

MONTBELLO SYNTHESIS UNIT
CALCULATION OF YIELDS

	FRESH FEED %	FEED m/hr	WET GAS %	GAS m/hr	CHANGE mols	C	H	O	POLY YIELD	MW	#/hr	#/gal	gal/hr
CO	34.4	6.485	8.0	0.665	-5.820	-5.820		-5.820					
H2	59.0	11.121	52.0	4.322	-6.799		-13.598						
CO2	2.4	0.452	24.2	2.010	1.558	1.558		3.116					
N2	1.5	0.283	1.4	0.116									
CH4	2.7	0.509	9.7	0.805	0.296	0.296	1.184						
C2H4			1.2	0.100	0.100	0.200	0.400						
C2H6			0.4	0.033	0.033	0.066	0.198						
C3H6			1.2	0.100	0.100	0.300	0.600		0.90 x 42		3.78	6.25	0.605
C3H8			0.2	0.017	0.017	0.051	0.136						
C4H8			0.9	0.075	0.075	0.300	0.600		0.95 x 56		3.99	6.1	0.654
C4H10			0.3	0.025	0.025	0.100	0.250		58		1.45	4.86	0.298
C5H10			0.5	0.042	0.042	0.200	0.420		70		2.94	5.3	0.555
OIL						2.749*	5.498		14		38.5	6.5	5.92
WATER							4.312*	2.704*					
								vs. 2.156 from H2 balance					
TOTAL		18.85		8.31							50.66		8.032

Fresh feed rate: $2350 \times 1.20 / 0.395 = 7150$ SCFH or 18.85 mols per hour

Wet gas rate: 3150 SCFH or 8.31 mols per hour

Contraction: $18.85 - 8.31 / 18.85 = 56.0 \%$

Conversion of CO: $5.820 / 6.485 = 89.7 \%$

Conversion of H2: $6.799 / 11.121 = 61.0 \%$

Entering CO converted to:

	m/hr	%
CO2	1.558	24.0
C1 & C2	0.562	8.7
C3 & Heavier	3.700	57.0
Unconverted	0.665	10.3

Oil Yields: $5.92 / 2.35 = 2.52$ gal. recovered oil per MCF of natural gas fed to generator
 $8.032 / 2.35 = 3.42$ gal. ultimate oil per MCF of natural gas fed to generator
 $= 81.4$ bbl. ultimate oil per MMCF of natural gas fed to generator

* These items by difference

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Comparison of Observed Data
With Baucher Correlation

Run Number	2A		3A		3B		4A		4B	
	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.
Contraction, %	66.1		44.1		50.0		53.5		56.0	
Conversion of H ₂ , %	75.6	72	49.5	48	55.4	55	58.5	58	61.0	61
Conversion of CO, %	97.2	98	88.8	80	89.3	88	89.5	90	89.7	93
% CO Converted to:										
CO ₂	18.3	22	38.0	28	35.2	30	28.9	29	26.8	28
C ₁ & C ₂	21.6	21	20.7	10	12.1	11	7.7	11	9.7	11
C ₃ & Heavier	60.1	57	51.3	62	52.7	59	63.4	60	63.5	61

Run Number	5A		5B		6		7		8	
	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.	Obs.	Pred.
Contraction, %	70.9		82.5		51.1		55.6		69.1	
Conversion of H ₂ , %		78		90		56		60		76
Conversion of CO, %		99		99		89		92		99
% CO Converted to:										
CO ₂		19		9		30		29		20
C ₁ & C ₂		10		4		11		13		11
C ₃ & Heavier		71		87		59		58		69

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	FRESH FEED % m/hr	WET GAS % m/hr	CHANGE mols	C	H	O	POLY YIELD	MW	#/hr	#/gal	gal/hr
CO	35.5	1.687	2.9	0.047	-1.640	-1.640					
H2	57.2	2.716	41.1	0.661	-2.055	-4.110					
CO2	2.2	0.104	25.1	0.404	0.300	0.300					
N2	3.3	0.157	7.0	0.113							
CH4	1.8	0.086	16.4	0.264	0.178	0.178					
C2H4			1.9	0.031	0.031	0.062					
C2H6			1.0	0.016	0.016	0.032					
C3H6			1.7	0.027	0.027	0.081					
C3H8			0.6	0.010	0.010	0.030		0.90 x 42	1.02	6.25	0.163
C4H8			1.3	0.021	0.021	0.084		0.95 x 56	1.12	6.1	0.184
C4H10			0.2	0.003	0.003	0.012		58	0.17	4.86	0.035
C5H10			0.5	0.008	0.008	0.040		70	0.56	5.4	0.104
C5H12			0.3	0.005	0.005	0.025		72	0.36	5.25	0.069
OIL					0.796*	1.592		14	11.14	6.5	1.71
WATER						1.006*					
TOTAL	4.75	1.610							14.37		2.265

Contraction: $4.75 - 1.61 / 4.75 = 66.1\%$
 Conversion of CO: $1.640 / 1.687 = 97.2\%$
 Conversion of H2: $2.055 / 2.716 = 75.6\%$

CO Converted to:	mols/hr	%	%
CO2	0.300	17.8	18.3
C1 & C2	0.272	16.1	16.6
C3 & Heavier	1.068	63.3	65.1
Unconverted	0.047	2.8	
	1.687		

Oil Yield: $1.71 / 0.592 = 2.88$ gal. "recovered" oil per MCF natural gas fed to generator
 $2.265 / 0.592 = 3.82$ gal. ultimate oil per MCF natural gas fed to generator
 $= 91.0$ bbl. ultimate oil per MMCF natural gas fed to generator

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CALCULATION OF YIELDS

	FRESH FEED		WET GAS		CHANGE	C	H	O	POLY	MW	#/hr	#/gal	gal/hr
	%	m/hr	%	m/hr	mols				YIELD				
CO	34.2	5.720	6.85	0.641	-5.079	-5.079		-5.079					
H2	58.9	9.856	53.3	4.988	-4.868		-9.736						
CO2	2.3	0.385	24.7	2.312	1.927	1.927		3.854					
N2	1.0	0.167	1.4	0.131									
CH4	3.6	0.602	8.7	0.815	0.213	0.213	0.852						
C2H4			1.25	0.117	0.117	0.234	0.468						
C2H6			0.5	0.047	0.047	0.094	0.282						
C3H6			1.25	0.117	0.117	0.351	0.702	0.90 x 42	4.42	6.25	0.708		
C3H8			0.15	0.014	0.014	0.042	0.112						
C4H8			1.05	0.098	0.098	0.392	0.784	0.95 x 56	5.21	6.1	0.855		
C4H10			0.2	0.019	0.019	0.076	0.190	58	1.10	4.86	0.226		
C5H10			0.5	0.047	0.047	0.235	0.470	70	3.29	5.4	0.610		
C5H12			0.15	0.014	0.014	0.070	0.168	72	1.01	5.24	0.192		
OIL						1.445*	2.890	14	20.23	6.5	3.12		
WATER							2.848*	1.225*					
							vs 1.424 from H2						
TOTAL		<u>16.73</u>		<u>9.36</u>						<u>35.26</u>		<u>5.711</u>	

Contraction: $16.73 - 9.36 / 16.73 = 44.1\%$
 Conversion of CO: $5.079 / 5.720 = 88.8\%$
 Conversion of H2: $4.868 / 9.856 = 49.5\%$

CO Converted to:

	mols/hr	%	%
CO2	1.927	33.7	37.9
C1 & C2	0.541	9.5	10.7
C3 & Heavier	2.611	45.6	51.4
Unconverted	0.641	11.2	
	<u>5.720</u>		

Oil Yields: $3.12 / 2.12 = 1.47$ gal. "recovered" oil per MCF natural gas fed to generator
 $5.71 / 2.12 = 2.7$ gal. ultimate oil per MCF natural gas fed to generator
 $= 64.1$ bbl. ultimate oil per MMCF natural gas fed to generator