



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

SOP MV-FUELS-154
Version 3.1
Effective Date: December 1, 2019

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Chemical Analysis and Emissions Research Branch
Mobile Source Laboratory Division

DISCLAIMER: This procedure has been reviewed by the staff of the California Air Resources Board and approved for publication. Mention of any trade name or commercial product in this Standard Operating Procedure does not constitute endorsement or recommendation of this product by Air Resources Board. Specific brand names and instrument descriptions listed in the Standard Operating Procedure are for equipment used by the Air Resources Board laboratory.

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 American Society for Testing and Materials (ASTM) D6756-02.

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 A portable spectrometer meets the specifications of ASTM 6756-02 and the ARB Enforcement Division requirements.
- 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

- 7.1 A minimum of 10 mL of the diesel fuel sample is required.
- 7.2 Refer to ASTM D4057 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 and instrument manual from manufacturer

11. Revision History

- 11.1 Version 1.0 Effective date: April 13, 2012
- 11.2 Version 2.0 Effective date: September 1, 2014

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Significant changes: Standard operating
procedure (SOP) naming convention updated.

11.3 Version 3.0 Effective date: May 1, 2017

Significant Changes:

4.1 Instrument brand name and manufacturer were removed

11.4 Version 3.1 Effective date: December 1, 2019

SOP format updated for ADA compliance