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## EDXRF1658 - Analysis of ULSD



### Scope

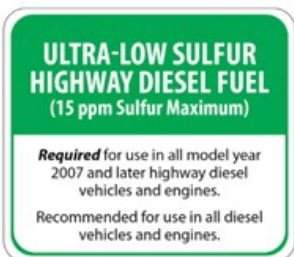
This application note demonstrates the analysis of sulfur in ULSD (ultra-low sulfur diesel) using [NEX DE](#).

### Background

Regulations around the world have limited the amount of sulfur in various fuels oils with particular attention to diesel fuel. For many years, road diesel has been limited to a maximum sulfur concentration between 10 – 15 ppm, depending on the global region. Now these limits are expanded to all diesel fuel, including use in large engines and off-road diesel engines.

### ASTM and international norms

The Rigaku NEX DE EDXRF analyzer meets several international norms for the measurement of sulfur in petroleum oils, fuels, and ULSD using EDXRF.



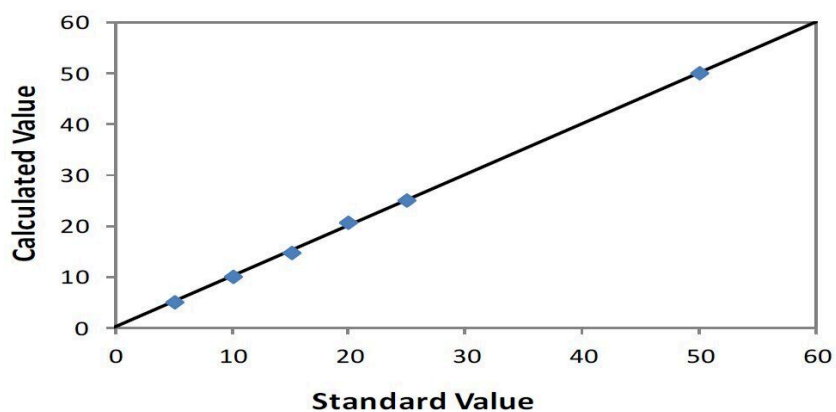
Standard method	Sulfur range
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ISO 13032	8 – 50 mg/kg
ASTM D4294	16 mg/kg – 5%
IP 532	6 – 50 mg/kg
EN ISO 8754	300 mg/kg – 5%
EN ISO 20847	30 – 500 mg/kg

## Calibration

Empirical calibration was built using a suite of 6 commercially available certified diesel calibration standards.

<b>Element: S</b>		
<b>Units: ppm</b>		
Sample I.D.	Standard value	Calculated value
STD 1	5.0	4.72
STD 2	10.0	10.00
STD 3	15.0	14.69
STD 4	20.0	20.42
STD 5	25.0	25.03
STD 6	50.0	49.83



Calibration plot S

## Precision

Instrument repeatability (precision) is determined by ten repeat analyses of a sample in static position.

<b>Element: S</b>
<b>Units: ppm</b>

Sample	Standard value	Average value	Std. dev	% Relative
STD 1	5.0	4.75	0.30	6.0
STD 2	10.0	10.12	0.21	2.1
STD 3	15.0	15.09	0.22	1.5

## Conclusion

The results shown here indicate the Rigaku NEX DE EDXRF analyzer gives excellent performance for the measurement of ULSD. The multi-element versatility of the NEX DE also makes it an ideal tool for the measurement of many other elements and oils, such as Ca and the metals V, Fe, and Ni in crude in residual oils.

## Related products



### NEX DE Series

High-power 60 kV EDXRF systems delivering speed, precision, and small spot measurements