

APPENDIX

Figure 1

Isobutene Yield vs. Hours on Stream (Run 58)

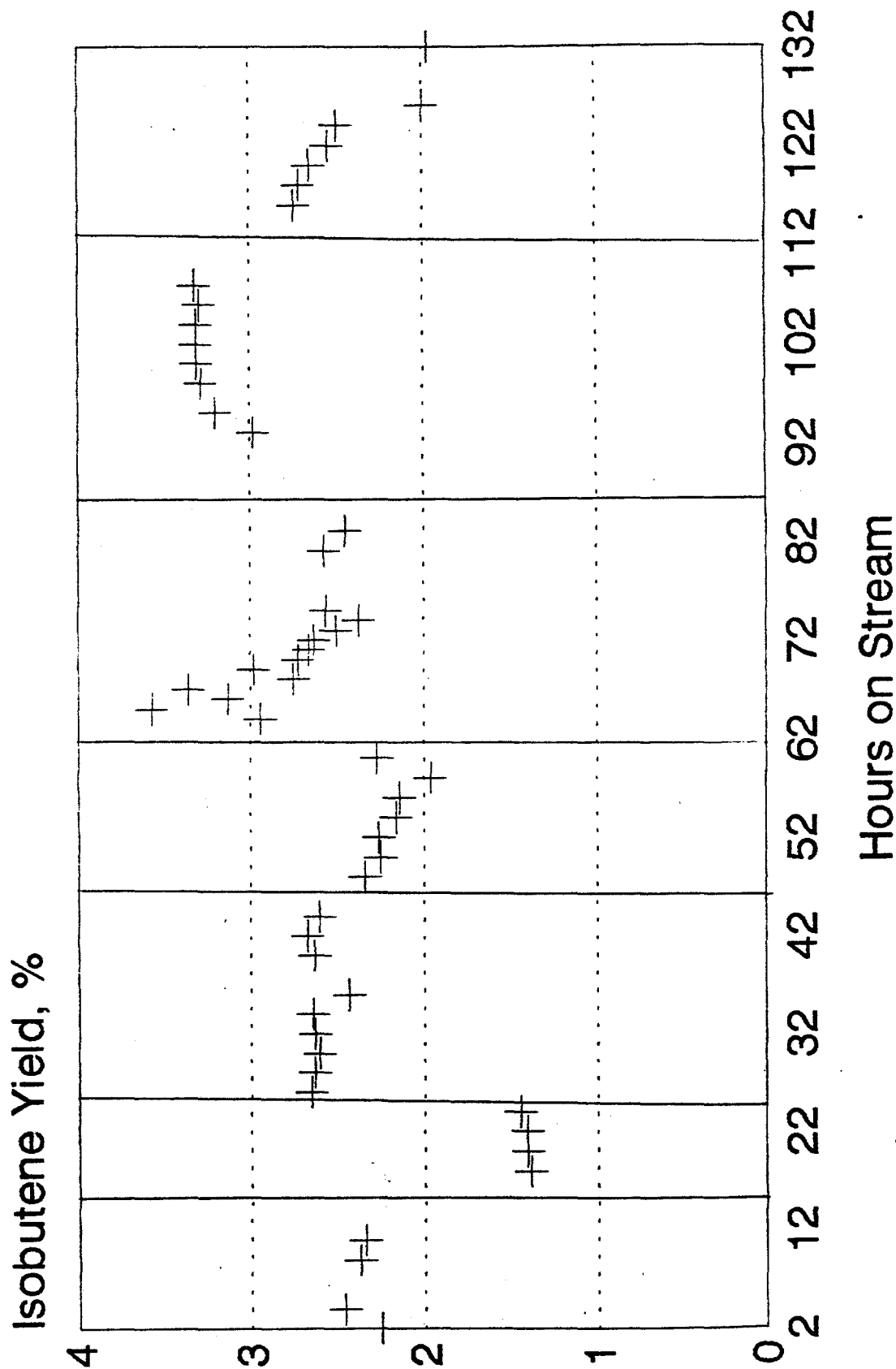


Figure 2

Isobutene Yield vs. Hours on Stream (Run 59)

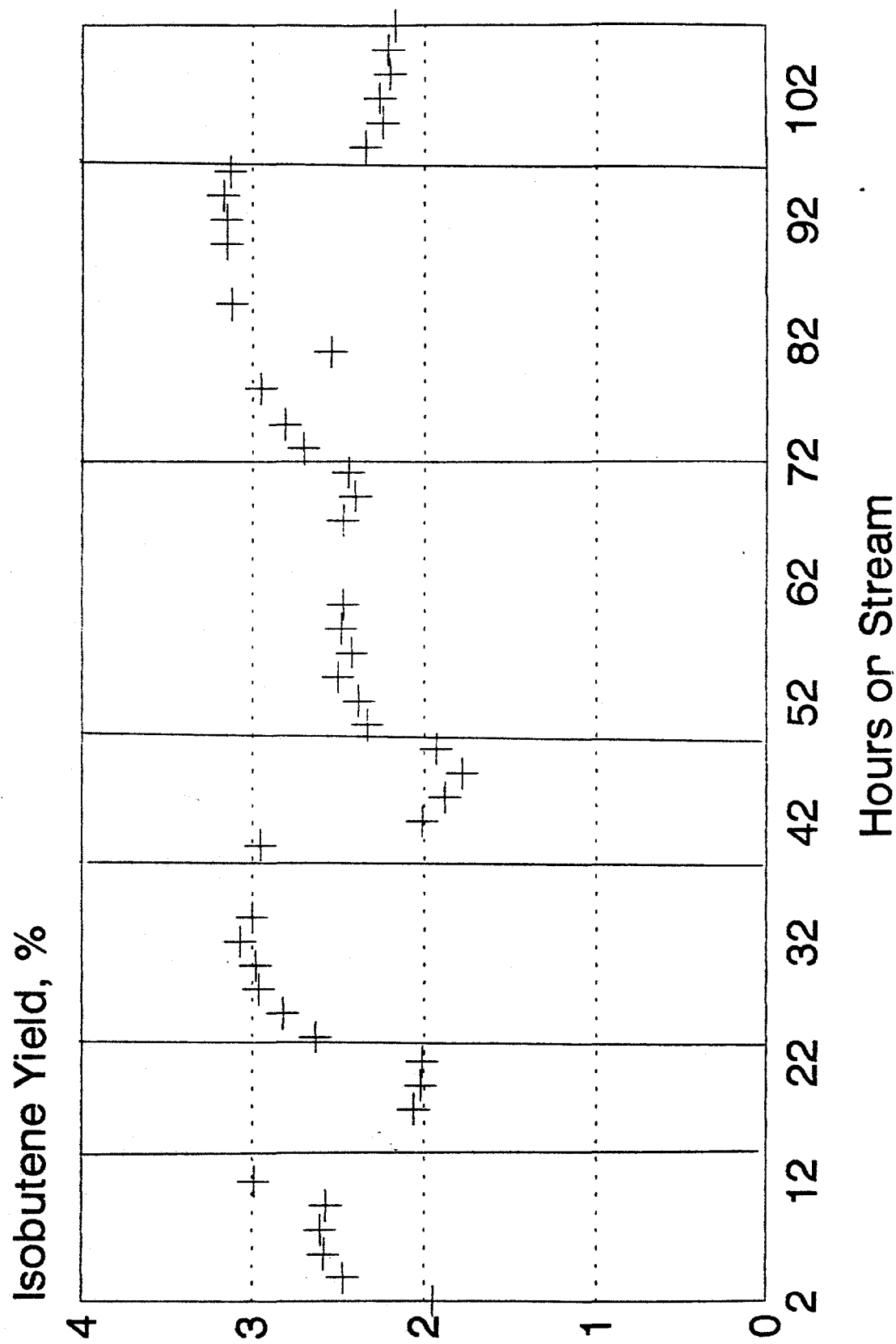
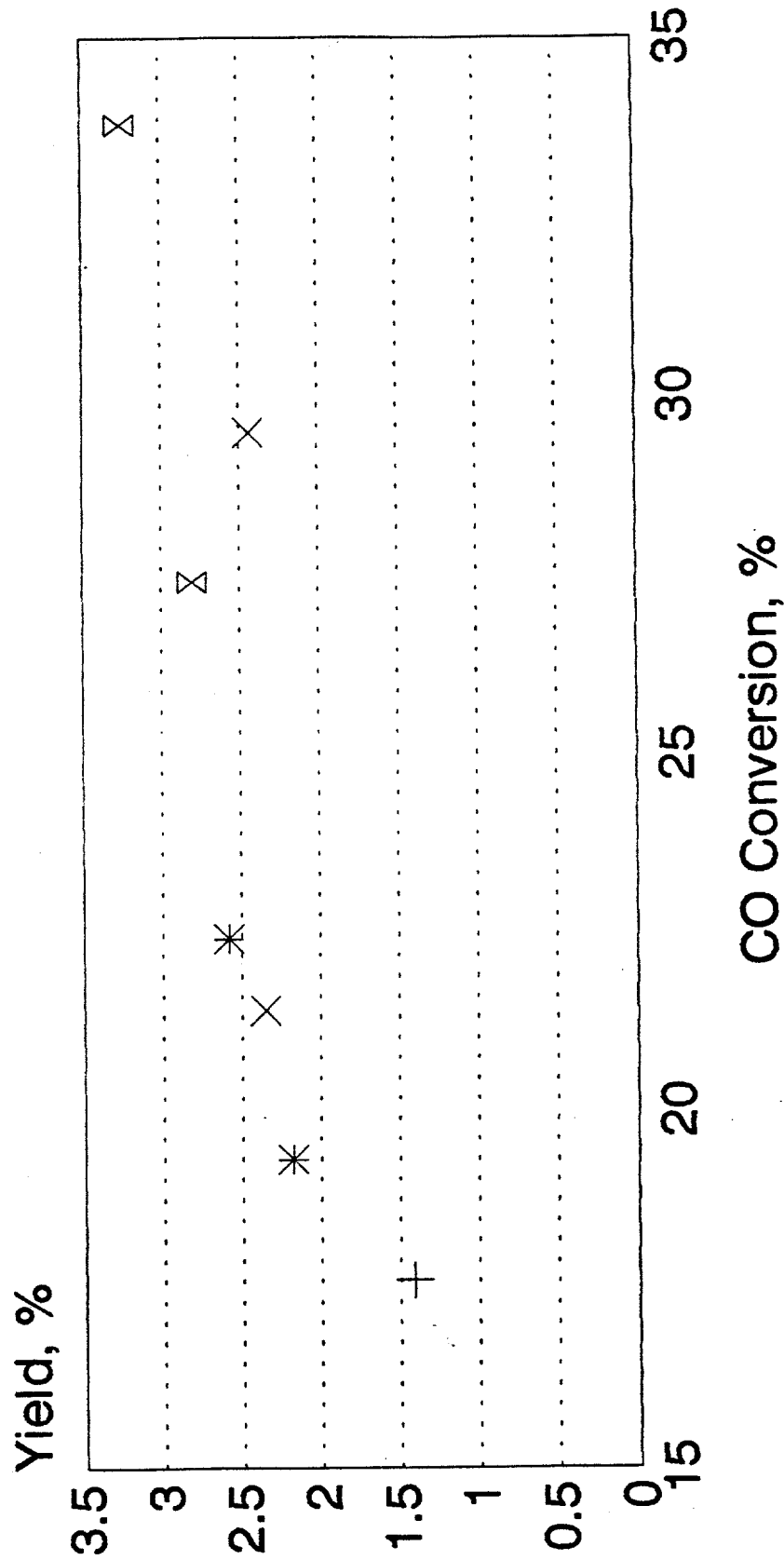


Figure 3

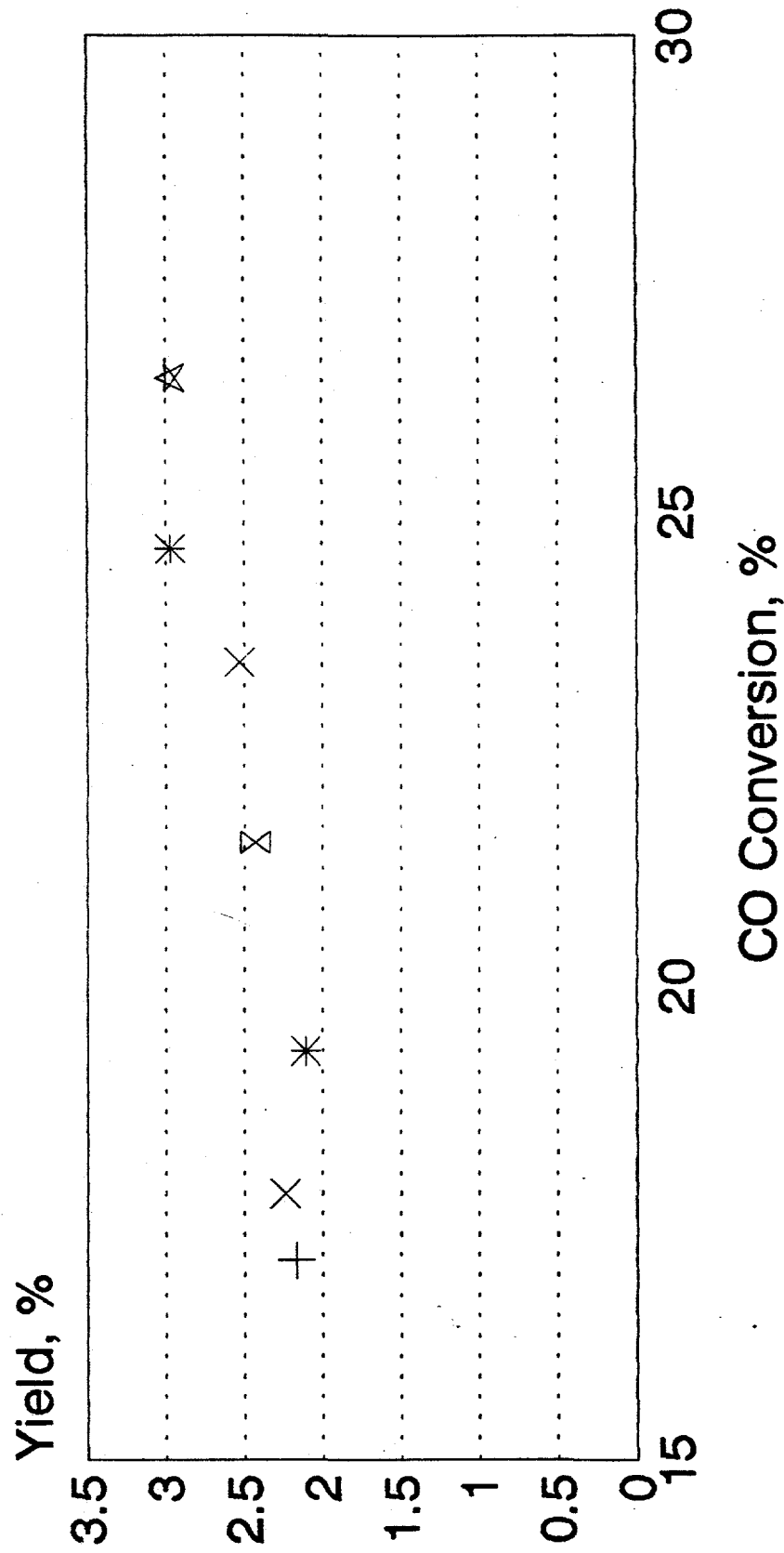
Isobutene Yield vs. CO Conversion (Run 58)



- × 400C, 200psig, 200GHSV
- * 375C, 200psig, 100GHSV
- ⊠ 375C, 100psig, 50GHSV

Figure 4

Isobutene Yield vs. CO Conversion (Run 59)



- X 400C, 200psig, 200GHSV
- * 385C, 200psig, 100GHSV
- X 385C, 100psig, 25GHSV

RUN SUMMARY

Run: 48.00
Catalyst: IS-29

HOURS ON STREAM
Temperature, C
Pressure, psig
GHSV, hr-1
Mass Balance, %

Conversions, %
CO
H2

Selectivities, C mole %

CO2
Hydrocarbon

HC Selectivities, C mole %

Methane
Ethane
Ethylene
Propane
Propylene
I-Butane

I-butene
N-Butenes+n-Butane
C5+

Oxygen Balance, %

I-Butene Yield, C mole %
i-C4H8/CH4, C-molar

i-C4H8/C4s, C-molar
i-C4s/C4s, C-molar
Isosynthesis Profile

0.00	1.00	2.00	3.00	4.00	5.00	6.00	7.00
416.00	416.00	433.00	430.00	424.00	417.00	416.00	427.00
620.00	610.00	610.00	610.00	615.00	615.00	620.00	620.00
960.00	960.00	960.00	960.00	960.00	960.00	960.00	960.00
0.0	207.9	0.0	62.5	75.8	75.2	70.1	72.8
7.28	27.30	25.34	25.92	26.99	25.44	23.04	22.58
55.88	7.06	7.56	6.41	8.85	7.63	7.41	6.50
37.06	56.24	54.77	49.28	50.28	51.32	50.68	47.80
62.94	43.76	45.23	50.72	49.72	48.68	49.32	52.20
36.69	18.17	21.28	22.82	25.42	24.55	25.34	24.39
17.75	9.20	9.14	4.28	10.15	9.81	8.75	7.72
10.06	9.31	7.73	6.08	6.21	5.90	5.11	4.10
6.21	3.13	3.14	3.14	3.56	3.52	3.20	2.88
4.79	5.25	4.66	3.65	3.70	3.52	3.20	2.72
0.98	5.95	6.81	6.61	7.95	7.82	7.57	6.95
1.39	13.92	15.09	12.95	13.87	14.30	15.10	14.03
6.15	7.56	7.90	6.91	7.21	7.62	7.74	7.14
15.98	27.51	24.27	33.57	21.94	22.96	23.99	30.09
58.88	128.50	121.11	97.18	101.14	105.43	102.75	91.56
0.06	1.66	1.73	1.70	1.86	1.77	1.72	1.65
0.04	0.77	0.71	0.57	0.55	0.58	0.60	0.58
0.16	0.51	0.51	0.49	0.48	0.48	0.50	0.50
0.28	0.72	0.73	0.74	0.75	0.74	0.75	0.75
0.22	1.02	1.21	1.54	1.23	1.31	1.50	1.61

RUN SUMMARY

Run: 49.00
Catalyst: IS-30

HOURS ON STREAM
Temperature, C 0.00 1.00 2.00 3.00 4.00 5.00 6.00 7.00
Pressure, psig 435.00 433.00 425.00 420.00 432.00 435.00 430.00 421.00
GHSV, hr-1 600.00 625.00 620.00 620.00 625.00 625.00 625.00 625.00
Mass Balance, % 960.00 960.00 960.00 960.00 960.00 960.00 960.00 960.00
0.0 72.6 75.8 82.4 84.0 87.0 84.5 87.3

Conversions, %
CO 20.54 26.56 29.67 22.86 20.79 23.41 22.82 21.86
HZ 98.09 7.61 8.42 8.64 6.84 8.14 9.21 8.27

Selectivities, C mole %
CO2 62.90 54.63 53.63 51.43 48.94 45.16 46.97 44.55
Hydrocarbon 37.10 45.37 46.37 48.57 51.06 54.84 53.03 55.45

HC Selectivities, C mole %
Methane 19.67 21.39 23.54 22.98 24.15 26.57 28.06 24.65
Ethane 12.17 9.67 9.50 8.22 7.54 8.57 9.23 7.40
Ethylene 13.07 8.13 7.07 5.54 4.42 4.14 4.33 3.42
Propane 4.60 3.62 3.56 3.08 2.92 3.14 3.36 2.80
Propylene 7.17 5.35 4.59 3.77 3.27 2.86 2.91 2.49
I-Butane 8.35 7.01 6.86 6.13 5.89 4.32 7.32 6.16

I-butene 10.93 12.65 12.78 12.83 13.08 7.78 12.56 11.57
N-Butenes+n-Butane 8.42 7.47 7.28 7.19 7.07 6.09 6.63 6.25
C5+ 15.62 24.71 24.81 30.26 31.66 36.54 25.61 35.26

Oxygen Balance, % 169.57 120.40 115.68 105.88 95.85 82.36 88.58 80.36

I-Butene Yield, C mole % 0.83 1.52 1.76 1.42 1.39 1.00 1.52 1.40
i-C4H8/CH4, C-molar 0.56 0.59 0.54 0.56 0.54 0.29 0.45 0.47

i-C4H8/C4s, C-molar 0.39 0.47 0.47 0.49 0.50 0.43 0.47 0.48
i-C4s/C4s, C-molar 0.70 0.72 0.73 0.72 0.73 0.66 0.75 0.74
Isosynthesis Profile 0.75 1.01 1.09 1.27 1.44 0.97 1.34 1.49

RUN SUMMARY

Run: 50.00
Catalyst: IS-31

HOURS ON STREAM	0.00	1.00	2.00	3.00	4.00	5.00	6.00
Temperature, C	428.00	423.00	418.00	424.00	429.00	431.00	428.00
Pressure, psig	600.00	600.00	600.00	605.00	610.00	615.00	610.00
GHSV, hr-1	960.00	960.00	960.00	960.00	960.00	960.00	960.00
Mass Balance, %	0.0	68.8	72.1	80.7	73.9	85.1	78.3
Conversions, %							
CO	26.37	28.30	23.34	21.39	21.08	23.71	23.24
H2	98.83	6.64	7.56	5.71	6.43	8.79	8.37
Selectivities, C mole %							
CO2	59.05	51.63	54.27	51.96	49.99	46.71	47.50
Hydrocarbon	40.95	48.37	45.73	48.04	50.01	53.29	52.50
HC Selectivities, C mole %							
Methane	18.18	17.25	23.06	22.96	27.96	27.98	27.31
Ethane	11.80	8.05	8.74	7.83	8.85	9.46	9.09
Ethylene	12.41	0.00	6.87	5.28	4.66	4.49	4.32
Propane	4.36	2.96	3.35	3.08	3.19	3.51	3.43
Propylene	6.59	4.70	4.70	3.92	3.36	3.07	3.05
I-Butane	7.54	5.40	6.32	5.97	6.26	4.43	4.65
I-butene	9.58	11.18	13.10	13.67	13.09	7.67	8.05
N-Butenes+n-Butane	7.03	6.36	7.48	7.46	6.96	6.34	6.71
C5+	22.51	44.10	26.38	29.83	25.66	33.05	33.40
Oxygen Balance, %	144.20	106.72	118.66	108.14	99.97	87.66	90.47
I-Butene Yield, C mole %	1.03	1.53	1.40	1.40	1.38	0.97	0.98
i-C4H8/CH4, C-molar	0.53	0.65	0.57	0.60	0.47	0.27	0.29
i-C4H8/C4s, C-molar	0.40	0.49	0.49	0.50	0.50	0.42	0.41
i-C4s/C4s, C-molar	0.71	0.72	0.72	0.72	0.74	0.66	0.65
Isosynthesis Profile	0.69	1.46	1.14	1.35	1.31	0.90	0.98

RUN SUMMARY

Run: 51.00
Catalyst: IS-13

HOURS ON STREAM 0.00 1.00 3.00 4.00 6.00 7.00 8.00 9.00
 Temperature, C 425.00 421.00 430.00 434.00 422.00 418.00 405.00 404.00
 Pressure, psig 615.00 620.00 605.00 605.00 600.00 605.00 600.00 620.00
 GHSV, hr-1 960.00 960.00 960.00 960.00 960.00 960.00 960.00 960.00
 Mass Balance, % 0.0 77.1 81.4 85.6 186.9 133.6 0.0 126.8

Conversions, %
 CO 22.39 21.04 19.61 18.92 59.31 65.75 14.46 62.67
 H2 12.56 5.73 5.77 4.66 -40.77 -38.37 6.73 -24.02

Selectivities, C mole %
 CO2 50.25 52.48 52.09 47.60 14.66 11.31 33.41 8.65
 Hydrocarbon 49.75 47.52 47.91 52.40 85.34 88.69 66.59 91.35

HC Selectivities, C mole %
 Methane 12.23 16.72 18.26 24.86 13.03 9.04 12.42 4.68
 Ethane 7.63 7.40 6.83 7.70 0.67 0.40 1.56 0.17
 Ethylene 7.63 6.62 5.01 4.70 0.26 0.18 1.19 0.14
 Propane 2.76 2.70 2.62 2.82 0.34 0.18 0.75 0.08
 Propylene 4.22 3.86 3.08 2.82 0.16 0.11 0.94 0.09
 I-Butane 6.19 6.87 6.58 6.95 0.00 0.00 3.01 0.00

I-butene 11.60 16.93 18.13 16.72 0.00 0.00 5.25 0.40
 N-Butenes+n-Butane 7.69 9.00 8.96 7.76 0.39 0.24 2.63 0.21
 C5+ 40.04 29.90 28.63 25.67 85.15 89.84 72.26 94.23

Oxygen Balance, % 101.00 110.42 109.45 90.83 17.17 12.76 50.17 9.47

I-Butene Yield, C mole %
 i-C4H8/CH4, C-molar 1.29 1.69 1.61 1.66 0.00 0.00 0.51 0.23
 0.95 1.01 1.05 0.67 0.00 0.00 0.42 0.09

i-C4H8/C4s, C-molar 0.46 0.52 0.54 0.53 0.00 0.00 0.48 0.65
 i-C4s/C4s, C-molar 0.70 0.73 0.74 0.75 0.00 0.00 0.76 0.65
 Isosynthesis Profile 1.15 1.59 1.79 1.74 0.27 0.27 2.45 1.26

10.00	11.00	12.00	13.00	14.00
402.00	401.00	424.00	424.00	424.00
610.00	620.00	630.00	650.00	635.00
960.00	960.00	960.00	960.00	960.00
141.6	134.4	134.8	135.0	136.9
63.58	62.04	53.55	38.56	42.33
-23.42	-23.78	-39.98	-49.27	-32.47
8.65	8.75	15.45	28.99	22.14
91.35	91.25	84.55	71.01	77.86
4.73	4.83	15.45	47.66	36.63
0.13	0.16	0.71	2.50	2.85
0.13	0.11	0.31	1.85	1.27
0.06	0.05	0.25	21.88	14.79
0.08	0.08	0.18	0.84	0.52
0.00	0.00	0.00	0.00	0.00
0.30	0.09	0.34	2.68	1.09
0.05	0.19	0.43	1.49	0.98
94.53	94.49	82.34	21.09	41.87
9.47	9.59	18.28	40.83	28.43
0.17	0.05	0.16	0.74	0.36
0.06	0.02	0.02	0.06	0.03
0.85	0.32	0.44	0.64	0.53
0.85	0.32	0.44	0.64	0.53
0.89	0.70	0.54	0.15	0.11

RUN SUMMARY

Run: 52.00
Catalyst: IS-13

HOURS ON STREAM
Temperature, C
Pressure, psig
GHSV, hr-1
Mass Balance, %

Conversions, %
CO
H2

Selectivities, C mole %
CO2
Hydrocarbon

HC Selectivities, C mole %
Methane
Ethane
Ethylene
Propane
Propylene
i-Butane

i-butene
N-Butenes+n-Butane
C5+

Oxygen Balance, %

i-Butene Yield, C mole %
i-C4H8/CH4, C-molar

i-C4H8/C4s, C-molar
i-C4s/C4s, C-molar
Isosynthesis Profile

0.00	1.00	2.00	3.00	4.00	5.00	6.00
405.00	402.00	398.00	403.00	398.00	393.00	399.00
300.00	290.00	300.00	300.00	300.00	200.00	200.00
240.00	240.00	240.00	240.00	240.00	240.00	240.00
0.0	82.5	74.4	76.2	79.7	90.3	106.1
15.75	19.85	17.49	20.52	18.11	12.21	13.77
55.04	4.25	3.57	4.74	4.65	-3.58	-0.18
58.56	54.67	56.96	53.68	60.27	53.16	48.24
41.44	45.33	43.04	46.32	39.73	46.84	51.76
12.36	10.68	10.23	15.46	16.57	24.23	20.95
6.10	4.55	3.81	5.86	6.17	4.01	5.35
16.86	13.07	9.53	10.76	11.32	7.80	8.76
2.41	1.65	1.43	2.15	2.35	1.34	1.84
7.59	5.51	4.55	4.90	5.25	3.18	3.55
4.96	3.07	2.56	3.62	3.61	1.49	2.13
17.68	17.04	19.62	21.03	24.73	19.24	21.01
11.56	8.81	8.84	9.67	10.68	4.46	7.71
20.47	35.61	39.43	26.56	19.33	34.26	28.70
141.31	120.59	132.37	115.90	151.73	113.48	93.21
1.15	1.53	1.48	2.00	1.78	1.10	1.50
1.43	1.60	1.92	1.36	1.49	0.79	1.00
0.52	0.59	0.63	0.61	0.63	0.76	0.68
0.66	0.70	0.72	0.72	0.73	0.82	0.75
1.04	1.17	1.61	1.45	1.56	1.54	1.58

RUN SUMMARY

53

Run: Catalyst: 15-32

	0	1	2	3	4	5	6	7	8
HOURS ON STREAM									
Temperature, C	405	397	395	396	397	397	405	399	399
Pressure, psig	305	300	300	300	300	300	300	200	200
GHSV, hr-1	240	480	480	480	480	480	480	240	240
Mass Balance, %	0.0	64.6	62.5	60.9	61.9	61.8	63.8	42.6	42.5
Conversions, %									
CO	15.75	13.29	14.72	15.09	16.87	16.36	20.31	19.98	5.08
H2	55.04	-2.61	-1.59	-2.21	-0.74	-0.76	1.69	2.38	15.38
Selectivities, C mole %									
CO2	58.56	56.58	52.95	50.28	45.01	45.88	47.63	49.37	6.60
Hydrocarbon	41.44	43.42	47.05	49.72	54.99	54.12	52.37	50.63	93.40
HC Selectivities, C mole %									
Methane	12.36	0.00	8.79	11.62	14.05	15.87	18.49	16.18	0.14
Ethane	6.10	4.99	3.89	4.44	5.37	5.82	8.37	7.29	1.85
Ethylene	16.86	9.98	7.48	7.31	7.85	8.01	10.21	10.22	4.42
Propane	2.41	1.87	1.31	1.70	1.96	2.18	2.84	2.44	0.43
Propylene	7.59	3.74	2.77	2.87	3.00	3.06	3.30	3.22	1.93
I-Butane	4.96	0.00	2.90	3.37	3.80	3.91	5.10	4.94	0.00
I-butene	17.68	0.00	22.17	24.83	25.68	27.24	21.80	22.28	0.00
N-Butenes+n-Butane	11.56	6.48	5.25	5.57	5.92	6.26	5.75	5.73	3.14
C5+	20.47	72.94	45.43	38.29	32.37	27.66	24.14	27.68	88.09
Oxygen Balance, %	141.31	130.30	112.54	101.13	81.85	84.79	90.95	97.49	7.06
I-Butene Yield, C mole %	1.15	0.00	1.54	1.86	2.38	2.41	2.32	2.25	0.00
i-C4H8/CH4, C-molar	1.43	ERR	2.52	2.14	1.83	1.72	1.18	1.38	0.00
i-C4H8/C4s, C-molar	0.52	0.00	0.73	0.74	0.73	0.73	0.67	0.68	0.00
i-C4s/C4s, C-molar	0.66	0.00	0.83	0.84	0.83	0.83	0.82	0.83	0.00
Isosynthesis Profile	1.04	0.32	1.96	2.07	1.95	1.96	1.32	1.42	0.36

9	11	12	13	14	15	16	17	18	19
391	390	210	205	205	102	100	100	102	102
200	200	210	205	205	102	100	100	102	102
240	240	240	240	240	120	120	120	60	60
51.0	47.3	31.1	29.7	29.5	41.8	47.9	44.6	43.5	61.4
16.25	18.63	19.22	19.42	18.38	8.33	16.20	15.87	12.52	18.84
-3.62	-3.01	4.18	1.66	0.17	21.38	1.58	-3.38	-3.00	3.20
45.41	46.23	50.74	54.53	50.99	9.34	32.04	40.31	49.90	48.94
54.59	53.77	49.26	45.47	49.01	90.66	67.96	59.69	50.10	51.06
17.88	17.25	18.33	17.61	16.96	0.00	16.14	15.58	23.49	20.56
6.02	5.12	6.53	6.12	5.91	3.39	6.06	5.27	7.46	0.66
8.52	7.46	8.40	9.70	8.39	0.00	6.18	0.00	10.65	7.32
2.31	1.97	2.29	2.13	2.08	1.27	2.32	1.86	2.66	2.41
2.97	2.63	2.71	2.69	2.63	4.37	2.78	2.33	3.37	2.20
4.54	3.65	5.29	5.10	4.92	0.96	0.00	0.00	5.36	6.94
22.05	22.66	21.23	22.21	22.51	7.31	0.00	0.00	24.23	18.38
5.58	5.26	5.55	5.52	5.40	2.07	4.82	4.03	5.92	4.39
30.11	33.99	29.68	28.92	31.19	80.63	61.69	70.93	16.86	37.14
83.18	85.96	102.99	119.93	104.05	10.30	47.16	67.52	99.59	95.87
1.96	2.27	2.01	1.96	2.03	0.55	0.00	0.00	1.52	1.77
1.23	1.31	1.16	1.26	1.33	ERR	0.00	0.00	1.03	0.89
0.69	0.72	0.66	0.68	0.69	0.71	0.00	0.00	0.68	0.62
0.83	0.83	0.83	0.83	0.84	0.80	0.00	0.00	0.83	0.85
1.62	1.84	1.61	1.59	1.73	1.15	0.28	0.43	1.47	2.36

20
405
310
480
63.8

11.50
-5.07

50.27
49.73

12.58
2.30
1.15
1.21
1.72
1.69

20.36
4.14
54.85

101.09

1.16
1.62

0.78
0.84
4.11

RUN SUMMAR:

Run: 54

Catalyst: IS-33

HOURS ON STREAM	0	1	2	3	4	5	6	7	8
Temperature, C	388	394	405	398	392	388	400	406	394
Pressure, psig	205	205	202	203	203	205	205	205	203
GHSV, hr-1	240	480	480	480	480	240	240	240	240
Mass Balance, %	0.0	83.0	60.2	68.6	72.8	52.9	62.1	57.8	64.7
Conversions, %									
CO	3.41	13.05	17.20	13.45	14.22	20.62	23.17	12.10	18.90
H2	26.47	6.54	8.29	4.93	4.56	12.14	12.81	-2.05	10.10
Selectivities, C mole %									
CO2	74.00	58.64	59.05	63.90	60.89	68.39	63.45	74.80	66.56
Hydrocarbon	26.00	41.36	40.95	36.10	39.11	31.61	36.55	25.20	33.44
HC Selectivities, C mole %									
Methane	0.00	0.00	8.30	16.80	18.64	17.37	16.97	11.13	21.31
Ethane	47.51	3.96	5.96	7.62	7.91	9.83	9.85	8.30	9.45
Ethylene	34.48	11.88	15.30	18.11	15.93	19.47	17.55	18.02	17.32
Propane	0.00	0.00	0.00	0.00	0.00	2.29	2.59	0.00	2.51
Propylene	16.09	4.41	5.06	6.18	6.34	5.44	5.29	5.77	5.61
I-Butane	0.00	2.65	2.94	5.20	5.30	4.53	6.41	8.38	3.63
I-butene	0.00	17.71	22.47	38.27	35.89	31.56	27.39	37.78	32.78
N-Butenes+n-Butane	0.00	0.00	0.00	0.00	2.38	2.10	2.45	0.00	0.00
C5+	1.92	59.39	39.97	7.81	7.59	7.40	11.51	10.63	7.38
Oxygen Balance, %	284.67	141.80	144.21	177.01	155.72	216.32	173.61	296.86	199.02
I-Butene Yield, C mole %	0.00	0.96	1.58	1.86	2.00	2.06	2.32	1.15	2.07
i-C4H8/CH4, C-molar	ERR	ERR	2.71	2.28	1.92	1.82	1.61	3.39	1.54
i-C4H8/C4s, C-molar	ERR	0.87	0.88	0.88	0.82	0.83	0.76	0.82	0.90
i-C4s/C4s, C-molar	ERR	1.00	1.00	1.00	0.95	0.95	0.93	1.00	1.00
Isosynthesis Profile	0.00	1.01	0.97	1.36	1.44	1.03	1.03	1.44	1.04

9	10	11	12	13	14	15	16	17	18	19
401	397	403	404	390	396	398	402	398	402	405
205	205	205	205	150	150	155	150	150	150	150
240	120	120	120	120	120	120	120	60	60	60
65.5	67.9	71.2	68.5	69.3	72.2	56.2	62.2	65.0	72.1	69.0
21.52	28.91	27.90	22.77	21.64	7.26	21.15	21.69	20.95	27.62	19.14
11.25	12.43	10.71	7.51	10.36	2.98	18.26	10.91	11.81	15.72	6.65
59.42	57.82	61.90	65.67	61.76	77.49	51.96	58.23	61.38	58.65	66.91
40.58	42.18	38.10	34.33	38.24	22.51	48.04	41.77	38.62	41.35	33.09
20.92	21.55	20.84	16.47	18.19	0.00	36.54	27.95	37.83	28.15	23.15
9.51	10.98	10.24	7.73	8.93	7.13	15.51	10.72	15.50	12.11	10.23
15.20	13.75	15.30	14.18	16.01	19.25	13.83	13.13	15.57	12.41	12.77
2.81	3.06	3.17	2.03	2.99	0.00	4.88	3.22	4.41	3.45	2.63
4.58	4.81	4.17	4.05	4.43	0.00	3.75	3.51	3.86	2.99	3.07
5.54	4.60	4.54	7.51	6.64	9.22	0.97	6.32	1.98	5.62	8.93
26.94	26.01	28.18	30.15	28.92	42.12	7.39	22.67	8.45	25.44	23.63
2.36	2.24	2.56	1.95	2.66	0.00	2.32	2.08	2.50	2.04	0.00
12.14	13.00	10.99	15.94	11.25	22.28	14.81	10.40	9.92	7.79	15.59
146.43	137.07	162.49	191.26	161.49	344.21	108.16	139.42	158.91	141.81	202.24
2.35	3.17	2.99	2.36	2.39	0.69	0.75	2.05	0.68	2.91	1.50
1.29	1.21	1.35	1.83	1.59	ERR	0.20	0.81	0.22	0.90	1.02
0.77	0.79	0.80	0.76	0.76	0.82	0.69	0.73	0.65	0.77	0.73
0.93	0.93	0.93	0.95	0.93	1.00	0.78	0.93	0.81	0.94	1.00
1.09	1.01	1.07	1.42	1.18	1.95	0.28	1.02	0.33	1.07	1.13

Run 54

Page 3

20
404
210
480
94.0

6.32
-1.57

63.93
36.07

0.00
5.35
8.84
0.00
0.00
2.84

34.11
0.00
48.86

177.24

0.78
ERR

0.92
1.00
2.60

RUN SUMMARY

Run: 55
Catalyst: IS-34

	0	1	2	3	4	5	6	7	8
HOURS ON STREAM									
Temperature, C	392	389	390	391	391	392	393	390	391
Pressure, psig	210	205	205	204	204	205	205	205	205
GHSV, hr-1	240	480	480	480	480	240	240	240	240
Mass Balance, %	0.0	93.7	91.5	93.6	91.7	70.8	103.1	102.3	71.7
Conversions, %									
CO	11.97	10.54	10.38	11.87	11.57	21.77	14.31	2.74	18.45
H2	-19.41	-13.78	-12.99	-12.39	-11.97	-9.55	-10.67	-19.25	-12.56
Selectivities, C mole %									
CO2	34.58	50.51	54.75	48.40	50.00	47.61	63.16	88.12	56.09
Hydrocarbon	65.42	49.49	45.25	51.60	50.00	52.39	36.84	11.88	43.91
HC Selectivities, C mole %									
Methane	0.00	0.00	0.00	3.45	3.49	7.00	12.29	0.00	13.09
Ethane	0.00	3.25	3.77	3.29	3.49	3.83	6.50	0.00	5.62
Ethylene	2.38	7.15	8.40	6.46	6.98	6.40	10.53	0.00	9.15
Propane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Propylene	0.00	3.12	3.69	2.79	3.49	2.49	4.68	0.00	2.27
I-Butane	1.15	2.34	2.78	2.38	2.40	2.11	5.67	18.15	2.60
1-butene	4.11	15.60	21.26	17.55	16.21	14.70	24.24	81.85	23.42
N-Butenes+n-Butane	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C5+	92.36	68.55	60.10	64.07	63.95	63.46	36.09	0.00	43.85
Oxygen Balance, %									
	52.87	102.08	121.00	93.81	100.00	90.88	171.46	742.00	127.74
I-Butene Yield, C mole %									
i-C4H8/CH4, C-molar	0.32	0.81	1.00	1.08	0.94	1.68	1.28	0.27	1.90
	ERR	ERR	ERR	5.09	4.65	2.10	1.97	ERR	1.79
i-C4H8/C4s, C-molar									
i-C4s/C4s, C-molar	0.78	0.87	0.88	0.88	0.87	0.87	0.81	0.82	0.90
Isosynthesis Profile	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
	2.21	1.33	1.52	1.59	1.33	1.32	1.38	ERR	1.53

9	10	11	12	13	14	15	16	17	18	19
392	390	391	391	390	390	391	392	392	289	389
205	204	203	203	205	205	205	205	205	200	200
240	120	120	120	120	120	120	120	120	60	60
73.0	91.2	64.3	84.2	79.0	84.8	74.1	83.3	88.9	52.8	69.2
15.01	13.52	28.83	22.04	21.90	5.14	26.65	19.56	20.03	26.85	30.58
-9.68	-9.80	-4.75	-5.37	-5.29	-21.69	-11.10	-10.46	-9.85	-6.41	-2.20
67.64	66.53	46.89	65.70	64.41	56.69	44.58	65.55	64.48	52.88	58.51
32.36	33.47	53.11	34.30	35.59	43.31	55.42	34.45	35.52	47.12	41.49
20.13	20.05	12.05	18.87	19.18	0.00	11.48	21.61	22.28	19.29	24.38
8.42	8.20	6.30	9.62	9.35	6.67	5.06	9.17	9.18	9.73	13.45
13.99	12.91	7.22	13.61	13.02	5.51	6.16	12.71	12.21	8.66	10.66
0.00	0.00	1.75	2.99	2.75	0.00	1.52	2.66	2.78	2.71	3.78
5.14	4.78	3.32	4.36	4.06	0.00	1.98	4.22	4.10	2.63	3.05
7.41	6.76	2.66	7.49	7.18	3.02	2.05	8.45	7.46	4.48	8.73
35.99	38.19	16.54	30.07	31.27	13.79	15.54	30.30	31.82	20.28	23.11
0.00	0.00	1.50	2.54	2.27	0.00	1.23	2.29	2.34	1.91	2.79
8.92	9.11	48.64	10.44	10.92	71.01	54.98	8.59	7.82	30.29	10.05
208.99	198.79	88.29	191.52	181.00	130.87	80.43	190.26	181.53	112.22	141.05
1.75	1.73	2.53	2.27	2.44	0.31	2.30	2.04	2.26	2.57	2.93
1.79	1.91	1.37	1.59	1.63	ERR	1.35	1.40	1.43	1.05	0.95
0.83	0.85	0.80	0.75	0.77	0.82	0.83	0.74	0.76	0.76	0.67
1.00	1.00	0.93	0.94	0.94	1.00	0.93	0.94	0.94	0.93	0.92
1.58	1.74	1.11	1.31	1.40	1.38	1.28	1.43	1.47	1.12	1.12

20
392
200
60
69.1

31.66
-3.25

61.32
38.68

22.73
12.95
11.38
3.62
3.20
2.55

30.63
2.58
10.37

158.52

3.75
1.35

0.86
0.93
1.15

RUN SUMMARY

Run: 56

Catalyst: IS-33

HOURS ON STREAM	0	1	2	3	4	5	6	7	8
Temperature, C	398	392	387	389	389	392	392	395	387
Pressure, psig	205	210	210	210	210	200	200	200	210
GHSV, hr ⁻¹	240	480	480	480	480	240	240	240	240
Mass Balance, %	0.0	104.9	96.7	96.4	95.2	74.4	84.2	84.2	76.5
Conversions, %									
CO	6.63	10.50	9.71	7.84	7.65	15.53	15.08	15.47	13.96
H2	-18.43	-5.62	-4.40	-2.89	-1.98	4.78	4.28	4.05	4.65
Selectivities, C mole %									
CO2	81.99	61.62	64.93	78.76	79.82	72.08	73.37	71.15	74.24
Hydrocarbon	18.01	38.38	35.07	21.24	20.18	27.92	26.63	28.85	25.76
HC Selectivities, C mole %									
Methane	0.00	0.00	0.00	0.00	0.00	17.63	16.40	17.31	19.54
Ethane	11.59	3.80	3.98	7.71	9.44	8.81	8.77	8.54	7.96
Ethylene	35.14	9.76	9.11	16.76	17.45	14.32	14.50	13.29	13.27
Propane	0.00	0.00	0.00	0.00	0.00	3.15	3.08	3.20	0.00
Propylene	10.65	3.90	3.66	5.59	5.58	5.26	5.36	4.95	4.89
I-Butane	9.33	3.19	3.47	7.25	8.69	4.95	8.25	7.68	4.31
I-Butene	33.29	21.32	26.55	53.39	58.83	34.51	35.26	34.61	38.88
N-Butenes+n-Butane	0.00	0.00	0.00	0.00	0.00	2.60	0.00	1.94	2.41
C5+	0.00	58.03	53.24	9.31	0.00	8.76	8.39	8.49	8.75
Oxygen Balance, %	455.33	160.52	185.18	370.74	395.42	258.14	275.54	246.65	288.24
I-Butene Yield, C mole %	0.40	0.86	0.90	0.89	0.91	1.50	1.42	1.54	1.40
i-C4H8/CH4, C-molar	ERR	ERR	ERR	ERR	ERR	1.96	2.15	2.00	1.99
i-C4H8/C4s, C-molar	0.78	0.87	0.88	0.88	0.87	0.82	0.81	0.78	0.85
i-C4s/C4s, C-molar	1.00	1.00	1.00	1.00	1.00	0.94	1.00	0.96	0.95
Isosynthesis Profile	0.74	1.40	1.79	2.02	2.08	1.33	1.37	1.48	1.75

9	10	11	12	13	14	15	16	17	18	19
389	393	393	388	392	392	394	397	392	397	388
210	205	205	205	205	205	210	210	105	110	210
240	120	120	120	120	120	120	120	120	120	480
86.5	50.3	83.7	81.1	75.8	74.6	82.0	70.4	67.6	68.7	94.6
13.42	25.85	19.71	20.64	23.04	4.20	21.26	10.22	14.49	5.11	6.28
4.67	15.55	8.63	9.96	10.90	-10.50	10.83	-2.91	-0.36	-1.82	-3.54
72.13	69.00	71.86	69.55	67.53	80.02	67.77	75.61	66.50	78.90	73.00
27.87	31.00	28.14	30.45	32.47	19.98	32.23	24.39	33.50	21.10	27.00
19.99	22.40	17.56	18.54	20.23	0.00	27.83	18.99	23.37	0.00	25.91
8.06	11.20	7.86	8.02	9.48	10.97	10.36	11.50	9.67	11.57	8.29
12.21	12.56	12.40	11.73	11.50	14.62	11.46	14.46	12.18	18.18	10.36
0.00	4.08	3.12	3.34	3.70	0.00	3.86	0.00	3.49	0.00	0.00
4.67	3.85	4.51	4.25	4.04	0.00	3.86	0.00	4.30	0.00	0.00
7.59	4.91	5.66	8.04	7.12	9.37	3.61	8.97	7.28	12.72	15.20
36.88	27.74	35.15	32.27	31.04	42.85	27.40	32.15	31.04	57.53	40.24
2.53	2.93	2.77	2.70	2.92	0.00	2.57	0.00	3.76	0.00	0.00
8.06	10.33	10.97	11.12	9.96	22.19	9.04	13.94	4.92	0.00	0.00
258.81	222.58	255.41	228.45	207.97	400.52	210.30	309.93	198.52	373.97	270.34
1.38	2.22	1.95	2.03	2.32	0.36	1.88	0.80	1.51	0.62	0.68
1.85	1.24	2.00	1.74	1.53	ERR	0.98	1.69	1.33	ERR	1.55
0.78	0.78	0.81	0.75	0.76	0.82	0.82	0.78	0.74	0.82	0.73
0.95	0.92	0.94	0.94	0.93	1.00	0.92	1.00	0.91	1.00	1.00
1.88	1.12	1.56	1.57	1.43	2.04	1.14	1.58	1.42	2.36	2.97

Run 51 Page 3

20
390
210
480
93.6

3.40
-14.59

68.36
31.64

0.00
18.71
6.65
0.00
20.58
2.88

34.55
0.00
16.63

216.01

0.37
ERR

0.92
1.00
0.81

RUN 30 123-00

8	98	100	102	104	106	108	110	112	114	116	118	120	122	124	126	128	130	132	134	136	138	140	142	144	146	148	150	152	154	156	158	160	162	164	166	168	170	172	174	176	178	180	182	184	186	188	190	192	194	196	198	200	202	204	206	208	210	212	214	216	218	220	222	224	226	228	230	232	234	236	238	240	242	244	246	248	250	252	254	256	258	260	262	264	266	268	270	272	274	276	278	280	282	284	286	288	290	292	294	296	298	300	302	304	306	308	310	312	314	316	318	320	322	324	326	328	330	332	334	336	338	340	342	344	346	348	350	352	354	356	358	360	362	364	366	368	370	372	374	376	378	380	382	384	386	388	390	392	394	396	398	400	402	404	406	408	410	412	414	416	418	420	422	424	426	428	430	432	434	436	438	440	442	444	446	448	450	452	454	456	458	460	462	464	466	468	470	472	474	476	478	480	482	484	486	488	490	492	494	496	498	500	502	504	506	508	510	512	514	516	518	520	522	524	526	528	530	532	534	536	538	540	542	544	546	548	550	552	554	556	558	560	562	564	566	568	570	572	574	576	578	580	582	584	586	588	590	592	594	596	598	600	602	604	606	608	610	612	614	616	618	620	622	624	626	628	630	632	634	636	638	640	642	644	646	648	650	652	654	656	658	660	662	664	666	668	670	672	674	676	678	680	682	684	686	688	690	692	694	696	698	700	702	704	706	708	710	712	714	716	718	720	722	724	726	728	730	732	734	736	738	740	742	744	746	748	750	752	754	756	758	760	762	764	766	768	770	772	774	776	778	780	782	784	786	788	790	792	794	796	798	800	802	804	806	808	810	812	814	816	818	820	822	824	826	828	830	832	834	836	838	840	842	844	846	848	850	852	854	856	858	860	862	864	866	868	870	872	874	876	878	880	882	884	886	888	890	892	894	896	898	900	902	904	906	908	910	912	914	916	918	920	922	924	926	928	930	932	934	936	938	940	942	944	946	948	950	952	954	956	958	960	962	964	966	968	970	972	974	976	978	980	982	984	986	988	990	992	994	996	998	1000
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NUM 1 1072

9	9	9	9	9	9	9
100	102	104	106	108	110	112
0.4	0.4	0.4	0.4	0.4	0.4	0.4
0.445	0.444	0.545	0.44	0.433	0	0
0	1.00	1.00	1.00	1.00	1.00	1.00
215	215	215	215	215	215	215
400.1	400.2	400.3	400.7	400.7	400.7	400.7
0.012297	0.012297	0.012297	0.012297	0.012297	0.012297	0.012297
0.015098	0.015114	0.018516	0.014979	0.014804	0.014804	0.014804
226.4	226.4	226.4	226.4	226.4	226.4	226.4
122.78	122.91	150.57	121.81	120.39	120.39	120.39
100	102	104	106	108	110	112
5.09	5.08	5.07	5.09	5.13	5.13	5.13
0.09	0.09	0.09	0.08	0.09	0.09	0.09
63.00	62.84	62.92	62.83	62.64	62.64	62.64
0.93	0.94	0.95	0.96	0.99	0.99	0.99
27.49	27.64	27.55	27.63	27.70	27.70	27.70
3.01	3.01	3.02	3.02	3.06	3.06	3.06
0.09	0.09	0.09	0.10	0.09	0.09	0.09
0.05	0.05	0.05	0.05	0.05	0.05	0.05
0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.02	0.02	0.02	0.02	0.02	0.02	0.02
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
0.00	0.00	0.00	0.00	0.00	0.00	0.00
99.999	100.001	99.999	100.000	99.994	99.994	99.994
12.66712	12.7093	12.68404	12.71018	12.76474	12.76474	12.76474
29.8	29.8	29.8	29.8	29.8	29.8	29.8
65.5	65.5	65.5	65.5	65.5	65.5	65.5
4.5	4.5	4.5	4.5	4.5	4.5	4.5
11.48	11.48	11.48	11.48	11.48	11.48	11.48
17.89	17.14	17.37	17.29	17.89	17.89	17.89
14.36	14.29	14.13	14.53	14.47	14.47	14.47
5.18	5.22	5.21	5.23	5.28	5.28	5.28
15.86	15.87	15.90	15.92	16.02	16.02	16.02
0.905112	0.905551	0.888591	0.912573	0.965799	0.965799	0.965799
17.927	17.948	18.260	18.390	18.650	18.650	18.650
59.066	57.885	58.007	57.714	57.300	57.300	57.300
3.589	3.605	3.610	3.632	3.666	3.666	3.666
2.084	2.081	2.035	2.026	1.966	1.966	1.966
1.158	1.208	1.210	1.204	1.138	1.138	1.138
1.274	1.266	1.243	1.242	1.268	1.268	1.268
1.775	1.801	1.843	1.912	1.968	1.968	1.968
0.000	0.000	0.000	0.000	0.000	0.000	0.000
14.126	14.267	13.825	13.917	13.550	13.550	13.550
0.000	0.000	0.000	0.000	0.000	0.000	0.000
0.000	0.000	0.000	0.000	0.000	0.000	0.000
138.472	136.938	138.134	136.483	137.697	137.697	137.697
-1.994	-1.926	-1.986	-1.908	-1.992	-1.992	-1.992
2.241	2.264	2.198	2.215	2.171	2.171	2.171
2.522	2.556	2.491	2.520	2.486	2.486	2.486
2.522	2.556	2.491	2.520	2.486	2.486	2.486
0.888	0.886	0.882	0.879	0.873	0.873	0.873
1.000	1.000	1.000	1.000	1.000	1.000	1.000
1.962	1.976	1.943	1.962	1.966	1.966	1.966
2.844	2.849	2.903	2.927	2.990	2.990	2.990