ENSAIO DE PETRÓLEO BRUTO
CRUDE OIL ASSAY

– CAMPO TUBARÃO MARTELO –

O QUE É UM ENSAIO DE PETRÓLEO BRUTO?

Um ensaio de petróleo bruto é essencialmente a avaliação química de matérias-primas de petróleo bruto por laboratórios de testes de petróleo. Cada tipo de óleo bruto possui características químicas e moleculares únicas. Nenhum tipo de petróleo é idêntico e há diferenças cruciais na qualidade do petróleo. Os resultados dos testes de ensaio de petróleo bruto fornecem extensos dados detalhados de análise de hidrocarbonetos para refinarias, comerciantes de petróleo e produtores. (fonte: Wikipedia)

WHAT IS A CRUDE OIL ASSAY?

A crude oil assay is essentially the chemical evaluation of crude oil feedstocks by petroleum testing laboratories. Each crude oil type has unique molecular, chemical characteristics. No crude oil type is identical and there are crucial differences in crude oil quality. The results of crude oil assay testing provide extensive detailed hydrocarbon analysis data for refiners, oil traders and producers. (Source: Wikipedia)

Report of Analysis

Client: Intertek Do Brasil Inspeções Ltda
Job Location: New Orleans, LA, USA
Our Reference Number: US320-0066579
Client Reference Number: none

Sample ID: 2014-NOLA-009272-001
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - As received
Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 04-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D2892	Distillation of Crude Petroleum (15-Theoretical Plate Column)		
	Distillation Summary	See Attached Report	
ASTM D5002	Density and Relative Density of Crude Oils		
	API Gravity @ 60°F	21.0	°API
	Relative Density @ 60/60°F	0.9279	
	Density 15°C/ 59°F	0.9273	g/mL
ASTM D4928	Water in Crude Oils by Coulometric Karl Fischer Titration		
	Sample Temp - Before Mixing	23	°C
	Sample Temp - After Mixing	23	°C
	Water Content	0.26	Mass %
	Water Content	0.24	Vol %
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sample Preparation	Centrifuged	
	Sulfur Content	1.06	Wt %
ASTM D664	Acid Number of Petroleum Products by Potentiometric Titration		
	Procedure Used	A	
	Acid Number	0.25	mg KOH/g
ASTM D97	Pour Point of Petroleum Products		
	Pour Point	-30	°C
	Pour Point	-22.0	°F
IP 143	Asphaltenes (Heptane Insolubles)		
	Asphaltene Content	4.2	%(m/m)
ASTM D4007	Water and Sediment in Crude Oil		
	Total Percent Water and Sediment	0.10	Vol %
ASTM D5762	Nitrogen in Petroleum Products by Boat-Inlet Chemiluminescence		
	Nitrogen Content	5300	ppm Wt
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 68 ºF/ 20 ºC	286.5	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 86 ºF/ 30 ºC	156.1	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 122 ºF/ 50 ºC	54.65	mm²/s
UOP 46	Paraffin Wax Content of Petroleum Oils and Asphalts		
	Wax Content	6.8	Wt %
ASTM D482	Ash from Petroleum Products		
	Average Ash	0.020	Wt %
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		

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Report of Analysis

Sample ID: 2014-NOLA-009272-001
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - As received

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 04-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D6730 MOD	Determination of Light Ends in Crude Oil by Direct Injection Gas Chromatography		
	DHA results	See Attached	
ASTM D5708	Metals by ICP-AES		
	Procedure	Test Method B	
	Vanadium Content	22.0	mg/kg
	Nickel Content	11.0	mg/kg
	Iron Content	1.00	mg/kg
ASTM D3230	Salts in Crude Oil (Electrometric Method)		
	Salt Content (as electrometric chloride)	30.2	lb/1000bbl

Sample ID: 2014-NOLA-009272-004
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - IBP-150C IBP-302F

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ITM 6005	Detailed Hydrocarbon Analysis by GC		
	Total Aromatics	7.37	Vol %
	Total Naphthenes	37.66	Vol %
	Total Olefins	0.03	Vol %
	Total Paraffins	54.94	Vol %
	Total Unknowns	< 0.01	Vol %
	Specific Gravity by DHA	0.729	
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sulfur Content	0.100	Wt %
ASTM D664	Acid Number of Petroleum Products by Potentiometric Titration		
	Procedure Used	A	
	Acid Number	0.10	mg KOH/g
ASTM D4530	Micro Carbon Residue		
	Average Micro Method Carbon Residue	< 0.10	Wt %
ASTM D2500	Cloud Point		
	Cloud Point	<-30	°C
	Cloud Point	<-22.0	°F
ASTM D97	Pour Point of Petroleum Products		
	Pour Point	<-33	°C
	Pour Point	<-27.4	°F
ASTM D2386	Freezing Point of Aviation Fuels		
	Freezing Point	<-73.0	°C
	Freezing Point	<-99	°F
UOP 163	Hydrogen Sulfide and Mercaptan Sulfur		
	H2S	38	ppm Wt

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Report of Analysis

Sample ID:	2014-NOLA-009272-004	**Date Taken:**	21-October-2014
Sample Designated As:	Crude Oil	**Date Submitted:**	21-October-2014
Vessel/Location:	Brazil	**Date Tested:**	18-November-2014
Representing:	Oleo Crude - IBP-150C IBP-302F	**Drawn By:**	Intertek

Method	Test	Result	Units
UOP 163	Hydrogen Sulfide and Mercaptan Sulfur		
	Mercaptan Sulfur	169	ppm Wt
ASTM D4629	Trace Nitrogen in Liquid Petroleum Hydrocarbons		
	Nitrogen	< 0.3	mg/kg
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 100 ºF/ 37.8 ºC	0.5974	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 122 ºF/ 50 ºC	0.5380	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 140 ºF/ 60 ºC	0.5074	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 210 ºF/ 98.9 ºC	0.4035	mm²/s
ASTM D611	Aniline Point		
	Test Method	Method E in °F	
	Unable to analyze	Not enough sample	
ASTM D1322	Smoke Point of Kerosine and Aviation Turbine Fuel		
	Smoke Point (Manual Procedure)	23.0	mm
ASTM D86	Distillation		
	Barometric Pressure	758	mm Hg
	Initial Boiling Point	113.4	°F
	5% Recovery	170.4	°F
	10% Recovery	185.7	°F
	20% Recovery	203.2	°F
	30% Recovery	214.4	°F
	40% Recovery	224.6	°F
	50% Recovery	234.1	°F
	60% Recovery	243.7	°F
	70% Recovery	253.5	°F
	80% Recovery	264.5	°F
	90% Recovery	279.8	°F
	95% Recovery	296.2	°F
	Final Boiling Point	317.1	°F
	Residue	1.0	Vol %
	Corrected Loss	2.0	Vol %
	Corrected Recovery	97.1	Vol %
ASTM D976	Cetane Index (Calculated)		
	Cetane Index	20.8	
ASTM D5708	Metals by ICP-AES		
	Procedure	Test Method B	

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Report of Analysis

Sample ID: 2014-NOLA-009272-004
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - IBP-150C IBP-302F

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D5708	Metals by ICP-AES		
	Vanadium Content	<0.100	mg/kg
	Nickel Content	<0.100	mg/kg
	Iron Content	18.0	mg/kg
	High Iron	Sample stored in a metal container which leached iron into the sample	

Sample ID: 2014-NOLA-009272-005
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - 150-240C 302-464F

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D4052	Density of Liquids by Digital Density Meter		
	Density @ 15°C/59°F	0.8171	g/mL
	Relative Density @ 60/60°F	0.8174	
	API Gravity @ 60°F	41.6	°API
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sulfur Content	0.228	Wt %
ASTM D664	Acid Number of Petroleum Products by Potentiometric Titration		
	Procedure Used	A	
	Acid Number	< 0.10	mg KOH/g
ASTM D4530	Micro Carbon Residue		
	Average Micro Method Carbon Residue	< 0.10	Wt %
ASTM D2500	Cloud Point		
	Cloud Point	<-30	°C
	Cloud Point	<-22.0	°F
ASTM D97	Pour Point of Petroleum Products		
	Pour Point	<-33	°C
	Pour Point	<-27.4	°F
ASTM D2386	Freezing Point of Aviation Fuels		
	Freezing Point	-61.0	°C
	Freezing Point	-78	°F
UOP 163	Hydrogen Sulfide and Mercaptan Sulfur		
	H2S	< 1	ppm Wt
	Mercaptan Sulfur	37	ppm Wt
ASTM D4629	Trace Nitrogen in Liquid Petroleum Hydrocarbons		
	Nitrogen	1.2	mg/kg
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 100 ºF/ 37.8 ºC	1.288	mm²/s

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Report of Analysis

Sample ID:	2014-NOLA-009272-005	**Date Taken:**	21-October-2014
Sample Designated As:	Crude Oil	**Date Submitted:**	21-October-2014
Vessel/Location:	Brazil	**Date Tested:**	18-November-2014
Representing:	Oleo Crude - 150-240C 302-464F	**Drawn By:**	Intertek

Method	Test	Result	Units
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 122 ºF/ 50 ºC	1.099	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 140 ºF/ 60 ºC	0.9754	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 210 ºF/ 98.9 ºC	0.6662	mm²/s
ASTM D611	Aniline Point		
	Test Method	Method E in °F	
	Aniline Point	127.6	°F
ASTM D1322	Smoke Point of Kerosine and Aviation Turbine Fuel		
	Smoke Point (Manual Procedure)	23.0	mm
ASTM D86	Distillation		
	Barometric Pressure	758	mm Hg
	Initial Boiling Point	317.5	°F
	5% Recovery	345.0	°F
	10% Recovery	350.8	°F
	20% Recovery	358.9	°F
	30% Recovery	367.6	°F
	40% Recovery	376.8	°F
	50% Recovery	386.4	°F
	60% Recovery	397.5	°F
	70% Recovery	408.8	°F
	80% Recovery	420.4	°F
	90% Recovery	434.1	°F
	95% Recovery	443.9	°F
	Final Boiling Point	465.4	°F
	Residue	1.1	Vol %
	Corrected Loss	0.6	Vol %
	Corrected Recovery	98.3	Vol %
ASTM D976	Cetane Index (Calculated)		
	Cetane Index	36.1	
ASTM D5708	Metals by ICP-AES		
	Procedure	Test Method B	
	Vanadium Content	<0.100	mg/kg
	Nickel Content	<0.100	mg/kg
	Iron Content	0.700	mg/kg

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Report of Analysis

Sample ID:	2014-NOLA-009272-006	**Date Taken:**	21-October-2014
Sample Designated As:	Crude Oil	**Date Submitted:**	21-October-2014
Vessel/Location:	Brazil	**Date Tested:**	18-November-2014
Representing:	Oleo Crude - 240-400C 464-752F	**Drawn By:**	Intertek

Method	Test	Result	Units
ASTM D4052	Density of Liquids by Digital Density Meter		
	Density @ 15°C/59°F	0.8817	g/mL
	Relative Density @ 60/60°F	0.8822	
	API Gravity @ 60°F	28.9	°API
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sulfur Content	0.712	Wt %
ASTM D664	Acid Number of Petroleum Products by Potentiometric Titration		
	Procedure Used	A	
	Acid Number	0.20	mg KOH/g
ASTM D4530	Micro Carbon Residue		
	Average Micro Method Carbon Residue	< 0.10	Wt %
ASTM D2500	Cloud Point		
	Cloud Point	-2	°C
	Cloud Point	28.4	°F
ASTM D97	Pour Point of Petroleum Products		
	Pour Point	-3	°C
	Pour Point	26.6	°F
ASTM D2386	Freezing Point of Aviation Fuels		
	Freezing Point	4.5	°C
	Freezing Point	40	°F
UOP 163	Hydrogen Sulfide and Mercaptan Sulfur		
	H2S	< 1	ppm Wt
	Mercaptan Sulfur	14	ppm Wt
ASTM D5762	Nitrogen in Petroleum Products by Boat-Inlet Chemiluminescence		
	Nitrogen Content	880	ppm Wt
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 100 ºF/ 37.8 ºC	6.720	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 122 ºF/ 50 ºC	4.835	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 140 ºF/ 60 ºC	3.845	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 210 ºF/ 98.9 ºC	1.931	mm²/s
ASTM D611	Aniline Point		
	Test Method	Method E in °F	
	Aniline Point	148.1	°F
ASTM D1322	Smoke Point of Kerosine and Aviation Turbine Fuel		
	Smoke Point (Manual Procedure)	20.0	mm
ASTM D86	Distillation		
	Barometric Pressure	757	mm Hg
	Initial Boiling Point	502.8	°F

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Report of Analysis

Sample ID: 2014-NOLA-009272-006
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - 240-400C 464-752F

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D86	Distillation		
	5% Recovery	526.5	°F
	10% Recovery	534.0	°F
	20% Recovery	547.2	°F
	30% Recovery	561.4	°F
	40% Recovery	579.7	°F
	50% Recovery	598.3	°F
	60% Recovery	618.1	°F
	70% Recovery	639.7	°F
	80% Recovery	660.5	°F
	90% Recovery	684.9	°F
	95% Recovery	699.2	°F
	Final Boiling Point	699.3	°F
	Residue	1.5	Vol %
	Corrected Loss	1.4	Vol %
	Corrected Recovery	97.1	Vol %
ASTM D976	Cetane Index (Calculated)		
	Cetane Index	45.0	
ASTM D5708	Metals by ICP-AES		
	Procedure	Test Method B	
	Vanadium Content	<0.100	mg/kg
	Nickel Content	<0.100	mg/kg
	Iron Content	0.400	mg/kg

Sample ID: 2014-NOLA-009272-007
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - 400C+ 752F+

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D5236	Distillation of Heavy Hydrocarbon Mixtures (Vacuum Potstill Method)		
	Distillation Summary	See Attached Report	
ASTM D70	Density / Relative Density /API (Pycnometer Method)		
	Density @ 60 deg F	0.989	g/mL
	Sp Gr @ 60/60 deg F	0.990	
	API Gravity	11.5	°API
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sulfur Content	1.26	Wt %
ASTM D4530	Micro Carbon Residue		

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Report of Analysis

Sample ID: 2014-NOLA-009272-007
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - 400C+ 752F+

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D4530	Micro Carbon Residue		
	Average Micro Method Carbon Residue	12.0	Wt %
IP 143	Asphaltenes (Heptane Insolubles)		
	Asphaltene Content	6.8	%(m/m)
ASTM D5762	Nitrogen in Petroleum Products by Boat-Inlet Chemiluminescence		
	Nitrogen Content	8300	ppm Wt
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 180 ºF/ 82.2 ºC	836.3	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 212 ºF/ 100 ºC	260.1	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 275 ºF/ 135 ºC	59.03	mm²/s
ASTM D5708	Metals by ICP-AES		
	Procedure	Test Method B	
	Vanadium Content	76.0	mg/kg
	Nickel Content	37.0	mg/kg
	Iron Content	5.00	mg/kg

Sample ID: 2014-NOLA-009272-008
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - 400-550C 752-1022F

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D4052	Density of Liquids by Digital Density Meter		
	Density @ 15°C/59°F	0.9434	g/mL
	Relative Density @ 60/60°F	0.9440	
	API Gravity @ 60°F	18.4	°API
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sulfur Content	0.954	Wt %
ASTM D664	Acid Number of Petroleum Products by Potentiometric Titration		
	Procedure Used	A	
	Acid Number	0.25	mg KOH/g
ASTM D4530	Micro Carbon Residue		
	Average Micro Method Carbon Residue	0.44	Wt %
ASTM D2500	Cloud Point		
	Unable to analyze	Due to the sample matrix being dark	
ASTM D97	Pour Point of Petroleum Products		
	Pour Point	33	°C
	Pour Point	91.4	°F
ASTM D2386	Freezing Point of Aviation Fuels		

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Report of Analysis

Sample ID: 2014-NOLA-009272-008
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - 400-550C 752-1022F

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D2386	Freezing Point of Aviation Fuels		
	Unable to analyze	Due to the sample matrix being dark	
UOP 163	Hydrogen Sulfide and Mercaptan Sulfur		
	H2S	< 1	ppm Wt
	Mercaptan Sulfur	19	ppm Wt
ASTM D5762	Nitrogen in Petroleum Products by Boat-Inlet Chemiluminescence		
	Nitrogen Content	3800	ppm Wt
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 100 ºF/ 37.8 ºC	346.7	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 122 ºF/ 50 ºC	143.8	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 140 ºF/ 60 ºC	78.94	mm²/s
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 210 ºF/ 98.9 ºC	15.49	mm²/s
ASTM D611	Aniline Point		
	Test Method	Method E in °F	
	Aniline Point	174.1	°F
ASTM D1322	Smoke Point of Kerosine and Aviation Turbine Fuel		
	Unable to analyze	Due to the sample matrix being too dark	
ASTM D1160	Distillation of Petroleum Products at Reduced Pressure		
	IBP	761	°F
	AET @ 5% Recovery	798	°F
	AET @ 10% Recovery	818	°F
	AET @ 20% Recovery	835	°F
	AET @ 30% Recovery	848	°F
	AET @ 40 % Recovery	859	°F
	AET @ 50% Recovery	873	°F
	AET @ 60% Recovery	889	°F
	AET @ 70% Recovery	911	°F
	AET @ 80% Recovery	938	°F
	AET @ 90% Recovery	978	°F
	AET @ 95% Recovery	1007	°F
	FBP	1036	°F
	% Recovered	98.0	%
	% Loss	0.0	%
	% Residue	2.0	%
	Cold Trap Volume	0.0	ml

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Report of Analysis

Sample ID: 2014-NOLA-009272-008
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - 400-550C 752-1022F

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D976	Cetane Index (Calculated)		
	Cetane Index	19.9	
ASTM D5708	Metals by ICP-AES		
	Procedure	Test Method B	
	Vanadium Content	0.200	mg/kg
	Nickel Content	0.200	mg/kg
	Iron Content	<0.100	mg/kg

Sample ID: 2014-NOLA-009272-009
Sample Designated As: Crude Oil
Vessel/Location: Brazil
Representing: Oleo Crude - 550C+ 1022F+

Date Taken: 21-October-2014
Date Submitted: 21-October-2014
Date Tested: 18-November-2014
Drawn By: Intertek

Method	Test	Result	Units
ASTM D70	Density / Relative Density /API (Pycnometer Method)		
	Density @ 60 deg F	1.026	g/mL
	Sp Gr @ 60/60 deg F	1.028	
	API Gravity	6.2	°API
ASTM D4294	Sulfur Content in Petroleum Products by ED-XRF		
	Sulfur Content	1.48	Wt %
ASTM D4530	Micro Carbon Residue		
	Average Micro Method Carbon Residue	20.7	Wt %
IP 143	Asphaltenes (Heptane Insolubles)		
	Asphaltene Content	13.6	%(m/m)
ASTM D5762	Nitrogen in Petroleum Products by Boat-Inlet Chemiluminescence		
	[1] Nitrogen Content	12000	ppm Wt
ASTM D445	Kinematic / Dynamic Viscosity		
	Unable to analyze	Sample does not flow at 82.2C	
ASTM D445	Kinematic / Dynamic Viscosity		
	Unable to analyze	Sample does not flow at 100C	
ASTM D445	Kinematic / Dynamic Viscosity		
	Kinematic Viscosity @ 275 ºF/ 135 ºC	1672	mm²/s
ASTM D5708	Metals by ICP-AES		
	Procedure	Test Method B	
	Vanadium Content	136	mg/kg
	Nickel Content	66.0	mg/kg
	Iron Content	8.30	mg/kg

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[1] Out of Scope of the Method

Signed: _____ Date: _____

Intertek

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