

MONTEBELLO SYNTHESIS UNIT
CALCULATION OF YIELDS

	FRESH FEED		WET GAS		CHANGE	C	H	O	MW	#/hr	#/gal	gal/hr
	%	m/hr	%	m/hr								
CO	35.5	1.687	2.9	0.047	-1.640	-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		0.600				
N2	3.3	0.157	7.0	0.113								
CH4	1.8	0.086	16.4	0.264	0.178	0.178	0.712					
C2H4			1.9	0.031	0.031	0.062	0.124					
C2H6			1.0	0.016	0.016	0.032	0.096					
C3H6			1.7	0.027	0.027	0.081	0.162	0.90 x 42	1.02	6.25	0.163	
C3H8			0.6	0.010	0.010	0.030	0.080					
C4H8			1.3	0.021	0.021	0.084	0.168	0.95 x 56	1.12	6.1	0.184	
C4H10			0.2	0.003	0.003	0.012	0.030	58	0.17	4.86	0.035	
C5H10			0.5	0.008	0.008	0.040	0.080	70	0.56	5.4	0.104	
C5H12			0.3	0.005	0.005	0.025	0.060	72	0.36	5.25	0.069	
OIL						0.796*	1.592	14	11.14	6.5	1.71	
WATER							1.006*	1.040				
TOTAL		4.75		1.610								

503
1543
772

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

Entering CO Converted to:

	m/hr	%
CO2	0.300	17.8
C1 & C2	0.272	16.1
C3 & Heavier	1.068	63.3
Unconverted	0.047	2.8

Natural Gas Fed: $1800 \times 0.395 / 1.20 = 592$ SCFH

Oil Yields: $1.71 / 0.592 = 2.88$ gal. recovered oil per MCF natural gas fed to generator
 $2.265 / 0.592 = 3.82$ gal. ultimate oil per MCF natural gas
 = 91 Bbl. ultimate oil per MMcf

2A

MONTEBELLO SYNTHESIS UNIT
CALCULATION OF YIELDS

	FRESH %	FEED m/hr	WET GAS %	GAS m/hr	CHANGE mols	C	H	O	POLY YIELD	MW	#/hr	#/gal	gal/hr
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							2.818*	1.225*					
							vs. 1.424 from H2 balance						
TOTAL		16.73		9.36							35.26		9.711

Fresh feed rate: $2120 \times 1.20 / 0.401 = 6350$ SCFH or 16.73 mols per hour
 Wet gas rate: 3550 SCFH or 9.36 mols per hour

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

Entering CO converted to:

	m/hr	%
CO2	1.927	33.7
C1 & C2	0.541	9.5
C3 & Heavier	2.611	45.6
Unconverted	0.641	11.2

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 bbl. ultimate oil per MCF

3A

MONTEBELLO SYNTHESIS UNIT
CALCULATION OF YIELDS

	FRESH FEED %	m/hr	WET GAS %	m/hr	CHANGE mols	C	H	O	POLY MW YIELD	#/hr	#/gal	gal/hr
CO	34.0	6.01	7.3	0.645	-5.365	-5.365		-5.365				
H2	58.4	10.325	52.1	4.600	-5.725		-11.450					
CO2	2.0	0.354	25.3	2.240	1.886	1.886		3.772				
N2	3.3	0.584	1.3	0.115								
CH4	2.3	0.407	8.5	0.753	0.346	0.346	1.384					
C2H4			1.3	0.115	0.115	0.230	0.460					
C2H6			0.4	0.35	0.35	0.70	0.210					
C3H6			0.7	0.062	0.062	0.186	0.372	0.90 x 42	2.34	6.25	0.375	
C3H8			0.2	0.18	0.18	0.54	0.144					
C4H8			1.4	0.124	0.124	0.496	0.992	0.95 x 56	6.60	6.1	1.082	
C4H10			0.4	0.035	0.035	0.140	0.350	58	2.03	4.86	0.418	
C5H10			0.8	0.071	0.071	0.355	0.710	70	4.96	5.4	0.920	
C5H12			0.3	0.027	0.027	0.135	0.324	72	1.94	5.25	0.370	
OIL						1.467*	2.934	14	20.52	6.5	3.16	
WATER							3.570*					
							vs 1.785 from H2					
TOTAL		17.68		8.84					38.39		6.325	

Fresh Feed Rate: $2140 \times 1.20 / 0.383 = 6700$ SCFH or 17.68 mols per hour

Wet Gas Rate: 3350 SCFH or 8.84 mols per hour

Contraction: $17.68 - 8.84 / 17.68 = 50.0 \%$

Conversion of CO: $5.365 / 6.01 = 89.3 \%$

Conversion of H2: $5.725 / 10.325 = 55.4 \%$

Entering CO Converted to:

	m/hr	%
CO2	1.886	31.4
C1 & C2	0.646	10.8
C3 & Heavier	2.833	47.1
Unconverted	0.645	10.7

3B

Oil Yields: $3.16 / 2.14 = 1.48$ gal. recovered oil per MCF natural gas fed to generator
 $6.325 / 2.14 = 2.96$ gal. ultimate oil per MCF natural gas fed to generator
 or 70.5 bbl. ultimate oil per MMCF natural gas fed to generator

* these items by difference

MONTEBELLO SYNTHESIS UNIT
CALCULATION OF YIELDS

	FRESH FEED %	FRESH FEED m/hr	WGT GAS %	WGT GAS m/hr	CHANGE mols	C	H	O	POLY MW YIELD	#/hr	#/gal	gal/hr
CO	34.1	6.355	7.7	0.666	-5.689	-5.689		-5.689				
H ₂	58.5	10.898	52.35	4.534	-6.364		-12.728					
CO ₂	2.2	0.410	23.75	2.055	1.645	1.645		3.290				
N ₂	1.6	0.298	1.75	0.152								
CH ₄	3.6	0.671	9.3	0.806	0.135	0.135	0.510					
C ₂ H ₄			1.3	0.113	0.113	0.226	0.452					
C ₂ H ₆			0.45	0.039	0.039	0.078	0.234					
C ₃ H ₆			1.15	0.100	0.100	0.300	0.600	0.90 x 42	3.78	6.25	0.605	
C ₃ H ₈			0.15	0.013	0.013	0.039	0.104					
C ₄ H ₈			1.05	0.091	0.364	0.364	0.728	0.95 x 56	4.84	6.1	0.794	
C ₄ H ₁₀			0.35	0.030	0.030	0.120	0.300	58	1.74	4.86	0.358	
C ₅ H ₁₀			0.7	0.061	0.061	0.305	0.610	70	4.27	5.3	0.806	
C ₅ H ₁₂												
Oil						2.477*	4.954		14	34.62	6.5	5.33
Water							4.206*	2.399*				
								vs. 2.103 from H ₂ balance				
TOTAL		18.632		8.66					49.25			7.893

Fresh feed rate: $2350 \times 1.20 / 0.399 = 18.62$ mols per hour
 Wet gas rate: 3280 SCFH or 8.66 mols per hour

Contraction: $18.632 - 8.66 / 18.632 = 53.5\%$
 Conversion of CO: $5.689 / 6.355 = 89.5\%$
 Conversion of H₂: $6.364 / 10.898 = 58.5\%$

Entering CO converted to:

	m/hr	%
CO ₂	1.645	25.9
C ₁ & C ₂	0.439	6.9
C ₃ & heavier	3.605	56.7
Unconverted	0.666	10.5

Oil yields: $5.33 / 2.35 = 2.26$ gal. recovered oil per MCF natural gas fed to generator
 $7.893 / 2.35 = 3.36$ gal. ultimate oil per MCF natural gas fed to generator
 = 80 bbl. ultimate oil per MMCF natural gas fed to generator

* These items by difference