

# S-Value Analyser to determine Fuel Stability and Fuels Compatibility – ASTM D 7157

## S-VALUE ANALYZER WITH 1 TEST POSITION (SVA-42)

- Supplied with
  - Electronic cabinet with Application Software
  - 1 SVA-50 individual test position equipped with pump, warming stirrer, Heptane bottle, probe support
- Ready for installation and use



1 POSITION MODEL

## S-VALUE ANALYZER WITH 2 TEST POSITIONS (SVA-84)

- Supplied with
  - Electronic cabinet with Application Software
  - 2 SVA-50 individual test positions equipped with pumps, warming stirrers, Heptane bottles, probe supports
- Ready for installation and use



2 POSITION MODEL

## S-VALUE ANALYZER WITH 3 TEST POSITIONS (SVA-126)

- Supplied with
  - Electronic cabinet with Application Software
  - 3 SVA-50 individual test positions equipped with pumps, warming stirrers, Heptane bottles, probe supports
- Ready for installation and use



3 POSITION MODEL

### What is the definition of 'Fuel Stability'?

Fuels are composed of many constituents such as asphaltenes, maltenes and resins. Asphaltenes are dispersed in a colloidal state into the maltenes phase. In cases of fuel instability a formation of granular deposits will appear, called "flocculation" or "peptization". These formations can occur due to environmental conditions but it is more frequent when mixing two or more fuels.

When this flocculation or peptization occurs, this means that the limit threshold stability of the fuel or the mixture of fuels has been reached.

When the instability threshold is reached or exceeded, particles in the form of granular deposits, will be generated, how much this occurs, depends on the nature and the mass of asphaltenes present in the fuel. There are many reasons for the transition from liquid to granular state. They are complex and sometimes difficult to identify.

The operational consequences of using unstable or incompatibly mixed fuels, include the formation of an asphaltenic sludge, which can block filters, separators and other components.

### Factors influencing stability:

- Fuel formulation, thermal and mechanical stress, storage time and condition.
- Stability is a key factor for the quality of fuels. It is the responsibility of the fuel supplier to provide stable fuels.
- Stability is the first of two applications of the S-Value analyser.
- Stability determination can be done down to 0.05 % of asphaltenes mass. It can be used for any of the below mentioned market applications.

**Compatibility** is the term used to evaluate if fuels can be mixed without flocculation and detection of asphaltenes. Compatibility is the second application of S-Value analyser. Compatibility can be determined with ROFA's application "prediction stability calculator". There are two approaches to calculate compatibility. In cases of good component compatibility the software uses the different stability test results for each individual component. If the compatibility is not good and instability is detected or suspected by the operator, the "prediction stability calculator", will instruct the operator to perform at least one more S-Value test. This test will be done on a mixture of the components, so the calculator can confirm or adjust the blend stability results.

### S-Value Analyser:

S-Value technology is in constant development reacting to the permanent changes of the fuels supplied on the market. The analyser is delivered ready for use. Very low maintenance is required to run the unit. Support by local offices, representatives and online support from the manufacturer is available. An example of a result screen with all different important information concerning the test.

### Calculator

Bunker Fuels & Marins Fuels					
	S	Sa	So	Stability Prediction	Stability factor
Recommended minimum value	>1.55	>0.45	>0.8		
Fuel name / Results data's to edit here	1.45	0.52	0.76	POOR	1.458

The prediction stability calculator is an important tool available with the S-Value analyser.

For the standard stability test there are 3 different ranges of products: Crude Oils, Marine Fuels, Distillates. Calculator will determine "Stability Prediction": GOOD, POOR or BAD. "Stability factor" allows user to see where his fuels are located in the range of stability.



PROBE SVA-130

### S-VALUE ANALYTICAL PROBE

- Model SVA-130
  - For all fuels application.
  - Equipped with filter and distance of measurement adjustment
- Ready for installation and use

### Market applications

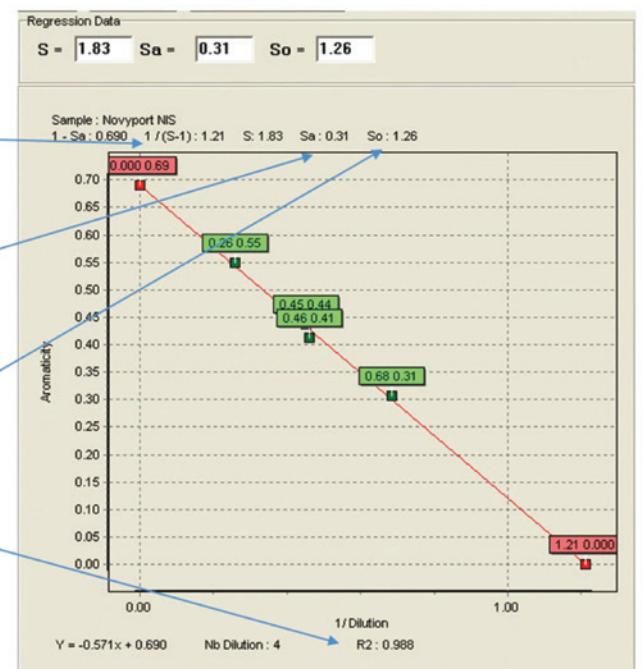
Relevant oil cuts: Diesel / Domestic Fuels / Marine Fuels / Heavy Fuels  
 Crude Oils: All 636 different types of Crude Oils, known so far can be tested  
 Control of Thermal Cracking unit, Visbreaker Products, Hydrocracking product H-Oil

CRUDE OILS COMPATIBLES						
% fuel and S values automatically edited from "Estimated blends Stability" calculator ONLY edit manually Sa and So values from tests results						
First Blend		of 2 Crude Oils			Stability Prediction	Stability factor
Recommended minimum value		>1.45	>0.5	>0.7		
Fuel Name	% Fuel	S	Sa	So		
20-0113	25%	3.38	0.27	2.43	GOOD	
20-0112	75%	4.03	0.76	0.98	GOOD	
Blends results		3.87	0.52	1.71	GOOD	4.125

Tools for blends of 2 fuels. Fuels compatibles according users experiences. No test on blend.

CRUDE OILS with problems of COMPATIBILITY						
THEN firstly apply Procedure "Estimation Blends Stability 2"						
% fuel, S values & Factor of incompatibility are automatically edited from "Estimated blends Stability 2"						
ONLY Edit Sa and So values in this calculator						
First Blend		of 3 Crude Oils			Stability Prediction	Stability factor
Recommended minimum value		>1.45	>0.5	>0.7		
Fuel Name	% Fuel	S	Sa	So		
	20%	2.46	0.5	0.7	GOOD	
	35%	3.38	0.5	0.7	GOOD	
	45%	4.03	0.5	0.7	GOOD	
Blends results with incompatibility factor		2.75	0.50	0.70	GOOD	2.747

Tools for blends of 3 fuels. Unknown Fuels compatibles according users experiences. Test on blend.



$X_{min} = S-1$   
 $S = 1+X_{min}$

$FR_{max} = 1-Sa$   
 $Sa = 1-FR_{max}$

$So = (FR_{max}) * (1+X_{min})$

**R2** Goodness of fit, R-squared of the regression. Must be equal or greater than 0.98

An example of a result screen with all different important information concerning the test.

The definitions of S, Sa and So, are shown in formulas.

With the three values measured on three dilutions a regression line is generated, using least square method.

The coefficient of determination R<sup>2</sup> must be always above 0.98, to confirm the quality of the tests and the regression.