PRELIMINARY PHYSICAL AND CHEMICAL EVALUATION OF FUEL TREATED BY ETI'S FUEL CONDITIONING DEVICE

for

EMISSIONS TECHNOLOGY, INC.

by

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INTRODUCTION

Fuel that had been subjected to ETI's fuel conditioning device was the object of several tests. Surface tension studies were done on gasoline and diesel before and after exposure (called untreated and treated fuels, respectively in this report) to ETI's device. Gas-chromatograph/mass spectrometry (GCMS) runs were made on gasoline before and after exposure. Vapor pressure data from United States Testing Company, Inc. and cloud point, pour point, and distillation data from Southwest Laboratory of Oklahoma were also considered in this discussion.

CONCLUSIONS

1. There is no significant change in surface tension between treated and untreated samples.

2. Vapor pressure and distillation data seem to indicate that the fuel is more volatile after exposure to ETI's device.

3. Pour point data seems to indicate that lower molecular weight materials are being formed.

4. Within the limits of the detection capability of GCMS experiments, there appears to be no new chemical compounds generated.

5. Considering the physical changes in the fuel listed in points 2 and 3 above and the fact that there appears to be little new compound formation as mentioned in item 4, there may be a further breakdown of the fuel into components already present in the untreated fuel. The treated fuel could thus have a higher concentration of these components than the untreated fuel. This hypothesis needs to be tested with further work.

6. A much more complete and elaborate study in needed to fully understand ETI's fuel conditioning device.

DISCUSSION

At the request of ETI, surface tension for treated and untreated diesel and gasoline provided by ETI were determined using the time-tested Wilhelmy hanging plate technique. The Wilhelmy technique is based on the force pulling down on a plate that is in contact with the liquid of interest. The force on the plate is measured by a microbalance and this value is changed to a surface tension reading. The values for untreated and treated gasoline are 21.3 and 21.5 dynes/cm respectively while the untreated and treated diesel values were 28.4 and 28.3 dynes/cm. The difference between the untreated and treated samples is viewed to be insignificant in both cases and provides little information concerning the system.

Test were made on methanol which was run through the ETI device to see if there was significant breakdown of methanol. These values were inconclusive.

GCMS runs were made on untreated and treated diesel provided by ETI. These runs were made on a Hewlett Packard 5890/5970 GCMS. Data from this technique are in the form of mass spectra where "peaks" in the various spectrum indicated a specific chemical compound. As expected, the spectrum of both untreated and treated diesel are very complicated. However, upon close inspection, there was no significant difference observed between the two samples. This tends to indicate that no new chemical compounds have been made.

The pour point values (from Southwest Laboratory of Oklahoma) are lower for the treated diesel which could indicate that lower molecular weight material is being formed. The cloud point data is inconclusive. Vapor pressure data (from United States Testing Company) shows that the treated diesel has a higher vapor pressure (1.0 psig) than the untreated sample (0.6 psig). Distillation data (Southwest Laboratory of Oklahoma) indicates that the treated sample was completely distilled at a lower temperature. Thus pour point data, distillation data and vapor pressure data could be interpreted as indicating more volatiles in the treated diesel. Since the GCMS data indicate no new compounds have been formed, one possible explanation for the increase in the volatility of the treated sample could be the break down of components in the diesel to form more of components originally present. This is only a hypothesis and much further work would be needed to confirm these ideas.

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