

CONCLUSIONS

There is a significant economic advantage to reform naphtha at low pressure (50 psig) as opposed to high pressure (125 psig). This is particularly true for an extremely lean naphtha produced by F-T synthesis. For the case of a 40,000 BPD unit processing a full-boiling range (FBR) Arge naphtha, an additional 5.4 vol-% yield is obtained at low pressure. This translates into 767,000 bbl of additional reformat over the course of a year. Process economics are tightly related to liquid product yield, and the additional reformat yield of the 50 psig operation adds over \$29,000/day to the gross margin. Although the low pressure unit has a larger catalyst regenerator (more capital) and has a higher utility consumption, the after-tax IRR increases by a factor of 1.3 as pressure is reduced from 125 to 50 psig because of the yield advantage.

Two naphtha upgrading process flow schemes are evaluated in this report. Low pressure reforming of the FBR naphtha is compared to a split-naphtha scheme where light and heavy naphtha is processed separately, so as to maximize yield. For gasoline production, we show that the additional complexity and capital required for the split-naphtha case are not economically justified.

Finally, two sources of F-T naphtha were evaluated. Arge synthesis produces a straight-chain naphtha without aromatics. Synthol F-T synthesis produces a naphtha that is highly branched, and has some aromatic content (15 wt-%). Although branched paraffins are more difficult to reform than normal paraffins, Synthol naphtha produces more attractive reforming economics than Arge naphtha. The economic advantage results from a lower capital cost design (higher LHSV) that is made possible by the presence of aromatics.

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APPENDIX A

PILOT PLANT DATA

Feedstock	Arge Heavy Naphtha					
Run	1	1	1	1	1	1
Period	1	2	3	4	5	6
Pressure, psig	125	125	125	125	125	125
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%						
=====						
H2	3.18	3.18	3.18	3.09	3.43	3.42
C1	1.32	1.21	1.15	1.13	1.20	1.16
C2	2.82	2.71	2.69	2.77	3.05	2.94
C3	4.90	4.64	4.58	5.24	4.64	4.37
iC4	1.90	1.78	1.84	2.21	1.71	1.56
nC4	2.24	3.14	6.78	2.49	3.39	3.17
iC5	2.99	3.99	2.56	2.21	2.69	2.30
nC5	2.17	2.59	1.92	1.90	2.32	1.76
C6+	78.48	76.76	75.30	78.96	77.57	79.32
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	87.78	88.26	88.40	87.77	87.68	88.11
C5+	83.64	83.34	79.78	83.07	82.58	83.38
Gas Yields, SCFB						
=====						
H2	1534	1533	1532	1489	1655	1650
C1	80	74	70	69	73	70
C2	91	88	87	90	99	95
C3	108	102	101	115	102	96
C1-C3	<u>279</u>	<u>264</u>	<u>258</u>	<u>274</u>	<u>274</u>	<u>262</u>
Liq. Yields, Vol-%						
=====						
iC4	2.46	2.31	2.39	2.87	2.22	2.03
nC4	2.80	3.93	6.48	3.11	4.24	3.97
iC5	3.49	4.67	3.00	2.58	3.15	2.69
nC5	2.51	3.00	2.23	2.20	2.69	2.04
C4+	79.41	80.83	81.68	79.94	79.41	79.53
C5+	74.15	74.59	70.81	73.96	72.95	73.53
C6+	68.15	66.92	65.58	69.18	67.11	68.80
C5+ RONC	100.00	98.80	99.40	97.90	100.00	99.00

Liquid Product
Composition, Wt-%

Run Period	1	1	1	1	1	1
	1	2	3	4	5	6

Aromatics

=====

Benzene
Toluene
Ethylbenzene
p-Xylene
m-Xylene
o-Xylene
A9+
Total Arom.

Olefins

=====

Para + Naph

=====

Propane
i-Butane
n-Butane
i-Pentane
n-Pentane
Cyclopentane

C6 Isoparaffins

n-Hexane
MCP
Cyclohexane

C7 Isoparaffins

n-Heptane
C7 Cyclopent.
Methylcyclohex.

C8 Isoparaffins

n-Octane
C8 Cyclopent.
C8 Cyclohex.

C9 Naphthenes

C9 Paraffins
C10 Naphthenes
C10 Paraffins
C11 Naphthenes
C11 Paraffins

C12 P+N

Poly Naphthenes
Heavy P+N

Total Paraffins	0.0	0.0	0.0	0.0	0.0	0.0
Total Naphthenes	0.0	0.0	0.0	0.0	0.0	0.0

Feedstock	Arge Heavy Naphtha					
Run	1	1	1	1	1	1
Period	7	8	9	10	11	12
Pressure, psig	125	125	125	123	124	125
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%						
=====						
H2	3.39	3.40	3.32	2.25	2.60	2.61
C1	1.18	1.18	1.15	0.65	0.80	0.80
C2	3.00	2.97	2.90	1.72	2.10	2.11
C3	4.51	4.36	4.28	2.97	3.42	3.45
iC4	1.67	1.57	1.54	1.06	1.21	1.27
nC4	3.31	3.07	3.03	2.49	2.65	2.94
iC5	3.21	2.49	2.49	2.39	2.31	2.21
nC5	2.42	1.93	1.93	1.77	1.68	1.76
C6+	77.31	79.03	79.36	84.70	83.23	82.85
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	87.92	88.09	88.35	92.41	91.08	91.03
C5+	82.94	83.45	83.78	88.86	87.22	86.82
Gas Yields, SCFB						
=====						
H2	1633	1638	1599	1084	1253	1257
C1	72	72	70	39	49	49
C2	97	96	94	56	68	68
C3	99	96	94	66	75	76
C1-C3	<u>268</u>	<u>264</u>	<u>258</u>	<u>160</u>	<u>192</u>	<u>193</u>
Liq. Yields, Vol-%						
=====						
iC4	2.17	2.04	2.00	1.38	1.57	1.65
nC4	4.14	3.84	3.79	3.11	3.32	3.68
iC5	3.76	2.91	2.91	2.80	2.70	2.59
nC5	2.80	2.24	2.24	2.05	1.95	2.04
C4+	79.93	79.82	80.14	87.50	84.98	85.14
C5+	73.62	73.94	74.35	83.01	80.09	79.81
C6+	67.06	68.79	69.20	78.16	75.44	75.18
C5+ RONC	99.70	99.50	99.10	77.30	85.90	86.50

Liquid Product
Composition, Wt-%
Run
Period

	1 7	1 8	1 9	1 10	1 11	1 12
Aromatics						
=====						
Benzene		0.8				0.5
Toluene		3.6				2.3
Ethylbenzene		1.0				0.6
p-Xylene		1.4				0.9
m-Xylene		2.9				1.9
o-Xylene		2.1				1.3
A9+		65.1				49.7
Total Arom.		76.9				57.2
Olefins		0.5				0.5
=====						
Para + Naph						
=====						
Propane		0.0				0.0
i-Butane		0.0				0.0
n-Butane		0.0				0.0
i-Pentane		2.4				2.2
n-Pentane		2.0				1.8
Cyclopentane		0.1				0.1
C6 Isoparaffins		3.7				3.7
n-Hexane		1.6				1.7
MCP		0.2				0.3
Cyclohexane		0.0				0.0
C7 Isoparaffins		3.2				3.6
n-Heptane		0.9				1.1
C7 Cyclopent.		0.2				0.3
Methylcyclohex.		0.0				0.0
C8 Isoparaffins		1.7				2.8
n-Octane		0.4				0.7
C8 Cyclopent.		0.0				0.2
C8 Cyclohex.		0.1				0.0
C9 Naphthenes		0.2				0.6
C9 Paraffins		4.2				13.5
C10 Naphthenes		0.1				0.3
C10 Paraffins		1.4				7.5
C11 Naphthenes		0.0				0.0
C11 Paraffins		0.2				1.8
C12 P+N		0.0				0.0
Poly Naphthenes		0.0				0.1
Heavy P+N		0.0				0.0
Total Paraffins	0.0	21.7	0.0	0.0	0.0	40.4
Total Naphthenes	0.0	0.9	0.0	0.0	0.0	1.9

Feedstock	Arge Heavy Naphtha			
Run	1	1	1	1
Period	13	14	15	16
Pressure, psig	126	125	125	126
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%				
=====				
H2	3.70	3.54	2.49	2.51
C1	1.45	1.39	0.81	0.82
C2	4.05	3.83	2.07	2.11
C3	5.17	4.73	3.21	3.35
iC4	1.72	1.53	1.11	1.18
nC4	3.61	3.12	2.67	2.87
iC5	2.37	2.54	2.39	2.39
nC5	1.89	1.91	1.94	1.94
C6+	76.04	77.41	83.31	82.83
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	85.63	86.51	91.42	91.21
C5+	80.30	81.86	87.64	87.16
Gas Yields, SCFB				
=====				
H2	1783	1710	1200	1212
C1	88	84	49	50
C2	131	124	67	68
C3	114	104	71	74
C1-C3	<u>333</u>	<u>313</u>	<u>187</u>	<u>192</u>
Liq. Yields, Vol-%				
=====				
iC4	2.24	1.98	1.44	1.53
nC4	4.52	3.91	3.34	3.59
iC5	2.77	2.97	2.80	2.79
nC5	2.19	2.22	2.25	2.24
C4+	76.94	77.47	85.74	85.96
C5+	70.18	71.58	80.96	80.84
C6+	65.22	66.39	75.91	75.81
C5+ RONC	102.10	101.80	83.30	82.30

Liquid Product
Composition, Wt-%

Run Period	1 13	1 14	1 15	1 16
Aromatics =====				
Benzene		1.0		0.5
Toluene		4.7		2.1
Ethylbenzene		1.3		0.6
p-Xylene		1.6		0.8
m-Xylene		3.4		1.8
o-Xylene		2.5		1.2
A9+		67.9		45.3
Total Arom.		82.4		52.3
Olefins =====				
		0.6		0.6
Para + Naph =====				
Propane		0.0		0.0
i-Butane		0.0		0.0
n-Butane		0.0		0.0
i-Pentane		2.4		2.4
n-Pentane		2.1		2.0
Cyclopentane		0.1		0.1
C6 Isoparaffins				
n-Hexane		3.4		3.5
MCP		1.6		1.6
Cyclohexane		0.2		0.3
		0.0		0.0
C7 Isoparaffins				
n-Heptane		2.5		3.3
C7 Cyclopent.		0.7		1.0
Methylcyclohex.		0.2		0.4
		0.0		0.0
C8 Isoparaffins				
n-Octane		0.9		2.7
C8 Cyclopent.		0.3		0.8
C8 Cyclohex.		0.0		0.3
		0.1		0.0
C9 Naphthenes				
C9 Paraffins		0.1		0.9
C10 Naphthenes		1.8		15.2
C10 Paraffins		0.0		0.5
C11 Naphthenes		0.5		9.4
C11 Paraffins		0.0		0.0
		0.1		2.5
C12 P+N				
Poly Naphthenes		0.0		0.1
Heavy P+N		0.0		0.0
Total Paraffins	0.0	16.3	0.0	44.5
Total Naphthenes	0.0	0.7	0.0	2.6

Feedstock	Arge Heavy Naphtha					
Run	2	2	2	2	2	2
Period	1	2	3	4	5	6
Pressure, psig	58	58	59	59	58	58
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%						
=====						
H2	4.38	4.33	4.33	3.93	3.84	3.91
C1	0.88	0.84	0.84	0.69	0.67	0.64
C2	1.82	1.77	1.80	1.59	1.52	1.48
C3	2.88	2.70	2.85	2.65	2.43	2.37
iC4	1.19	1.02	1.12	0.99	1.01	0.89
nC4	2.19	1.97	2.06	1.61	2.21	1.93
iC5	0.94	1.54	1.28	1.27	2.05	1.71
nC5	0.69	1.37	1.20	1.12	1.38	1.12
C6+	85.03	84.46	84.52	86.15	84.89	85.95
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	90.04	90.36	90.18	91.14	91.54	91.60
C5+	86.66	87.37	87.00	88.54	88.32	88.78
Gas Yields, SCFB						
=====						
H2	2113	2090	2087	1895	1851	1886
C1	54	51	51	42	41	39
C2	59	57	58	51	49	48
C3	64	59	63	58	54	52
C1-C3	<u>176</u>	<u>167</u>	<u>172</u>	<u>151</u>	<u>143</u>	<u>139</u>
Liq. Yields, Vol-%						
=====						
iC4	1.55	1.33	1.45	1.28	1.31	1.15
nC4	2.74	2.46	2.57	2.01	2.76	2.41
iC5	1.10	1.81	1.50	1.49	2.40	2.00
nC5	0.79	1.59	1.39	1.30	1.59	1.30
C4+	78.20	79.31	79.20	81.13	82.05	81.82
C5+	73.91	75.52	75.18	77.84	77.99	78.26
C6+	72.02	72.12	72.29	75.05	74.00	74.96
C5+ RONC	103.60	102.00	102.40	98.20	97.50	97.20

Liquid Product
Composition, Wt-%
Run
Period

	2 1	2 2	2 3	2 4	2 5	2 6
Aromatics						
=====						
Benzene	0.8		0.9		0.6	
Toluene	3.8		3.6		2.7	
Ethylbenzene	1.0		0.9		0.7	
p-Xylene	1.4		1.3		1.0	
m-Xylene	3.1		2.8		2.2	
o-Xylene	2.5		2.1		1.7	
A9+	76.5		73.2		65.9	
Total Arom.	89.1		84.8		74.8	
Olefins	0.4		0.4		0.5	
=====						
Para + Naph						
=====						
Propane	0.0		0.0		0.0	
i-Butane	0.0		0.0		0.0	
n-Butane	0.0		0.0		0.0	
i-Pentane	0.5		0.9		2.0	
n-Pentane	0.6		1.0		1.4	
Cyclopentane	0.0		0.1		0.1	
C6 Isoparaffins	2.1		2.5		2.4	
n-Hexane	0.9		1.1		1.1	
MCP	0.1		0.2		0.2	
Cyclohexane	0.0		0.0		0.0	
C7 Isoparaffins	2.0		2.3		2.3	
n-Heptane	0.5		0.6		0.7	
C7 Cyclopent.	0.1		0.1		0.2	
Methylcyclohex.	0.0		0.0		0.0	
C8 Isoparaffins	0.8		1.1		1.5	
n-Octane	0.2		0.3		0.5	
C8 Cyclopent.	0.1		0.1		0.2	
C8 Cyclohex.	0.0		0.0		0.0	
C9 Naphthenes	0.1		0.2		0.5	
C9 Paraffins	1.8		3.0		7.5	
C10 Naphthenes	0.0		0.1		0.2	
C10 Paraffins	0.6		1.0		3.2	
C11 Naphthenes	0.0		0.0		0.0	
C11 Paraffins	0.1		0.1		0.6	
C12 P+N	0.0		0.0		0.0	
Poly Naphthenes	0.0		0.1		0.1	
Heavy P+N	0.0		0.0		0.0	
Total Paraffins	10.1	0.0	13.9	0.0	23.2	0.0
Total Naphthenes	0.4	0.0	0.9	0.0	1.5	0.0

Feedstock	Arge Heavy Naphtha			
Run	2	2	2	2
Period	7	8	9	10
Pressure, psig	58	57	58	58
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%				
=====				
H2	3.35	3.33	3.86	3.75
C1	0.58	0.58	0.67	0.62
C2	1.34	1.33	1.60	1.49
C3	2.21	2.10	2.47	2.32
iC4	0.82	0.81	0.85	0.81
nC4	1.81	1.80	1.68	1.86
iC5	1.51	1.60	1.18	1.18
nC5	1.11	1.20	0.94	0.94
C6+	87.27	87.25	86.75	87.03
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	92.52	92.66	91.40	91.82
C5+	89.89	90.05	88.87	89.15
Gas Yields, SCFB				
=====				
H2	1617	1604	1861	1807
C1	35	35	41	38
C2	43	43	52	48
C3	49	46	55	51
C1-C3	<u>128</u>	<u>124</u>	<u>147</u>	<u>137</u>
Liq. Yields, Vol-%				
=====				
iC4	1.07	1.05	1.11	1.05
nC4	2.26	2.25	2.10	2.33
iC5	1.77	1.87	1.38	1.38
nC5	1.29	1.39	1.09	1.09
C4+	83.88	84.28	81.49	82.42
C5+	80.55	80.98	78.28	79.04
C6+	77.49	77.72	75.81	76.57
C5+ RONC	91.60	90.90	97.10	95.50

Liquid Product
Composition, Wt-%

Run Period	2 7	2 8	2 9	2 10
Aromatics =====				
Benzene		0.5		0.6
Toluene		2.3		2.6
Ethylbenzene		0.6		0.7
p-Xylene		0.8		1.0
m-Xylene		1.8		2.0
o-Xylene		1.3		1.5
A9+		57.1		63.2
Total Arom.		64.4		71.6
Olefins =====				
		0.4		0.5
Para + Naph =====				
Propane		0.0		0.0
i-Butane		0.0		0.0
n-Butane		0.0		0.0
i-Pentane		1.4		1.3
n-Pentane		1.1		1.2
Cyclopentane		0.0		0.1
C6 Isoparaffins				
n-Hexane		1.1		1.1
MCP		0.3		0.3
Cyclohexane		0.0		0.0
C7 Isoparaffins				
n-Heptane		0.7		0.7
C7 Cyclopent.		0.3		0.3
Methylcyclohex.		0.0		0.0
C8 Isoparaffins				
n-Octane		0.7		0.5
C8 Cyclopent.		0.3		0.2
C8 Cyclohex.		0.0		0.0
C9 Naphthenes				
C9 Paraffins		12.6		9.2
C10 Naphthenes		0.4		0.3
C10 Paraffins		7.1		4.7
C11 Naphthenes		0.0		0.0
C11 Paraffins		1.8		1.1
C12 P+N				
Poly Naphthenes		0.2		0.2
Heavy P+N		0.0		0.0
Total Paraffins	0.0	33.0	0.0	25.8
Total Naphthenes	0.0	2.2	0.0	2.1

Feedstock	Arge Heavy Naphtha					
Run	3	3	3	3	3	3
Period	1	3	4	5	6	7
Pressure, psig	56	60	59	59	60	60
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%						
=====						
H2	4.00	3.55	3.55	3.46	3.13	2.10
C1	0.67	0.66	0.76	0.92	1.19	1.68
C2	1.67	1.62	2.01	2.44	3.36	5.06
C3	3.00	2.84	3.20	3.44	4.33	5.39
iC4	1.29	1.32	1.38	1.26	1.51	1.40
nC4	2.20	2.52	2.56	2.65	3.27	3.97
iC5	1.42	1.72	1.97	1.95	1.84	1.73
nC5	0.93	1.35	1.60	1.64	1.70	2.05
C6+	84.83	84.42	82.97	82.26	79.67	76.62
	<u>100.01</u>	<u>100.00</u>	<u>100.00</u>	<u>100.02</u>	<u>100.00</u>	<u>100.00</u>
C4+	90.67	91.33	90.48	89.76	87.99	85.77
C5+	87.18	87.49	86.54	85.85	83.21	80.40
Gas Yields, SCFB						
=====						
H2	1928	1712	1714	1667	1508	1013
C1	40	40	46	56	72	102
C2	54	52	65	79	109	164
C3	66	63	71	76	96	119
C1-C3	<u>161</u>	<u>155</u>	<u>182</u>	<u>210</u>	<u>277</u>	<u>384</u>
Liq. Yields, Vol-%						
=====						
iC4	1.67	1.71	1.80	1.64	1.96	1.82
nC4	2.75	3.16	3.20	3.31	4.08	4.97
iC5	1.66	2.01	2.31	2.28	2.15	2.02
nC5	1.08	1.57	1.85	1.90	1.97	2.37
C4+	80.56	82.11	81.40	80.56	80.79	83.16
C5+	76.14	77.24	76.40	75.61	74.75	76.37
C6+	73.40	73.66	72.24	71.43	70.63	71.98
C5+ RONC	102.70	98.30	98.10	98.10	93.70	82.00

Liquid Product
Composition, Wt-%

Run Period	3 1	3 3	3 4	3 5	3 6	3 7
---------------	--------	--------	--------	--------	--------	--------

Aromatics

=====

Benzene
Toluene
Ethylbenzene
p-Xylene
m-Xylene
o-Xylene
A9+
Total Arom.

Olefins

=====

Para + Naph

=====

Propane
i-Butane
n-Butane
i-Pentane
n-Pentane
Cyclopentane

C6 Isoparaffins

n-Hexane
MCP
Cyclohexane

C7 Isoparaffins

n-Heptane
C7 Cyclopent.
Methylcyclohex.

C8 Isoparaffins

n-Octane
C8 Cyclopent.
C8 Cyclohex.

C9 Naphthenes

C9 Paraffins
C10 Naphthenes
C10 Paraffins
C11 Naphthenes
C11 Paraffins

C12 P+N

Poly Naphthenes
Heavy P+N

Total Paraffins	0.0	0.0	0.0	0.0	0.0	0.0
Total Naphthenes	0.0	0.0	0.0	0.0	0.0	0.0

Feedstock	Arge Heavy Naphtha					
Run	4	4	4	4	4	4
Period	1	2	3	4	5	6
Pressure, psig	125	125	125	125	125	125
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%						
=====						
H2	3.15	2.98	2.97	3.00	2.80	1.98
C1	1.30	1.14	1.07	1.15	1.56	2.11
C2	3.20	2.91	2.86	3.40	4.90	6.96
C3	5.67	5.27	5.02	5.29	6.26	7.88
iC4	2.44	2.29	2.10	1.92	2.01	2.14
nC4	4.14	4.09	3.97	4.11	4.33	5.28
iC5	3.43	3.69	3.55	3.29	2.98	2.33
nC5	2.45	2.47	2.24	2.30	2.38	2.59
C6+	74.21	75.16	76.22	75.55	72.78	68.73
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.01</u>	<u>100.00</u>	<u>100.00</u>
C4+	86.67	87.70	88.08	87.17	84.48	81.07
C5+	80.09	81.32	82.01	81.14	78.14	73.65
Gas Yields, SCFB						
=====						
H2	1526	1439	1432	1448	1349	957
C1	79	69	65	70	95	128
C2	103	94	92	110	159	225
C3	125	116	111	117	138	174
C1-C3	<u>308</u>	<u>279</u>	<u>268</u>	<u>296</u>	<u>391</u>	<u>527</u>
Liq. Yields, Vol-%						
=====						
iC4	3.16	2.97	2.73	2.49	2.61	2.77
nC4	5.17	5.11	4.97	5.14	5.41	6.60
iC5	4.01	4.32	4.16	3.85	3.48	2.72
nC5	2.83	2.87	2.59	2.66	2.75	3.00
C4+	79.38	80.67	81.28	79.97	77.37	74.91
C5+	71.05	72.59	73.58	72.34	69.35	65.54
C6+	64.21	65.40	66.83	65.83	63.12	59.82
C5+ RONC	101.80	100.50	99.10	99.30	99.70	97.40

Liquid Product
Composition, Wt-%
Run
Period

Run	4	4	4	4	4	4
Period	1	2	3	4	5	6

Aromatics
=====

Benzene
Toluene
Ethylbenzene
p-Xylene
m-Xylene
o-Xylene
A9+
Total Arom.

Olefins
=====

Para + Naph
=====

Propane
i-Butane
n-Butane
i-Pentane
n-Pentane
Cyclopentane

C6 Isoparaffins
n-Hexane
MCP
Cyclohexane

C7 Isoparaffins
n-Heptane
C7 Cyclopent.
Methylcyclohex.

C8 Isoparaffins
n-Octane
C8 Cyclopent.
C8 Cyclohex.

C9 Naphthenes
C9 Paraffins
C10 Naphthenes
C10 Paraffins
C11 Naphthenes
C11 Paraffins

C12 P+N
Poly Naphthenes
Heavy P+N

Total Paraffins	0.0	0.0	0.0	0.0	0.0	0.0
Total Naphthenes	0.0	0.0	0.0	0.0	0.0	0.0

Feedstock	Arge FBR Naphtha						
Run	5	5	5	5	5	5	5
Period	1	2	3	4	5	6	7
Pressure, psig	123	124	125	122	122	123	122
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%							
=====							
H2	2.79	2.86	2.73	2.74	3.18	3.18	2.81
C1	1.44	1.48	1.30	1.28	1.77	1.61	1.20
C2	3.44	3.48	3.18	3.19	4.76	4.45	3.24
C3	4.57	4.51	4.22	4.36	5.51	5.56	4.20
iC4	2.71	2.62	2.44	2.53	2.89	2.95	2.50
nC4	3.27	3.13	2.93	3.08	3.64	5.21	3.17
iC5	3.92	4.10	4.17	4.10	3.86	4.04	4.27
nC5	3.16	3.00	2.95	2.85	2.82	3.01	3.01
C6+	74.70	74.82	76.08	75.87	71.57	69.99	75.60
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	87.76	87.67	89.57	88.43	84.78	85.20	88.55
C5+	81.78	81.92	83.20	82.82	78.25	77.04	82.88
Gas Yields, SCFB							
=====							
H2	1299	1334	1274	1275	1481	1480	1309
C1	84	87	76	75	104	95	70
C2	107	109	99	100	149	139	101
C3	97	96	90	93	117	118	90
C1-C3	<u>289</u>	<u>292</u>	<u>265</u>	<u>268</u>	<u>370</u>	<u>352</u>	<u>261</u>
Liq. Yields, Vol-%							
=====							
iC4	3.40	3.28	3.06	3.17	3.63	3.70	3.13
nC4	3.95	3.79	3.54	3.72	4.41	6.29	3.84
iC5	4.44	4.64	4.72	4.63	4.37	4.57	4.83
nC5	3.53	3.36	3.30	3.18	3.16	3.37	3.37
C4+	80.36	80.17	81.31	81.37	75.91	76.93	81.37
C5+	73.01	73.10	74.71	74.48	67.87	66.94	74.40
C6+	65.04	65.10	66.69	66.67	60.34	59.00	66.20
C5+ RONC	97.40	97.60	96.00	95.70	101.80	101.70	96.10

Liquid Product
Composition, Wt-%
Run
Period

	5 1	5 2	5 3	5 4	5 5	5 6	5 7
Aromatics =====							
Benzene				1.8		2.8	
Toluene				9.0		14.0	
Ethylbenzene				2.3		3.0	
p-Xylene				3.2		4.2	
m-Xylene				7.1		9.1	
o-Xylene				5.2		6.4	
A9+				34.1		36.7	
Total Arom.				62.7		76.2	
Olefins =====							
				1.1		1.2	
Para + Naph =====							
Propane				0.0		0.0	
i-Butane				0.0		0.0	
n-Butane				0.0		0.0	
i-Pentane				4.4		4.1	
n-Pentane				3.2		3.5	
Cyclopentane				0.1		0.1	
C6 Isoparaffins							
n-Hexane				10.0		7.8	
MCP				4.1		3.2	
Cyclohexane				0.2		0.2	
				0.0		0.0	
C7 Isoparaffins							
n-Heptane				8.6		2.8	
C7 Cyclopent.				2.3		0.7	
Methylcyclohex.				0.2		0.1	
				0.0		0.0	
C8 Isoparaffins							
n-Octane				2.2		0.1	
C8 Cyclopent.				0.5		0.0	
C8 Cyclohex.				0.1		0.0	
				0.0		0.0	
						0.0	
C9 Naphthenes							
C9 Paraffins				0.0		0.0	
C10 Naphthenes				0.3		0.0	
C10 Paraffins				0.0		0.0	
C11 Naphthenes				0.0		0.0	
C11 Paraffins				0.0		0.0	
C12 P+N							
Poly Naphthenes				0.0		0.0	
Heavy P+N				0.0		0.0	
Total Paraffins	0.0	0.0	0.0	35.6	0.0	22.2	0.0
Total Naphthenes	0.0	0.0	0.0	0.6	0.0	0.4	0.0

Feedstock	Arge FBR Naphtha					
Run	6	6	6	6	6	6
Period	1	2	3	4	5	6
Pressure, psig	60	60	60	60	60	60
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%						
=====						
H2	3.71	3.55	3.26	3.25	3.99	3.93
C1	0.91	0.84	0.74	0.68	0.91	0.89
C2	2.69	2.51	2.13	2.14	2.94	2.89
C3	3.36	3.03	2.71	3.45	3.38	3.31
iC4	2.01	1.93	1.65	1.66	2.01	1.96
nC4	2.18	2.06	2.03	1.95	2.34	2.27
iC5	2.87	3.29	3.20	2.91	3.38	3.13
nC5	2.49	2.49	2.42	2.22	2.48	2.32
C6+	79.78	80.30	81.86	81.74	78.57	79.30
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	89.33	90.07	91.16	90.48	88.78	88.98
C5+	85.14	86.08	87.48	86.87	84.43	84.75
Gas Yields, SCFB						
=====						
H2	1728	1657	1521	1517	1859	1833
C1	53	49	43	40	53	52
C2	84	78	67	67	92	90
C3	72	65	58	74	72	71
C1-C3	<u>209</u>	<u>192</u>	<u>168</u>	<u>180</u>	<u>217</u>	<u>213</u>
Liq. Yields, Vol-%						
=====						
iC4	2.52	2.43	2.07	2.09	2.52	2.46
nC4	2.63	2.50	2.45	2.35	2.83	2.74
iC5	3.25	3.72	3.61	3.30	3.82	3.54
nC5	2.78	2.79	2.71	2.49	2.77	2.59
C4+	80.30	80.84	82.86	82.24	78.51	78.67
C5+	75.15	75.91	78.34	77.80	73.16	73.47
C6+	69.12	69.40	72.02	72.01	66.57	67.34
C5+ RONC	98.40	98.40	94.90	94.70	101.80	101.40

Liquid Product
Composition, Wt-%
Run
Period

6 6 6 6 6 6
1 2 3 4 5 6

Aromatics

=====

Benzene		1.6		1.2		
Toluene		10.1		7.6		
Ethylbenzene		2.5		2.2		
p-Xylene		3.6		3.1		
m-Xylene		7.7		6.6		
o-Xylene		6.2		5.3		
A9+		37.1		36.1		
Total Arom.		68.8		62.1		

Olefins

=====

		1.7		1.8		
--	--	-----	--	-----	--	--

Para + Naph

=====

Propane		0.0		0.0		
i-Butane		0.0		0.0		
n-Butane		0.0		0.0		
i-Pentane		3.2		2.9		
n-Pentane		2.6		2.3		
Cyclopentane		0.1		0.1		

C6 Isoparaffins

n-Hexane		8.6		8.9		
MCP		3.8		4.3		
Cyclohexane		0.2		0.2		
		0.0		0.0		

C7 Isoparaffins

n-Heptane		7.2		9.6		
C7 Cyclopent.		1.9		2.8		
Methylcyclohex.		0.3		0.3		
		0.0		0.0		

C8 Isoparaffins

n-Octane		1.1		3.0		
C8 Cyclopent.		0.3		0.8		
C8 Cyclohex.		0.1		0.2		
		0.0		0.0		

C9 Naphthenes

C9 Paraffins		0.0		0.0		
C10 Naphthenes		0.1		0.6		
C10 Paraffins		0.0		0.0		
C11 Naphthenes		0.0		0.1		
C11 Paraffins		0.0		0.0		

C12 P+N

Poly Naphthenes		0.0		0.0		
Heavy P+N		0.0		0.0		

Total Paraffins	0.0	28.8	0.0	35.3	0.0	0.0
Total Naphthenes	0.0	0.7	0.0	0.8	0.0	0.0

Feedstock Arge FBR Naphtha

Run	6	6
Period	7	8
Pressure, psig	59	59
LHSV, 1/hr	LHSV-A	LHSV-A

Prod. Yields, Wt-%

=====		
H2	3.18	3.19
C1	0.66	0.63
C2	2.01	1.95
C3	2.51	2.43
iC4	1.55	1.44
nC4	1.90	1.85
iC5	3.38	3.03
nC5	2.51	2.34
C6+	82.30	83.14
	<u>100.00</u>	<u>100.00</u>

C4+	91.64	91.80
C5+	88.19	88.51

Gas Yields, SCFB

=====		
H2	1484	1487
C1	39	37
C2	63	61
C3	54	52
C1-C3	<u>155</u>	<u>150</u>

Liq. Yields, Vol-%

=====		
iC4	1.95	1.80
nC4	2.30	2.23
iC5	3.82	3.43
nC5	2.81	2.62
C4+	83.56	83.55
C5+	79.31	79.52
C6+	72.68	73.47
C5+ RONC	93.60	93.50

Liquid Product
Composition, Wt-%
Run
Period

6	6
7	8

Aromatics

=====

Benzene	1.1
Toluene	7.2
Ethylbenzene	2.2
p-Xylene	3.1
m-Xylene	6.2
o-Xylene	4.9
A9+	35.9
Total Arom.	60.6

Olefins	2.0
---------	-----

=====

Para + Naph

=====

Propane	0.0
i-Butane	0.0
n-Butane	0.0
i-Pentane	2.7
n-Pentane	2.3
Cyclopentane	0.1

C6 Isoparaffins	8.4
n-Hexane	4.5
MCP	0.3
Cyclohexane	0.0

C7 Isoparaffins	9.3
n-Heptane	3.1
C7 Cyclopent.	0.5
Methylcyclohex.	0.0

C8 Isoparaffins	3.6
n-Octane	1.0
C8 Cyclopent.	0.3
C8 Cyclohex.	0.0

C9 Naphthenes	0.1
C9 Paraffins	0.9
C10 Naphthenes	0.0
C10 Paraffins	0.3
C11 Naphthenes	0.0
C11 Paraffins	0.0

C12 P+N	0.0
Poly Naphthenes	0.0
Heavy P+N	0.0

Total Paraffins	0.0	36.1
Total Naphthenes	0.0	1.3

Feedstock	Arge Light Naphtha					
Run	7	7	7	7	7	7
Period	1	2	3	4	5	6
Pressure, psig	60	60	61	61	60	60
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%						
=====						
H2	3.66	3.60	3.52	3.15	3.09	3.77
C1	1.41	1.39	1.36	1.04	0.97	1.42
C2	4.99	4.98	4.88	3.98	3.78	5.18
C3	5.35	5.30	5.21	4.39	6.20	5.34
iC4	4.05	3.93	3.88	3.45	3.28	3.77
nC4	4.04	4.15	4.11	3.03	2.94	4.14
iC5	4.11	4.64	4.64	4.70	4.44	4.33
nC5	3.33	3.55	3.41	3.34	3.09	3.17
C6+	69.06	68.46	68.99	72.92	72.21	68.88
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	84.59	84.73	85.03	87.44	85.96	84.29
C5+	76.50	76.65	77.04	80.96	79.74	76.38
Gas Yields, SCFB						
=====						
H2	1826	1796	1757	1570	1540	1880
C1	88	87	85	65	61	89
C2	167	167	163	133	126	173
C3	122	121	119	100	141	122
C1-C3	<u>377</u>	<u>375</u>	<u>367</u>	<u>298</u>	<u>329</u>	<u>384</u>
Liq. Yields, Vol-%						
=====						
iC4	5.44	5.27	5.20	4.63	4.41	5.06
nC4	5.23	5.37	5.31	3.92	3.80	5.36
iC5	4.97	5.61	5.61	5.69	5.37	5.24
nC5	3.98	4.25	4.08	4.01	3.71	3.79
C4+	82.87	83.43	83.68	86.98	85.40	84.48
C5+	72.20	72.79	73.17	78.43	77.19	74.06
C6+	63.25	62.93	63.48	68.73	68.11	65.03
C5+ RONC	101.10	100.80	99.90	95.30	94.90	101.70

Liquid Product
Composition, Wt-%
Run
Period

	7 1	7 2	7 3	7 4	7 5	7 6
Aromatics =====						
Benzene		4.7			2.9	
Toluene		26.6			19.3	
Ethylbenzene		4.3			3.8	
p-Xylene		6.1			5.6	
m-Xylene		13.3			11.8	
o-Xylene		10.1			9.1	
A9+		7.4			6.9	
Total Arom.		72.5			59.4	
Olefins =====						
		2.0			2.3	
Para + Naph =====						
Propane		0.0			0.0	
i-Butane		0.0			0.0	
n-Butane		0.0			0.0	
i-Pentane		4.9			5.0	
n-Pentane		4.1			3.7	
Cyclopentane		0.1			0.1	
C6 Isoparaffins						
n-Hexane		3.8			5.2	
MCP		0.2			0.3	
Cyclohexane		0.0			0.0	
C7 Isoparaffins						
n-Heptane		0.5			2.0	
C7 Cyclopent.		0.1			0.3	
Methylcyclohex.		0.0			0.0	
C8 Isoparaffins						
n-Octane		0.0			0.1	
C8 Cyclopent.		0.0			0.0	
C8 Cyclohex.		0.0			0.0	
C9 Naphthenes						
C9 Paraffins		0.0			0.0	
C10 Naphthenes						
C10 Paraffins		0.0			0.0	
C11 Naphthenes						
C11 Paraffins		0.0			0.0	
C12 P+N						
Poly Naphthenes		0.0			0.0	
Heavy P+N		0.0			0.0	
Total Paraffins	0.0	25.1	0.0	0.0	37.6	0.0
Total Naphthenes	0.0	0.4	0.0	0.0	0.7	0.0

Feedstock	Arge Light Naphtha				
Run	7	7	7	7	7
Period	7	8	9	10	11
Pressure, psig	60	60	60	60	60
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%					
=====					
H2	3.80	3.43	3.24	2.67	2.66
C1	1.39	1.21	1.11	0.76	0.76
C2	5.13	4.51	4.18	3.06	3.06
C3	5.27	4.76	7.00	3.47	3.55
iC4	3.78	3.59	3.36	2.68	2.76
nC4	4.21	3.63	3.58	2.52	2.52
iC5	4.27	4.44	4.42	4.15	4.14
nC5	3.25	3.37	3.23	3.09	3.00
C6+	68.90	71.06	69.88	77.60	77.55
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	84.41	86.09	84.47	90.04	89.97
C5+	76.42	78.87	77.53	84.84	84.69
Gas Yields, SCFB					
=====					
H2	1894	1709	1615	1333	1326
C1	87	76	70	48	48
C2	172	151	140	102	102
C3	120	109	160	79	81
C1-C3	<u>379</u>	<u>335</u>	<u>369</u>	<u>229</u>	<u>231</u>
Liq. Yields, Vol-%					
=====					
iC4	5.07	4.82	4.51	3.60	3.71
nC4	5.45	4.70	4.63	3.25	3.26
iC5	5.17	5.37	5.34	5.02	5.01
nC5	3.89	4.04	3.87	3.70	3.59
C4+	84.64	85.96	84.31	88.95	88.92
C5+	74.12	76.44	75.17	82.10	81.95
C6+	65.06	67.03	65.96	73.38	73.35
C5+ RONC	101.80	98.40	98.10	88.10	88.10

Liquid Product
Composition, Wt-%

Run	7	7	7	7	7
Period	7	8	9	10	11

Aromatics

=====

Benzene	4.9		3.7		2.0
Toluene	28.1		23.7		14.2
Ethylbenzene	4.7		4.4		3.4
p-Xylene	6.4		6.1		4.9
m-Xylene	13.5		12.8		10.0
o-Xylene	10.4		9.7		7.5
A9+	6.3		6.1		5.4
Total Arom.	74.3		66.5		47.4

Olefins	2.3		2.5		2.6
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=====

Para + Naph

=====

Propane	0.0		0.0		0.0
i-Butane	0.0		0.0		0.0
n-Butane	0.0		0.0		0.0
i-Pentane	4.6		4.6		4.3
n-Pentane	3.8		3.7		3.2
Cyclopentane	0.1		0.1		0.1

C6 Isoparaffins	8.7		11.2		13.9
n-Hexane	3.6		4.6		6.1
MCP	0.3		0.3		0.4
Cyclohexane	0.0		0.0		0.0

C7 Isoparaffins	1.8		4.8		13.9
n-Heptane	0.4		1.2		3.8
C7 Cyclopent.	0.1		0.3		0.6
Methylcyclohex.	0.0		0.0		0.0

C8 Isoparaffins	0.0		0.2		2.8
n-Octane	0.0		0.0		0.7
C8 Cyclopent.	0.0		0.0		0.2
C8 Cyclohex.	0.0		0.0		0.0

C9 Naphthenes	0.0		0.0		0.0
C9 Paraffins	0.0		0.0		0.0
C10 Naphthenes	0.0		0.0		0.0
C10 Paraffins	0.0		0.0		0.0
C11 Naphthenes	0.0		0.0		0.0
C11 Paraffins	0.0		0.0		0.0

C12 P+N	0.0		0.0		0.0
Poly Naphthenes	0.0		0.0		0.0
Heavy P+N	0.0		0.0		0.0

Total Paraffins	22.9	0.0	30.3	0.0	48.7
Total Naphthenes	0.5	0.0	0.7	0.0	1.3

Feedstock	Arge FBR Naphtha				
Run	8	8	8	8	8
Period	1	2	3	4	5
Pressure, psig	60	60	60	60	60
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%					
=====					
H2	3.43	3.49	3.61	3.53	3.36
C1	0.79	0.77	0.95	1.06	1.27
C2	2.34	2.31	2.95	3.33	3.97
C3	3.86	3.70	4.10	4.34	4.74
iC4	2.54	2.24	2.60	2.34	2.29
nC4	2.33	2.15	2.95	3.08	3.58
iC5	3.65	2.72	3.08	3.23	3.09
nC5	2.48	2.38	2.30	2.61	2.65
C6+	78.58	80.24	77.46	76.48	75.05
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	89.58	89.73	88.39	87.74	86.66
C5+	84.71	85.34	82.84	82.32	80.79
Gas Yields, SCFB					
=====					
H2	1600	1629	1682	1643	1565
C1	46	45	56	62	74
C2	73	72	92	104	124
C3	82	79	87	93	101
C1-C3	<u>202</u>	<u>196</u>	<u>235</u>	<u>259</u>	<u>300</u>
Liq. Yields, Vol-%					
=====					
iC4	3.19	2.81	3.27	2.94	2.88
nC4	2.81	2.60	3.56	3.73	4.32
iC5	4.12	3.07	3.48	3.66	3.50
nC5	2.78	2.66	2.58	2.93	2.97
C4+	80.38	80.37	79.17	78.99	78.15
C5+	74.38	74.96	72.34	72.32	70.95
C6+	67.48	69.23	66.28	65.73	64.48
C5+ RONC	99.80	98.60	99.50	98.80	98.10

Liquid Product
Composition, Wt-%
Run
Period

8	8	8	8	8
1	2	3	4	5

Aromatics

=====

Benzene
Toluene
Ethylbenzene
p-Xylene
m-Xylene
o-Xylene
A9+
Total Arom.

Olefins

=====

Para + Naph

=====

Propane
i-Butane
n-Butane
i-Pentane
n-Pentane
Cyclopentane

C6 Isoparaffins

n-Hexane
MCP
Cyclohexane

C7 Isoparaffins

n-Heptane
C7 Cyclopent.
Methylcyclohex.

C8 Isoparaffins

n-Octane
C8 Cyclopent.
C8 Cyclohex.

C9 Naphthenes

C9 Paraffins
C10 Naphthenes
C10 Paraffins
C11 Naphthenes
C11 Paraffins

C12 P+N

Poly Naphthenes
Heavy P+N

Total Paraffins	0.0	0.0	0.0	0.0	0.0
Total Naphthenes	0.0	0.0	0.0	0.0	0.0

Feedstock	Branched FBR Naphtha					
Run	9	9	9	9	9	9
Period	1	2	3	4	5	6
Pressure, psig	58	59	59	59	59	59
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%						
=====						
H2	3.04	3.09	2.86	2.67	2.64	3.05
C1	0.98	0.93	0.80	0.69	0.68	0.90
C2	2.31	2.21	1.94	1.61	1.55	2.54
C3	3.85	3.75	3.35	3.03	2.99	3.85
iC4	2.67	2.65	2.38	2.18	2.16	2.54
nC4	2.70	2.58	2.37	2.27	2.25	2.93
iC5	4.95	4.76	5.98	6.22	6.05	5.47
nC5	3.07	4.11	4.37	4.39	4.30	4.17
C6+	76.43	75.92	75.95	76.94	77.38	74.55
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	89.82	90.02	91.05	92.00	92.14	89.66
C5+	84.45	84.79	86.30	87.55	87.73	84.19
Gas Yields, SCFB						
=====						
H2	1410	1433	1327	1239	1223	1414
C1	57	54	46	40	40	52
C2	72	69	60	50	48	79
C3	82	80	71	64	63	82
C1-C3	<u>210</u>	<u>203</u>	<u>178</u>	<u>154</u>	<u>151</u>	<u>213</u>
Liq. Yields, Vol-%						
=====						
iC4	3.33	3.30	2.96	2.73	2.69	3.17
nC4	3.24	3.11	2.85	2.73	2.70	3.52
iC5	5.57	5.35	6.72	7.00	6.81	6.15
nC5	3.42	4.57	4.86	4.88	4.79	4.64
C4+	80.59	81.99	83.45	85.55	85.74	80.43
C5+	74.02	75.58	77.64	80.09	80.35	73.74
C6+	65.03	65.66	66.06	68.21	68.75	62.95
C5+ RONC	98.80	97.20	95.90	92.40	92.10	100.30

Liquid Product
Composition, Wt-%

Run Period	9 1	9 2	9 3	9 4	9 5	9 6
Aromatics =====						
Benzene		1.9			1.4	
Toluene		9.8			6.4	
Ethylbenzene		2.0			1.6	
p-Xylene		3.3			2.6	
m-Xylene		7.2			5.6	
o-Xylene		5.4			4.1	
A9+		35.3			32.8	
Total Arom.		64.9			54.5	
Olefins =====						
		2.1			2.5	
Para + Naph =====						
Propane		0.0			0.0	
i-Butane		0.0			0.0	
n-Butane		0.0			0.0	
i-Pentane		4.8			6.0	
n-Pentane		4.7			4.5	
Cyclopentane		0.1			0.1	
C6 Isoparaffins						
n-Hexane		4.1			4.5	
MCP		0.2			0.3	
Cyclohexane		0.0			0.0	
C7 Isoparaffins						
n-Heptane		1.6			2.7	
C7 Cyclopent.		0.2			0.4	
Methylcyclohex.		0.0			0.0	
C8 Isoparaffins						
n-Octane		0.2			0.9	
C8 Cyclopent.		0.0			0.2	
C8 Cyclohex.		0.0			0.0	
C9 Naphthenes						
C9 Paraffins		0.1			0.9	
C10 Naphthenes		0.0			0.0	
C10 Paraffins		0.0			0.2	
C11 Naphthenes		0.0			0.0	
C11 Paraffins		0.0			0.0	
C12 P+N						
Poly Naphthenes		0.0			0.0	
Heavy P+N		0.0			0.0	
Total Paraffins	0.0	32.5	0.0	0.0	42.1	0.0
Total Naphthenes	0.0	0.5	0.0	0.0	1.1	0.0

Feedstock	Branched FBR Naptha				
Run	9	9	9	9	9
Period	7	8	9	10	11
Pressure, psig	58	58	57	57	57
LHSV, 1/hr	LHSV-A	LHSV-A	LHSV-A	LHSV-A	LHSV-A
Prod. Yields, Wt-%					
=====					
H2	3.45	2.70	2.68	3.53	3.42
C1	1.01	0.67	0.67	1.20	1.20
C2	2.86	1.73	1.68	3.59	3.58
C3	4.37	3.12	3.06	5.12	5.02
iC4	2.75	2.19	2.15	2.78	2.74
nC4	3.29	2.38	2.23	3.72	3.77
iC5	7.22	5.77	5.68	5.23	5.36
nC5	4.97	4.53	4.38	4.16	4.22
C6+	70.08	76.91	77.47	70.67	70.69
	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>	<u>100.00</u>
C4+	88.31	91.78	91.91	86.56	86.78
C5+	82.27	87.21	87.53	80.06	80.27
Gas Yields, SCFB					
=====					
H2	1601	1251	1242	1635	1584
C1	59	39	39	70	70
C2	89	54	52	112	111
C3	93	66	65	109	106
C1-C3	<u>241</u>	<u>159</u>	<u>156</u>	<u>290</u>	<u>287</u>
Liq. Yields, Vol-%					
=====					
iC4	3.43	2.73	2.68	3.46	3.42
nC4	3.96	2.86	2.69	4.47	4.53
iC5	8.11	6.49	6.39	5.89	6.02
nC5	5.53	5.05	4.88	4.63	4.70
C4+	80.36	85.00	85.17	77.78	78.36
C5+	72.97	79.41	79.80	69.85	70.41
C6+	59.33	67.87	68.53	59.33	59.69
C5+ RONC	99.60	92.90	92.20	101.30	100.40

Liquid Product
Composition, Wt-%

Run Period	9 7	9 8	9 9	9 10	9 11
Aromatics =====					
Benzene	2.4		1.5		
Toluene	12.2		6.7		
Ethylbenzene	2.3		1.7		
p-Xylene	3.8		2.8		
m-Xylene	7.8		5.7		
o-Xylene	5.4		3.9		
A9+	36.1		32.6		
Total Arom.	70.0		54.9		
Olefins =====					
	2.6		2.5		
Para + Naph =====					
Propane	0.0		0.0		
i-Butane	0.0		0.0		
n-Butane	0.0		0.0		
i-Pentane	6.4		5.9		
n-Pentane	4.9		4.7		
Cyclopentane	0.1		0.1		
C6 Isoparaffins					
n-Hexane	3.3		4.6		
MCP	0.3		0.4		
Cyclohexane	0.0		0.0		
C7 Isoparaffins					
n-Heptane	0.8		2.6		
C7 Cyclopent.	0.2		0.5		
Methylcyclohex.	0.0		0.0		
C8 Isoparaffins					
n-Octane	0.1		0.9		
C8 Cyclopent.	0.0		0.3		
C8 Cyclohex.	0.0		0.0		
C9 Naphthenes					
C9 Paraffins	0.0		1.0		
C10 Naphthenes					
C10 Paraffins	0.0		0.3		
C11 Naphthenes					
C11 Paraffins	0.0		0.0		
C12 P+N					
Poly Naphthenes	0.0		0.0		
Heavy P+N	0.0		0.0		
Total Paraffins	26.8	0.0	41.2	0.0	0.0
Total Naphthenes	0.6	0.0	1.4	0.0	0.0

Feedstock	Branched Light				
	10 2	10 8	10 22	10 29	10 33
Run Period					
LHSV, 1/hr	LHSV-B	LHSV-B	LHSV-B	LHSV-B	LHSV-B
Prod. Yields, Wt-%					
=====					
H2	5.31	5.21	5.03	4.66	4.34
C1	4.29	4.33	5.14	5.92	6.21
C2	1.20	1.39	1.65	2.15	2.27
C3	1.09	1.10	1.39	1.86	1.92
iC4	0.41	0.31	0.51	0.76	0.65
nC4	0.39	0.65	1.02	1.32	1.37
iC5	0.56	1.15	1.22	1.55	1.45
nC5	2.47	2.38	2.61	2.70	2.51
C6+	84.28	83.48	81.43	79.08	79.28
	100.00	100.00	100.00	100.00	100.00
C4+	88.11	87.97	86.79	85.41	85.26
C5+	87.31	87.01	85.26	83.33	83.24
Gas Yields, SCFB					
=====					
H2	2412	2366	2287	2116	1974
C1	245	247	294	338	355
C2	37	42	50	66	69
C3	23	23	29	39	40
C1-C3	305	312	373	443	464
Liq. Yields, Vol-%					
=====					
iC4	0.50	0.38	0.62	0.93	0.80
nC4	0.46	0.76	1.20	1.56	1.62
iC5	0.61	1.26	1.35	1.71	1.60
nC5	2.70	2.60	2.85	2.95	2.74
C4+	74.02	74.77	78.19	73.06	73.21
C5+	73.06	73.63	76.37	70.57	70.79
C6+	69.75	69.77	72.17	65.91	66.45
C5+ RONC	105.10	102.60	102.70	101.90	101.50

Liquid Product
Composition, Wt-%

Run Period	10 2	10 8	10 22	10 29	10 33
---------------	---------	---------	----------	----------	----------

Aromatics

=====

Benzene	37.7	35.0	35.9	39.1	39.7
Toluene	34.0	33.9	31.4	29.6	29.6
Ethylbenzene	0.9	1.1	1.0	0.8	0.8
p-Xylene	1.2	1.3	1.1	1.0	1.0
m-Xylene	3.3	3.2	3.0	2.5	2.6
o-Xylene	2.2	2.2	1.9	1.7	1.6
A9+	1.1	0.9	0.9	0.8	0.9
Total Arom.	80.4	77.6	75.2	75.5	76.2

Olefins	0.4	0.6	0.9	1.0	1.1
---------	-----	-----	-----	-----	-----

=====

Para + Naph

=====

Propane	0.0	0.0	0.0	0.0	0.0
i-Butane	0.0	0.0	0.0	0.0	0.0
n-Butane	0.0	0.1	0.3	0.5	0.1
i-Pentane	0.7	0.9	1.1	1.3	0.9
n-Pentane	2.4	1.8	2.2	2.8	2.1
Cyclopentane	0.1	0.1	0.1	0.2	0.2
C6 Isoparaffins	9.2	10.4	10.7	9.7	9.0
n-Hexane	1.3	1.7	1.6	1.5	1.4
MCP	0.6	0.8	0.9	0.9	1.0
Cyclohexane	0.0	0.0	0.0	0.0	0.0
C7 Isoparaffins	3.0	3.6	4.2	4.0	4.7
n-Heptane	0.1	0.2	0.2	0.2	0.3
C7 Cyclopent.	0.2	0.3	0.4	0.5	0.6
Methylcyclohex.	0.0	0.0	0.0	0.0	0.0
C8 Isoparaffins	1.4	1.7	1.9	1.7	2.1
n-Octane	0.0	0.0	0.0	0.0	0.0
C8 Cyclopent.	0.1	0.1	0.2	0.1	0.1
C8 Cyclohex.	0.0	0.0	0.0	0.0	0.1
C9 Naphthenes	0.0	0.0	0.0	0.0	0.0
C9 Paraffins	0.1	0.1	0.1	0.1	0.1
C10 Naphthenes	0.0	0.0	0.0	0.0	0.0
C10 Paraffins	0.0	0.0	0.0	0.0	0.0
C11 Naphthenes	0.0	0.0	0.0	0.0	0.0
C11 Paraffins	0.0	0.0	0.0	0.0	0.0
C12 P+N	0.0	0.0	0.0	0.0	0.0
Poly Naphthenes	0.0	0.0	0.0	0.0	0.0
Heavy P+N	0.0	0.0	0.0	0.0	0.0
Total Paraffins	18.2	20.5	22.3	21.8	20.7
Total Naphthenes	1.0	1.3	1.6	1.7	2.0

Feedstock	Arge Light		
Run Period	11 3	11 6	11 9
LHSV, 1/hr	LHSV-B	LHSV-B	LHSV-B
Prod. Yields, Wt-%			
=====			
H2	5.56	5.02	5.04
C1	4.53	5.23	7.42
C2	1.39	2.31	3.34
C3	1.22	1.51	2.10
iC4	0.43	0.24	0.52
nC4	0.46	0.78	1.59
iC5	0.23	0.46	1.24
nC5	0.96	3.81	3.43
C6+	85.22	80.64	75.32
	100.00	100.00	100.00
C4+	87.30	85.93	82.10
C5+	86.41	84.91	79.99
Gas Yields, SCFB			
=====			
H2	2530	2285	2291
C1	259	299	424
C2	42	71	102
C3	26	32	44
C1-C3	327	402	570
Liq. Yields, Vol-%			
=====			
iC4	0.53	0.30	0.63
nC4	0.54	0.92	1.87
iC5	0.25	0.51	1.37
nC5	1.05	4.16	3.74
C4+	71.92	72.26	68.63
C5+	70.85	71.04	66.13
C6+	69.55	66.37	61.02
C5+ RONC	104.30	100.60	102.30

Liquid Product
Composition, Wt-%

Run	11	11	11
Period	3	6	9

Aromatics

===== Benzene	25.8	37.2	31.8
Toluene	43.4	31.7	39.7
Ethylbenzene	6.0	0.9	3.8
p-Xylene	0.7	1.1	0.6
m-Xylene	3.4	3.0	2.6
o-Xylene	6.8	1.9	4.8
A9+	2.0	0.9	1.7
Total Arom.	88.1	76.7	85.0

Olefins	0.4	0.7	0.7
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Para + Naph

===== Propane	0.0	0.0	0.0
i-Butane	0.0	0.0	0.0
n-Butane	0.0	0.3	0.4
i-Pentane	0.0	1.1	0.9
n-Pentane	0.4	2.4	3.3
Cyclopentane	0.1	0.1	0.2
C6 Isoparaffins	3.3	10.3	3.2
n-Hexane	2.0	1.6	1.7
MCP	0.6	0.8	0.5
Cyclohexane	0.0	0.0	0.0
C7 Isoparaffins	1.7	3.7	1.2
n-Heptane	1.4	0.2	1.2
C7 Cyclopent.	0.6	0.3	0.5
Methylcyclohex.	0.0	0.0	0.0
C8 Isoparaffins	0.5	1.6	0.4
n-Octane	0.7	0.0	0.6
C8 Cyclopent.	0.1	0.1	0.1
C8 Cyclohex.	0.1	0.0	0.1
C9 Naphthenes	0.0	0.0	0.0
C9 Paraffins	0.0	0.1	0.0
C10 Naphthenes	0.0	0.0	0.0
C10 Paraffins	0.0	0.0	0.0
C11 Naphthenes	0.0	0.0	0.0
C11 Paraffins	0.0	0.0	0.0
C12 P+N	0.0	0.0	0.0
Poly Naphthenes	0.0	0.0	0.0
Heavy P+N	0.0	0.0	0.0
Total Paraffins	10.0	21.3	12.9
Total Naphthenes	1.5	1.3	1.4