COMPOSITIONAL ANALYSIS REPORT FOR NATURAL GAS FROM YOKRI-FORCADOS WELLHEADS, DELTA STATE

FOR

SHELL PETROLEUM DEVELOPMENT COMPANY OF NIGERIA

BY

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Report General Information

Reporting Company	International Energy Services Limited
Report Description	Gas Chromatography Analysis of Gas Sample
Report Number	IES-ELS-12082020-020091
Reporting Date	14/09/2020
Field	Yokri-Forcados, Escravos and Otumara Fields
Field Location	Yokri-Forcados Wellheads
State/Province	Delta State, Niger Delta
Country	Nigeria

Approval

Responsibilities	**Reviewed By**	**Approved By**	**SPDC Approval**
Name			
Position			
Date			

REPORT ON YOKRI-FORCADOS WELLHEAD GAS ANALYSIS

1.0 Sample Collection

IESL mobilized personnel and equipment for field sampling campaign on July 20, 2020, to collect well-head samples from Yokri-Forcados, Escravos and Otumara stations respectively. IESL personnel observed a 7 days COVID-19 protocol from July 20 to July 26, 2020 before the commencement of work in all the stations. Work commenced in Yokri-Forcados station on July 27, 2020

A total of (5) samples were collected from wellhead flow arm at the station. The well head samples were flashed and gases collected for both compositional and hydrogen sulfide (H2S) analysis in the laboratory.

The gas line was properly flushed to remove dead gas along the line and the pressure and temperature observed and recorded.

2.0 Sample Reception

On August 17, 2020, five (5) gas samples collected from Otumara station were received in our laboratory for compositional analyses.

3.0 Validity Check

The integrity of the gas samples was confirmed through opening pressure check for all the samples.

4.0 Analytical Method

The gas samples were analyzed by gas chromatography technique for their molecular compositions, using ASTM D1945, as standard test method. The results of the analyses are as contained in this report.

Key to Terms and Units Used

g/mol	Gram per mol
mol%	Mole percent
Btu/scf	British thermal units / standard cubic foot
ASTM	American Society for Testing and Materials

Yokri-Forcados WELL 113

Gas Composition

SN	Component	Mol %
1	Nitrogen	0.15
2	Hydrogen Sulfide	0.00
3	Carbon Dioxide	1.38
4	Methane	95.56
5	Ethane	2.62
6	Propane	0.08
7	i-Butane	0.04
8	n-Butane	0.03
9	i-Pentane	0.12
10	n-Pentane	0.01
11	Hexane	0.01
12	Heptane plus	0.00
	Total	**100**

Gas Properties:

1	Molecular Weight (g/mol)	16.94
2	Specific Gravity (air=1)	0.585
3	Mole % C_{7+}	0.00
4	Mol wt C_7+ (g/mol)	0.000
5	Gross Heat Content (Btu/ft3)	1023.63
6	Net heat Content (Btu/ft3)	920.08
7	Wobbe Index (Btu/ft3)	1338.34
8	H2S	<0.2ppm

Yokri-Forcados WELL 115T

Gas Composition

SN	Component	Mol %
1	Nitrogen	0.16
2	Hydrogen Sulfide	0.00
3	Carbon Dioxide	1.44
4	Methane	93.60
5	Ethane	2.97
6	Propane	0.12
7	i-Butane	0.03
8	n-Butane	0.02
9	i-Pentane	0.18
10	n-Pentane	0.49
11	Hexane	0.43
12	Heptane plus	0.56
	Total	**100**

Gas Properties:

1	Molecular Weight (g/mol)	18.07
2	Specific Gravity (air=1)	0.624
3	Mole % C_{7+}	0.56
4	Mol wt C_7+ (g/mol)	100.321
5	Gross Heat Content (Btu/ft3)	1084.51
6	Net heat Content (Btu/ft3)	976.93
7	Wobbe Index (Btu/ft3)	1372.91
8	H2S	<0.2ppm

Yokri-Forcados WELL 152

Gas Composition

SN	Component	Mol %
1	Nitrogen	0.09
2	Hydrogen Sulfide	0.00
3	Carbon Dioxide	0.12
4	Methane	95.47
5	Ethane	3.83
6	Propane	0.20
7	i-Butane	0.08
8	n-Butane	0.01
9	i-Pentane	0.09
10	n-Pentane	0.01
11	Hexane	0.04
12	Heptane plus	0.06
	Total	**100**

Gas Properties:

1	Molecular Weight (g/mol)	16.85
2	Specific Gravity (air=1)	0.582
3	Mole % C_{7+}	0.06
4	Mol wt C_7+ (g/mol)	99.667
5	Gross Heat Content (Btu/ft3)	1051.72
6	Net heat Content (Btu/ft3)	945.82
7	Wobbe Index (Btu/ft3)	1378.60
8	H2S	<0.2ppm

Yokri-Forcados WELL 117

Gas Composition

SN	Component	Mol %
1	Nitrogen	0.06
2	Hydrogen Sulfide	0.00
3	Carbon Dioxide	0.27
4	Methane	94.12
5	Ethane	3.95
6	Propane	0.25
7	i-Butane	0.13
8	n-Butane	0.04
9	i-Pentane	0.62
10	n-Pentane	0.30
11	Hexane	0.13
12	Heptane plus	0.13
	Total	**100**

Gas Properties:

1	Molecular Weight (g/mol)	17.54
2	Specific Gravity (air=1)	0.605
3	Mole % C_{7+}	0.13
4	Mol wt C_7+ (g/mol)	101.077
5	Gross Heat Content (Btu/ft3)	1085.51
6	Net heat Content (Btu/ft3)	977.30
7	Wobbe Index (Btu/ft3)	1395.58
8	H2S	<0.2ppm

Yokri-Forcados WELL 127T

Gas Composition

SN	Component	Mol %
1	Nitrogen	0.07
2	Hydrogen Sulfide	0.00
3	Carbon Dioxide	0.54
4	Methane	91.70
5	Ethane	7.31
6	Propane	0.16
7	i-Butane	0.01
8	n-Butane	0.01
9	i-Pentane	0.01
10	n-Pentane	0.11
11	Hexane	0.03
12	Heptane plus	0.05
	Total	**100**

Gas Properties:

1	Molecular Weight (g/mol)	17.41
2	Specific Gravity (air=1)	0.601
3	Mole % C_{7+}	0.05
4	Mol wt C_7+ (g/mol)	100.400
5	Gross Heat Content (Btu/ft3)	1071.87
6	Net heat Content (Btu/ft3)	964.75
7	Wobbe Index (Btu/ft3)	1382.63
8	H2S	<0.2ppm