

# Process Witnessing Report

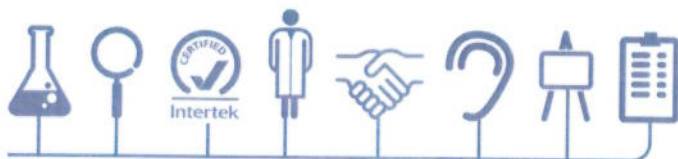
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## **Introduction**

EGM-Holding International from Papenburg/Germany along with The Centre of Excellence for Applied Research & Training (CERT) and the Higher Colleges of Technology (HCT) in Abu Dhabi have been working on a project focusing on enhancing and creating more and cleaner fuel using water. The EGM technology is stated as a bounding technology that bounds water into diesel fuel increasing the amount of output diesel while increasing the quality.

Intertek Sharjah was assigned by Etihad Group- Pakistan and Petro De Royale DMCC –Dubai to witness the above stated process and conduct sampling and analysis.

## **Process:**

The demonstration process unit installed at the facility has the following course. Input diesel and input water is passed through EGM Process unit. The final product is collected in settling tank. At this stage the product is a mixture of water and diesel. The water settles to the bottom of the tank. From the first settling tank the fuel part is transferred to second settling tank. The water settled in the first settling tank is transferred to waste water tank. The fuel from the second settling tank is transferred to final product tank. From final product tank the fuel is passed through a filtration unit to absorb water content and the sludge produced during process is transferred to sludge collection tank. The fuel thus filtered is collected in measuring tank to verify the final quantity.



**Process witnessing Details:**

**Date :** 24 May 2014

**Location:** Higher Colleges of Technology (HCT) - Abu Dhabi

Process verification Task	Intertek Verification result
Ensure all tanks are clean and empty. Ensure system piping is empty	Tanks and system pipe had negligible quantity of products to avoid air passing into piping system. This quantity is ignored as it will remain constant after the process.
Instrument calibrations and system operation	Calibration data verified by document review. System operation is satisfactory
Obtain tank dimensions that are required to allow manual tank level measurements to be converted to tank volume	Tank dimension were taken but quantity verification based on this principle is only for reference and precision data cannot be applied as the tank dimensions are not certified measurements.
Witness filling of input fuel and water tanks. Manually note all tank levels	Witnessed and drawn samples. Quantity verified.  Input fuel- 1900 litres Input water- 2300 litres
<b>During processing</b>	
Start time	1330 hrs on 24 May 2014
Instrument readings during testing . Water and fuel flow rates and total flow of each into the EGM processing unit.	Instrument data noted at regular intervals and example data is as follows.  1345 hrs <b>Water</b> Flow rate:757kg/h Pressure:3.4 bar Temperature:35.2 °C Density:0.993g/qm  <b>Fuel</b> Flow rate:756kg/h Pressure:3.4 bar Temperature:35.8 °C Density:0.817g/qm
Stop time	1538 hrs on 24 May 2014

Draw sample after initial processing but before fuel is transferred to final settling tanks (located outside):	Samples drawn from first setting tank.
Manually note level of water and fuel surfaces in the primary settling tank.	Tank dimension and fuel level noted.
Determine quantity of fuel and water remaining in the input tanks	All quantity used.
Manually note all other tank levels	Tank dimension and fuel level noted
<b>After transfer to secondary settling tanks:</b>	
Note level of fuel in secondary settling tanks.	Quantity verified
Note level of waste water in waste water tank after transfer of waste water from primary settling tank. Determine how much water has been produced.	Quantity verified Waste water Quantity: 1700 litres
Draw samples of waste water from the waste water tank.	Samples drawn
Note the level in the final product tank	Level gauge marked and noted
Final product is passed through filtration unit to remove water content and is then collected in a measuring tank to verify the quantity. Verify quantity in sludge tank.	Quantity verified and sample collected. Sludge Quantity: 45 litres Final quantity : 2400 litres of fuel



**Quality verification.**

Sample drawn at different stages were analysed. The final product sample was analysed at an interval of 1 day each to verify any quality changes. Details of analysis result are as attached. Appendix 1

**Remarks on analysis report.**

Flash Point – Increased  
Sulphur Content – Decreased  
Cetane Number – Increased  
Lubricity – Decreased  
Conductivity – Increased  
Density – Decreased  
Calorific value – Increased  
Water content – Decreased  
Aromatics – Decreased





APPENDIX 1

DIESEL OIL SAMPLES FROM PROCESS UNIT  
Lab. Report: SHRJ-002166/14

SR.NO	Lab. ID	TEST	METHOD	UNIT	Input fuel on 24/05/2014	Final Product Tank On 25/05/2014 - 1st Day	Final Product Tank On 25/05/2014 - 2nd Day	Final Product Tank On 25/05/2014 - 3rd Day	Final Product Tank On 25/05/2014 - 4th Day	Final Product Tank On 25/05/2014 - 5th Day	Final Product Tank On 25/05/2014 - 6th Day
					<b>2166</b>	<b>2166A</b>	<b>2166B</b>	<b>2166C</b>	<b>2166D</b>	<b>2166E</b>	<b>2166F</b>
1		Flash Point	ASTM D93	°C	60.0	69.0	67.0	67.0	66.0	66.0	66.0
2		Kinematic Viscosity @ 100 °F	ASTM D445	mm <sup>2</sup> /s	2.784	2.992	2.970	2.917	2.979	2.920	2.913
3		<b>Distillation, IBP</b>	ASTM_D86	°C	165.6	177.6	175.9	175.3	175.4	173.0	173.8
		10% Recovery, °C,			201.1	212.3	210.8	211.7	212.1	208.8	209.8
		50% Recovery, °C,			276.0	279.5	277.5	278.3	278.7	277.8	277.7
		90% Recovery, °C,			349.7	346.0	342.5	342.6	342.2	342.2	341.8
		Final Boiling Point			377.9	377.2	376.4	376.2	376.9	376.7	376.7
		Loss		Vol %	1.0	1.0	1.0	1.0	1.0	1.0	1.0
		Residue		Vol %	1.1	1.1	1.0	1.0	1.0	1.0	1.0

SR.NO	TEST	METHOD	UNIT	Input fuel on 24/05/2014	Final Product Tank On 25/05/2014 - 1st Day	Final Product Tank On 25/05/2014 - 2nd Day	Final Product Tank On 25/05/2014 - 3rd Day	Final Product Tank On 25/05/2014 - 4th Day	Final Product Tank On 25/05/2014 - 5th Day	Final Product Tank On 25/05/2014 - 6th Day
4	Sediment and Water	ASTM_D2709	Vol %	0.000	0.000	0.000	0.000	0.000	0.000	0.000
5	Acid Number	ASTM D974	mgKOH/g	0.02	0.02	0.02	0.03	0.02	0.02	0.02
6	Sulfur Content	ASTM D5453	mg/kg	265	148	151	144	143	139	139
7	Copper Corrosion@50°C/3 Hrs	ASTM D130		1a	1a	1a	1a	1a	1a	1a
8	Microcarbon Residue on 10% Distillation Residue	ASTM_D4530	Wt %	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
9	Ash Content	ASTM D482	Wt %	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
10	Cetane Number	ASTM D613		52.6	56.2	55.1	55.0	55.4	54.7	55.1
11	Electrical Conductivity	ASTM D2624	pS/M	<1@ 27.2°C	132 @ 30.6°C	74 @ 24.6°C	72 @ 25.0°C	68 @ 24.0°C	69 @ 24.0°C	71 @ 23.2
12	Lubricity(Wear Scar Diameter)	ASTM D6079	µm	530	460	420	400	420	350	430
13	Cloud Point	ASTM D2500	°C	+1	+1	+1	+1	+1	0	+1
14	Density @ 15°C	ASTM D4052	Wt %	0.8329	0.8289	0.8289	0.8289	0.8289	0.8288	0.8288
15	Gross Calorific Value	ASTM D240	Kcal/kg	10998	11024	11009	11009	11009	11012	11012
16	Water Content	ASTM D6304	mg/kg	137	188	147	137	118	134	108





SR.NO	TEST	METHOD	UNIT	Input fuel on 24/05/2014	Final Product Tank On 25/05/2014 - 1st Day	Final Product Tank On 25/05/2014 - 2nd Day	Final Product Tank On 25/05/2014 - 3rd Day	Final Product Tank On 25/05/2014 - 4th Day	Final Product Tank On 25/05/2014 - 5th Day	Final Product Tank On 25/05/2014 - 6th Day
17	Aromatics	ASTM D1319	Vol %	25.5	21.8	21.2	21.1	20.6	21.3	21.5
18	Olefins	ASTM D1319	Vol %	0.8	0.7	1.1	1.0	1.0	1.0	0.8
19	Saturates	ASTM D1319	Vol %	73.7	77.5	77.5	77.9	78.4	77.7	77.7
20	Total Bacterial Count	IP 385	CFU/L	N/A	N/A	N/A	700	3400	Zero	Zero
21	Yeast & Mould	IP 385	CFU/L	N/A	N/A	N/A	800	Zero	Zero	Zero

Water sample analysis report

**ANALYSIS REPORT**

Report No. AE131-20126/14	Lab Sample ID: DL 9797 A	Date : 29/05/2014
<i>Client/Establishment</i>	<i>Name:</i> PETRO DE ROYALE	
	<i>Address &amp; Location:</i> Abu Dhabi, UAE	
<i>Sampling Date:</i>	24/05/2014	<i>Receiving Date:</i> 26/05/2014
<i>Sampled by:</i>	Intertek	<i>Temp. on receipt of sample:</i> 26°C
<i>Delivered by:</i>	Intertek	<i>Received by:</i> G.V
<i>Sample Type:</i>	Water	<i>Sample Received Condition:</i> Normal
<i>Source of Sample/Sampling point:</i>	See below	<i>Tested By:</i> G.V
<i>Sampling Procedure:</i>	In House	<i>Appearance of Sample:</i> Clear Liquid
<i>Sample Container:</i>	Plastic Bottle	<i>Treatment/Preservation:</i> Normal
<i>Description on sample label:</i>	SAMPLE TYPE: WATER, SAMPLE POINT: INPUT, LOCATION: ABUDHABI HIGHER COLLEGE OF TECHNOLOGY, DATE: 24/05/2014	

**TEST RESULTS**

SR. NO.	TEST	METHOD	UNIT	RESULT
1.	Density @ 20°C	ASTM D 4052	mg/L	0.9982
2.	Electrical Conductivity @ 25°C	APHA 2510 B	µS/cm	122.4

**Conclusion:**

Based on our intervention in witnessing the process we have verified that the process demonstration lead to increased quantity and improved quality in comparison to input fuel.

Any advice, opinions, or recommendations within this document should be read and relied upon only in the context of the document as a whole and for the purpose for which it was prepared and provided. Customer is responsible for acting as it sees fit on the basis of such advice, opinions, and recommendations.

**Process witnessed by:**



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**Lijin V, Pillai**  
**Business Development Manager**



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**George Idicula**  
**Sharjah Laboratory Manager**