California Environmental Protection Agency

Air Resources Board

PROCEDURE FOR DETERMINATION OF EQUIVALENT SOLVENT RED 26 DYE CONCENTRATION IN DIESEL FUELS BY PORTABLE VISIBLE SPECTROMETER

Standard Operating Procedure No. MLD 154

Revision No. 1.0

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1 Introduction

1.1 This document describes a method of determining the concentration of red dye levels equivalent to 0.1 to 20 mg/L of Solvent Red 26 in commercially available diesel and burner fuels using visible spectroscopy.

1.2 This method is based on ASTM 6756-02.

2 Method Summary

The diesel samples are transferred into a cuvette, which is placed into the light path of the instrument. A beam of visible light is imaged through the sample onto a detector, and the detector response is determined. Wavelength ranges which correlate strongly with the red dye concentration are selected for analysis using bandpass filters. A multivariate mathematical model converts the absorption values to the red dye concentration.

3 Interferences and Limitations

The presence of colorants other than typical diesel hydrocarbons, or the presence of red dye other than the specified types, can interfere with the accurate determination of the red dye concentration.

4 Instrumentation and Apparatus

4.1 Petrospec DT-100C portable spectrometer

4.2 Sample cells (cuvettes): fused silica, glass, or polymethacrylate cells with a sample path length of 10 mm.

5 Reagents and Materials

Check samples containing red dye 26 equivalent concentrations of 0.0, 5.0, and 12.0 mg/L can be prepared in-house or purchased from the instrument manufacturer.

6 Safety Precautions

Standard laboratory safety procedures and equipment should be used in performing this method. For example, safety glasses and gloves should be worn. All standard and sample preparation should be done in the fume hood. Diesel fuel contains compounds known to be toxic and carcinogenic.

7 Samples

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7.1 A minimum of 10 mL of the diesel fuel sample is required.

7.2 Refer to ASTM D 4057 for proper sampling techniques. Since red dye is known to decompose slowly under direct sunlight, precautions must be taken to shield the samples prior to analysis.

8 Procedure

8.1 Turn on the spectrophotometer and wait approximate 30 second warm-up time.

8.2 Insert the sealed cuvette containing the 12.0 mg/L check standard into the instrument. Wait approximately 5 seconds, and record the reported concentration. Remove the cuvette.

8.3 Repeat step 8.2 for the 5.0 and 0.0 mg/L check standards.

8.4 Transfer approximately 4 mL of the sample to be measured into a cuvette. Insert the cuvette into the instrument and record the reported concentration.

8.5 Repeat step 8.4 for all samples.

8.6 All results are recorded in an Excel spreadsheet.

9 Quality Control (QC)

9.1 Three check standards are analyzed at the beginning of each set of samples, as described in 8.2-8.3 above. The difference between the measured results and the known concentrations must be no more than twice the repeatability of ASTM D6756-02

9.1.1 The repeatability of ASTM D6756-02 is 0.22 mg/L.

10 Reference

ASTM D6756-02

11 Revision History

11.1 Revision No. 1.0 Effective date: April 13, 2012