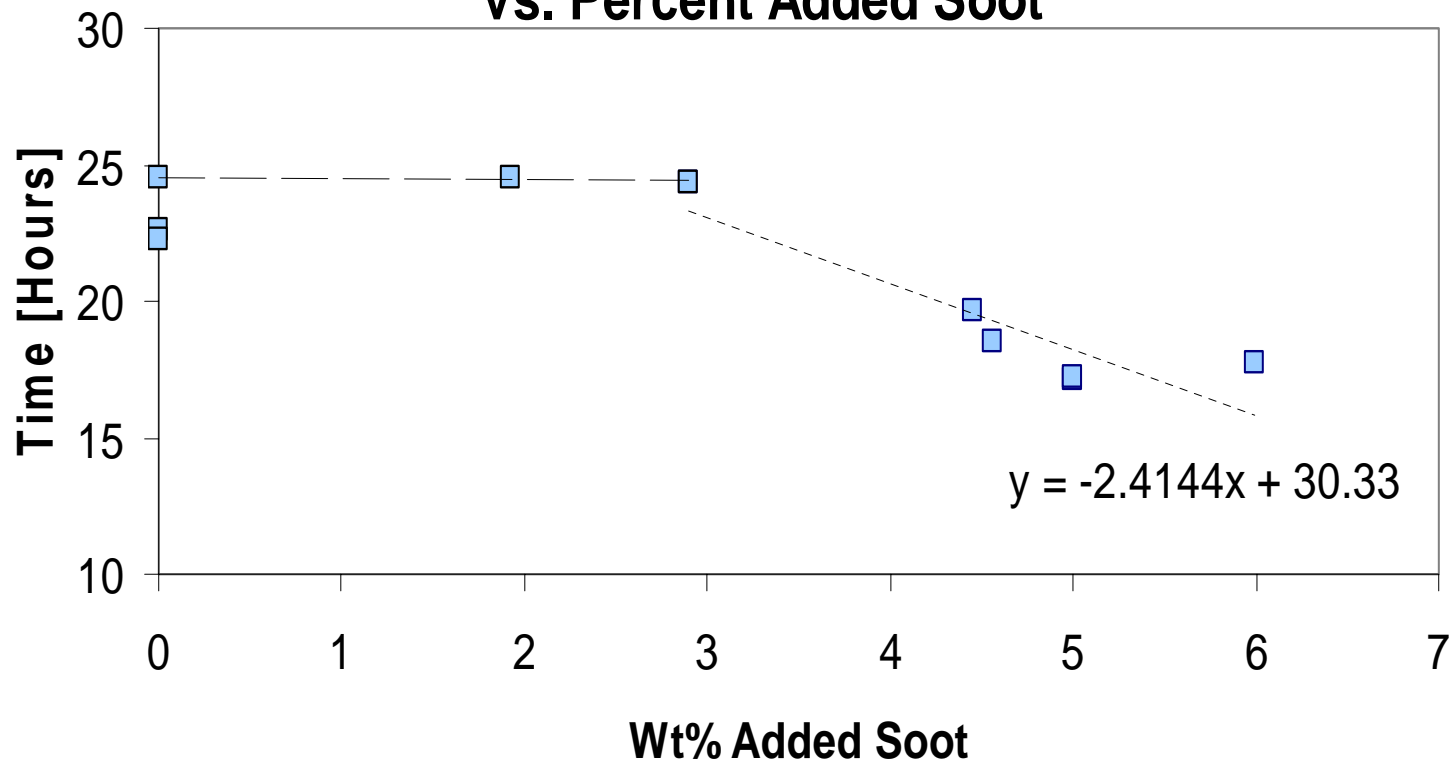
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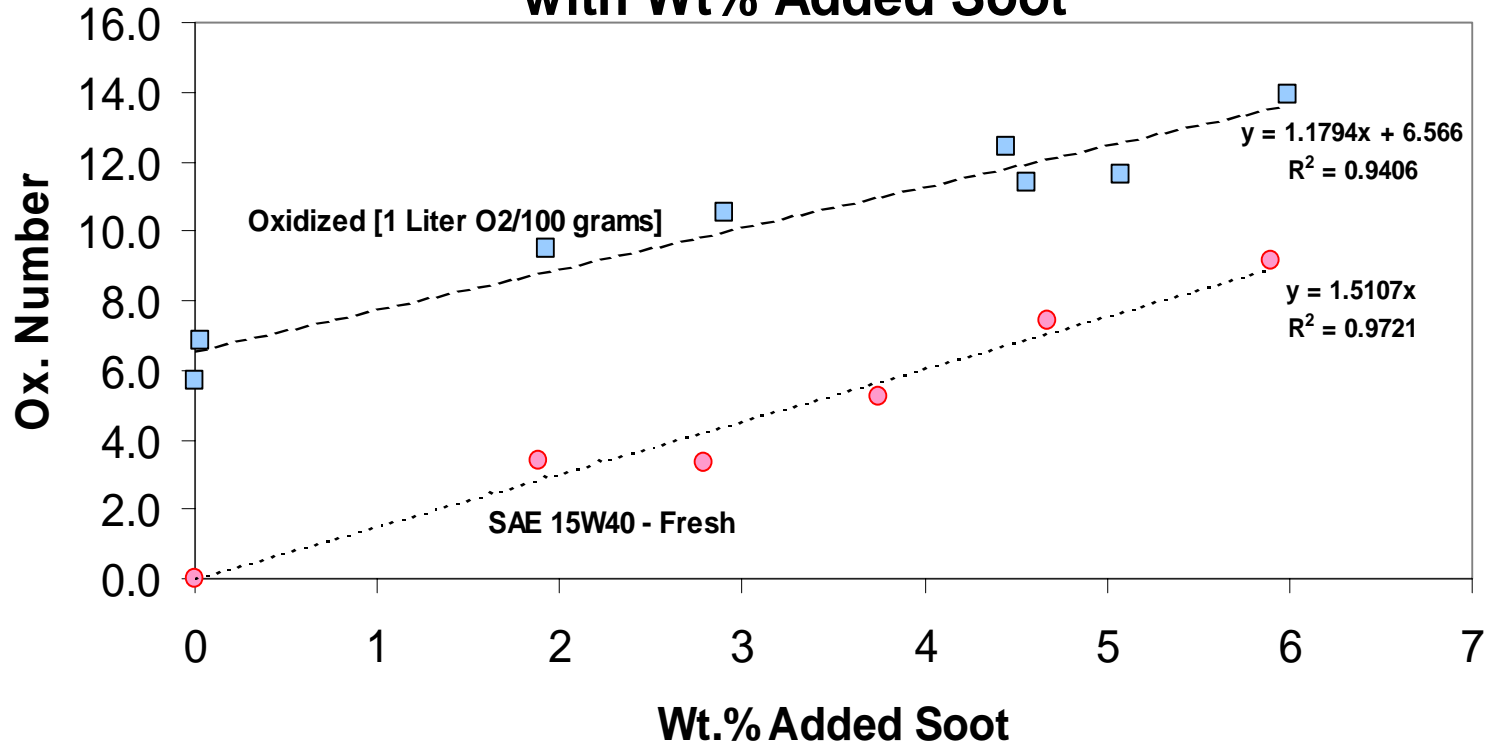
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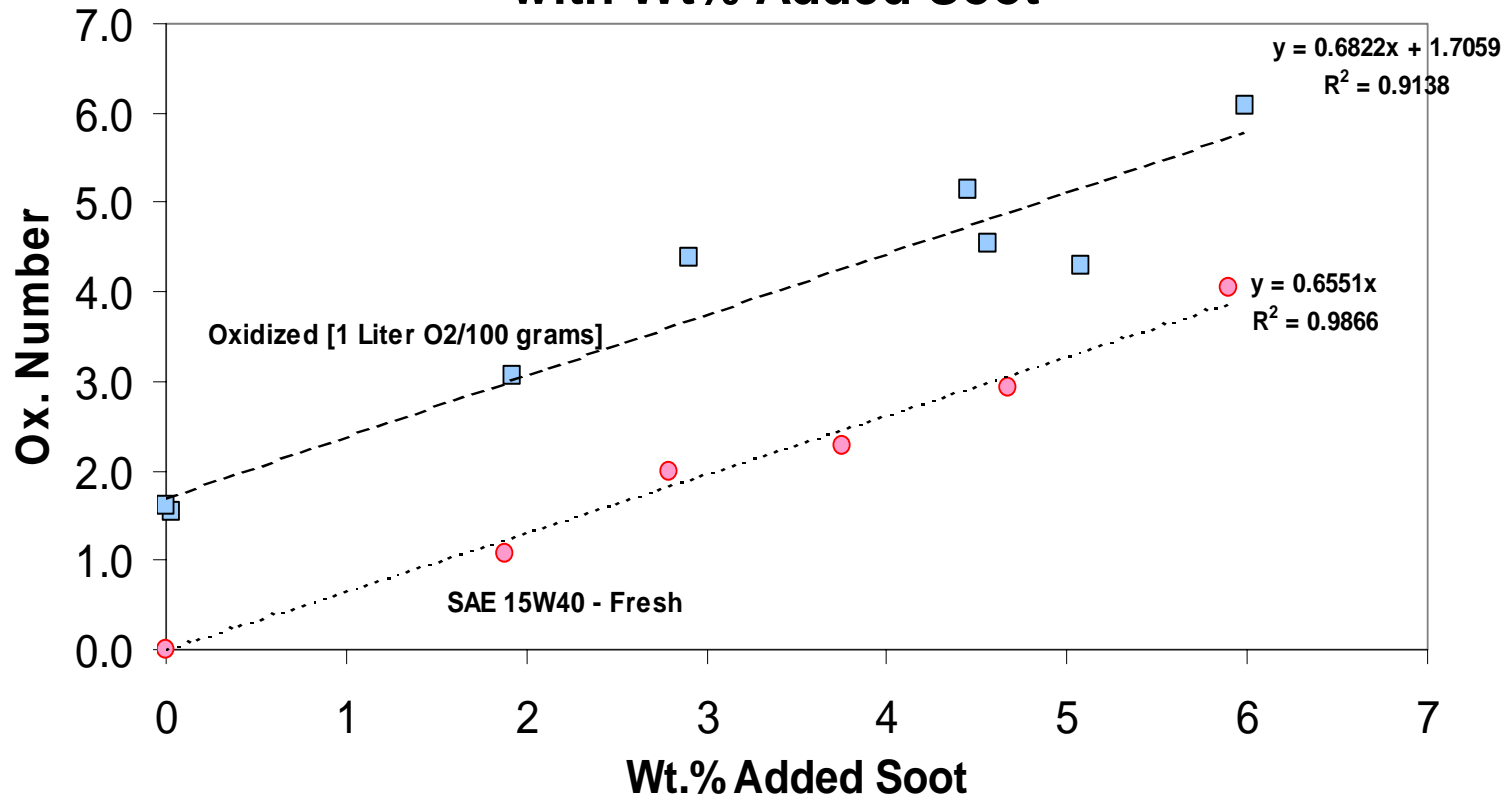
Change in Time Required for 100 grams of SAE15W40 to React with 1 Liter O2 vs. Percent Added Soot



Change in Apparent FTIR Ox. Number [Method 2] with Wt% Added Soot



Change in Apparent FTIR Ox. Number [Method 5] with Wt% Added Soot



SUMMARY

- **Soot Complicates Measurement of “True” Oil Oxidation**
 - Soot levels >3% accelerate oxygen uptake rate
 - Oxidized soot particles contribute to the 1800-1665 cm^{-1} abs.
 - Soot degrades method precision by requiring special sample dilution procedures / use of thin layer cells
- **Mack T10 300 hr. Soot Loadings Vary from 5.4-6.5%.
Soot Content Normalization Procedure Will Be Needed**
- **HDMO Oxidation Resistance Best Evaluated Using Severe Gasoline Engine Tests [e.g. Sequence IIF] to Eliminate Soot Effects**

