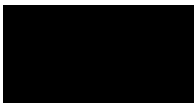
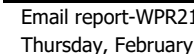
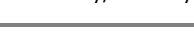


From: 
To: 
Cc: 
Subject: Email report-WPR21LA002 (Green liquid samples)
Date: Thursday, February 3, 2022 12:56:01 PM

Michael,

Three glass vials of a light green liquid (approximately 500 milliliters of liquid) were submitted to the Materials Laboratory for examination. The liquid was initially examined using a Fourier Transform Infrared (FTIR) spectrometer with a diamond attenuated total reflectance (ATR) accessory in accordance to ASTM E1252-98 (American Society for Testing Materials E1252-98: *Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis and American Society for Testing Materials*). The spectrometer was used to collect and process infrared wavelength absorbance spectra of the unknown material.

The presence of a strong doublet peak between $\sim 2950\text{ cm}^{-1}$ and $\sim 2870\text{ cm}^{-1}$ is indicative of a carbon-hydrogen (C-H) single stretching bond. The presence of a single peak $\sim 1460\text{ cm}^{-1}$ is indicative of a carbon-hydrogen (C-H) scissoring bond. The presence of a single peak $\sim 1366\text{ cm}^{-1}$ is indicative of a carbon-hydrogen (C-H₃) methyl rocking bond. The presence of a single peak $\sim 720\text{ cm}^{-1}$ is indicative of a carbon-hydrogen (C-H₃) long chain rocking bond. This combination of functional groups is consistent with a long straight chain alkane. A spectral library search was performed using the unknown liquid spectrum. The unknown spectrum was found to be a very strong match to octane, a major component of gasoline.

The samples were combined and sent to a independent third-party laboratory for further analysis. The testing included ASTM D3237M (*Standard Test Method for Lead by Atomic Adsorption Spectroscopy*) to determine the lead content and ASTM D86 (*Standard Test Method for Distillation of Petroleum Products and Liquid Fuel at Atmospheric Pressure*) to verify that the sample was aviation gasoline (Avgas100LL). The lead content was found to be 9665 ppm (or 9.665 grams/liter (g/L)) which is higher than the lead content specified by ASTM D910- (*Standard Specification for Leaded Aviation Gasolines*) -1.12 g/L. The cause for the out-of-specification finding could not be determined, however, the use of a lead scavenging additive that had been added to the fuel tank prior to flight, may have caused the number to be artificially high. The results for the D86 Distillation were within the specified ranges for Avgas 100LL. The FTIR spectrum and the distillation results indicate that the liquid was aviation gasoline and showed that the green-colored fuel should have been able to support combustion in an internal combustion engine.

According to an aviation gasoline manufacturer, for Avgas 100LL to turn green, "some contaminant that is broadly yellow through to red in colour" could be the cause for the color change. The presence of a fine ferrous particulate material or copper particulate material are examples of possible contaminants. Another possibility is fuel standing in the selector for a long period and the fuel itself degrading. According to the

manufacturer, this would be unusual, but it could be possible if the selector has fuel wetted surfaces that are made of a catalytic metal such as copper.

Additionally, the fuel manufacturer did not recommend the use of an additional lead scavenging additive since the fuel itself is formulated with additives specifically designed to reduce lead build-up on engine components.

Since the fuel sample was consumed in testing mentioned above, additional material testing could not be done. Therefore, the exact cause of the fuel color change in this case could not be determined.

If you have any questions, please let me know.

Nancy B McAtee
Senior Chemist
RE-30