ROFA FRANCE

Welcome to our World of Technology *Reference Materials - Physical Properties Analyzers*

Certified Quality Management System ISO 9001 2008

SV-01

S-VALUE

Fuels Stability Analyzer - According ASTM D 7157

S-VALUE PRESENTATION

SVA-42 = 1 test slot (upgradable to 3 slots)
SVA-30 = 3 tests slot (3 Probes Sva-103)
SVA-31 = 3 tests slot (3 Probes Sva-130)
SVA-32 = 3 tests slot (3 Probes Sva-103 + 3 Sva130)

S-Value Presentation - Test Method: ASTM D7157
Asphaltene Stability - Automated Instrument (Peptizing Power)

Keys Benefits

Automated Determination of the Intrinsic Stability of Asphaltenes Containing Residues, Heavy Fuel Oils and Crude Oils

- Conforms to ASTM D7157 Test Method
- Test Performed at Ambient Temperature
- Rapid Results (15 to 30 minutes)
- Up to Three Simultaneous Measurements
- Reduced Operator Errors
- Operator Time Saving
- Windows 7 Based Software
- Quick Investment Play-back

For More Info, email Rofa.france@wanadoo.fr

- **Model SVA-42** Automated Fuels Stability Analyzer applies a procedure for quantifying the intrinsic stability of the asphaltenes in an oil. A sample dissolved in toluene is titrated at room temperature with n-heptane until an optical device detects asphaltine precipitation. The analyzer conforms to ASTM D7157 Test Method.
- Model SVA-42 is applicable to residual products from thermal and hydrocracking processes, to products typical of ASTM D396 Grades 5L, 5H, and 6, and D2880 Grades 3-GT and 4-GT, and to all types ofcrude oils. The instrument is limited to products containing a minimum of 0.2% concentration of asphaltenes.
- This analyzer quantifies asphaltene stability in terms of state of peptization of the asphaltenes (S-value), intrinsic stability of the oily medium (So) and the solvency requirements of the peptized asphaltenes (Sa).
- The operating principal of Model SVA-42 is based on titration and optical detection of precipitated asphaltenes. Three different mixtures of the sample oil plus aromatic solvent (toluene) are simultaneously and automatically titrated with paraffinic solvent (n-heptane) to cause precipitation of asphaltenes.
- An optical probe monitors the formation of flocculated asphaltenes during the titration. The optical probe consists of a system of light emitting and light receiving components. Flocculated asphaltenes alter the detected light intensity. New model of Probe SVA-130 allows running fuels with very low mass of asphatenes and very clear samples.
- The start of flocculation is interpreted when the optical probe detects a significant and sustained decrease in rate-of-change of the light intensity.
- The results of the three flocculation determinations are used to calculate stability parameters and subsequently the intrinsic stability of the oil from the added n-heptane at the inversion point, the mass of specimen and the volume of toluene, for each determination
  Model SVA-42 is supplied with 1 titration pumps, 1 titration test positions, 1 detection probes of each model, Windows 7 based proprietary software, and a PC. On this unit can be connected 2 more tests positions (code SAV-50) then can run 3 tests positions simultaneously.

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S-VALUE APPLICATIONS

- **Existing Process adopted by Refineries**

  Sludge formation, which occurs when a Fuel is unstable, affects both the Refiner and the ultimate Engine Operator. For the Refiner, it is a direct loss when sludge separates and precipitates out besides problems posed in terms of blockages and pumping. For the end user, it is not only a direct loss, but can lead to problems of filter choking and inoperability.
- Such sludge formation can occur when the fuel is composed of two different cycle streams or when it is a mixture of different fuels.
- On the other hand, with severe Visbreaking, some coke formation in the fuel is inevitable. Generally however, the particulate size of such suspended coke is so small that the suspension is actually very stable. Also such small particles of coke (<5 microns) in no way affect the engine or components such as fuel filters.
- To overcome stability problems, an earlier approach used by the refineries was to operate the visbreaker at less than optimum severity and then dilute the visbroken fuel with aromatic diluent streams. Such aromatic diluent streams not only lower viscosity to the desired level but also help in homogenizing and stabilizing the fuel.
- It has been the common practice at backward refineries to depend on the "**drop test**" to gauge stability. The drop test is basically to put a drop of fuel on a porous paper where the asphaltenes tend to form a small ring while the oil spreads out to a wider ring.
- A visbroken fuel may appear to be unstable when actually it may be quite stable. As a result unnecessary extra cost is incurred – either, by using up valuable material for further blending or by not operating the visbreaker at optimum severity.
- The Result of a Drop test suffers from a lack of uniformity from person to person, from paper to paper and can even show variance between two tests with the same sample. Consequently, the development of a scientific alternative became imperative.
- **This led to the development of the S-Value Analyser by ROFA France.**
- ROFA France specialise in the Research, Manufacturing and Marketing of Analysers and Certified Reference Material for Petroleum industry. It also manufactures S – Value Analysers for Fuel stability Measurements – for usage in Refineries.
- The Principle - Measurement of The point of flocculation.
- **Features of S – Value Analyser**
- In the S-Value Analyser, three titrations are conducted, determining with great accuracy the actual points of precipitation. It thus gives accurate readings of true stability. A Regression analysis is conducted to safeguard for errors.
- Three different mixtures from the same sample of fuel are prepared with toluene (aromatic solvent) and then minutely titrated within-heptane (paraffinic solvent). Thus, three readings are obtained of the precipitation of asphaltenes – through three optical probes.
- The S - Value Analyser is computerised – employing a number of inbuilt safeguards and reminders for the technicians conducted the test. The kit comes complete with weighing scales, beakers, heaters, optical probes, titration pumps, et al.
- The system is quick and can handle a large work-load. It allows analysis of the gamut of refinery throughput and products, from crudes to visbroken residues.
- It allows for the determination of three Values
- S : The overall stability of the sample
- Sa : The aromaticity of the asphaltenes – the ability of the asphaltenes to stay in colloidal dispersion.
- So : The aromaticity of the resins – their capability to maintain asphaltenes in colloidal dispersion.
- **BENEFITS OF S – VALUE FUEL STABILITY ANALYSER**
- To operate the Visbreaker optimally, stability of the output needs to be monitored constantly. The ROFA analyser is unique in its ability to handle a large number of samples in any given time frame, quickly and with precision. Being an S-value analyser, it not only states the current stability of a fuel but also gives indications for potential instability.
- Refineries using the S-value system, pertaining to the ASTM Standard : D 7157 – 05, huge benefits are derived from optimal refinery operation.
- **USAGE OF S – VALUE FUEL STABILITY ANALYSER**
- Marine Engine & Stationary Engines on land-based DG Sets:
- For such engines the Viscosity stipulation is entirely different at 180 CST max at 50 C. To meet this viscosity specification the visbreaker needs to be operated at optimum severity, often at over 470 C. However, such visbroken fuel is generally found to be very unstable.
- Further, employment of aromatic diluents have two significant drawbacks.
- The combustion quality of the fuel deteriorates sharply on account of the aromaticitiy of the diluent.
- In addition, there is considerable value down In addition, there is considerable value down gradation of a higher value diluent stream to FO.

  (The preventable wastage aspect).

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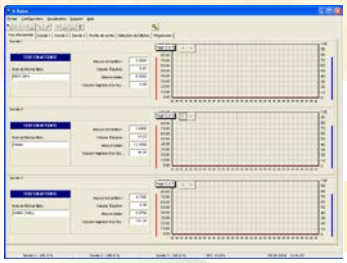
S-VALUE - Configuration - Probes models - Application screens

S-Value one slot position



3 slots creens display on application

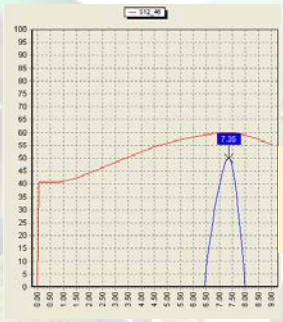
Probe SVA-103 with 3 fixed detection areas

Applications

Routine tests according ASTM D 7157 Definition

Probe compatible to work with very dark samples.

Probe Less efficient on clear samples end very low asphaltens content



Example of Flocculation graph display recorded

Probe SVA-130 with on adjustable detection area

Applications

Routine tests according ASTM D 7157 Definition & R&D tests

Probe compatible to work with clear samples & low asphaltens content.

Probe Less efficient on very dark samples

Example of Regression on 3 tests. This regression procedure gives full precision and result security

S-Value with maximum configuration in 3 slots position

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