

Measured Data

Table 2: Oil Composition and Properties of MV Manolis L “Bunker C” Fuel Oil

		ROV (2013) 2013/05/13-2244 As provided	Cofferdam (2014) 2014/08/19-2542 %Evap. Mass Loss Fresh (0.0%) 10.1%		May (2015) Operations 2015/06/12-2932 As provided
Density (g/mL)	0°C	1.0136	1.00635	1.02901	1.00638
	10°C	1.0101			
	15°C	1.0036	0.99533	1.01782	0.99553
Dynamic Viscosity (mPa·s)	0°C	1.30E+05	6.24E+04 at $\gamma = 1$ (1/s); 6.78E+04 at $\gamma = 0.1$ (1/s); 9.29E+04 at $\gamma = 0.01$ (1/s)	1.07E+07 $\gamma = 0.01$ (1/s); 1.84E+07 at $\gamma = 0.001$ (1/s); 2.21E+07 at $\gamma = 0.0001$ (1/s)	4.78E+04 $\gamma = 1$ (1/s); 5.21E+04 at $\gamma = 0.1$ (1/s); 7.24E+04 $\gamma = 0.01$ (1/s)
	5°C	5.63E+04			
	10°C	2.62E+04			
	15°C	1.34E+04	6.08E+03	2.35E+05	5.68E+03
Surface Tension (mN/m)	0°C		NM	NM	
	15°C		29.99	NM	
Interfacial Tension Oil/Water (mN/m)	0°C		NM	NM	
	15°C		NM	NM	
Interfacial Tension Oil/Brine, 33‰ NaCl (mN/m)	0°C		NM	NM	
	15°C		NM	NM	
Water Content (%w/w)			0.97	0	4.57
Flash Point (°C)			120*	142	Not Determined**
Pour Point (°C)			-9	15	
Emulsion Formation	Visual Stability		Mesostable	Entrained	

	Complex Modulus (Pa)		559	1789	
	Water Content (%w/w)		66.0	36.7	
Hydrocarbon Groups (%w/w)	% Saturates		33.5	26.7	35.3
	% Aromatics		43.2	37.2	38.1
	% Resins		10.4	15.2	11.9
	% Asphaltenes		12.9	21.0	14.7
GC-TPH Distributions	Total GC-TPH (mg/g)	380	421	390	406
	%GC-Saturates/GC-TPH	39.7	43.7	41.9	48.1
	%GC-Aromatics/GC-TPH	60.3	56.3	58.1	51.9
	%Resolved peaks/GC-TPH	35.9	30.0	25.3	30.8
GC-TPH in CCME PHC Tier 1 Ranges (%w/w)	F1 (<nC ₁₀)	1.03	1.32	0.00	0.76
	F2 (nC ₁₀ to nC ₁₆)	28.8	29.9	17.5	28.6
	F3 (nC ₁₆ to nC ₃₄)	57.7	59.5	71.6	59.5
	F4 (nC ₃₄ +)	12.5	9.25	10.9	11.1

* Pensky-Martens Closed Cup Method (ASTM D93-15); **The flash point could not be determined using ASTM D7094 mini flash point analyzer). The sample volume was not sufficient for ASTM D93 method; γ : shear rate; NM: Not Measured (Viscosity too high)

Pour Point

Pour point analysis was performed following ASTM DD5949, “Standard Test Method for Pour Point of Petroleum Products Automatic Pressure Pulsing Method”. A Phase Technology 70Xi Pour Point Analyzer was used for this analysis. The pour point is measured as the lowest temperature at which the liquid still flows before turn to semi-solid state or becoming adequately viscous and immovable under the test conditions. The detection of pour point in 70Xi Analyzer is performed by shooting a calculated pulse of compressed gas onto surface of the sample. The pulsed gas creates disturbances in the sample and the analyzer’s optical sensors detect this movement. Absence of movement indicates that the liquid has reached its pour point.