Use of Yield Charts

		Vol%		Wt%		Density	
H2S				H2 Correction			
Hydrogen				Fig 10.7			
C1 + C2				Fig 10.6			
C3		Ratio		Fig 10.6		Pure	
C4s	IC4	Fig 10.5	41.5%		Ratio		Pure
	NC4		58.5%		Ratio		Pure
C5+ Gasoline		Fig 10.4		Δ		Ratio	
Total				100%			

Notes:

- Y-axis of Fig 10.4 is C5+ gasoline yield
- Typically use the Watson K Factor of feed in Fig 10.4.

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Gasoline Yield vs. Reformate Octane

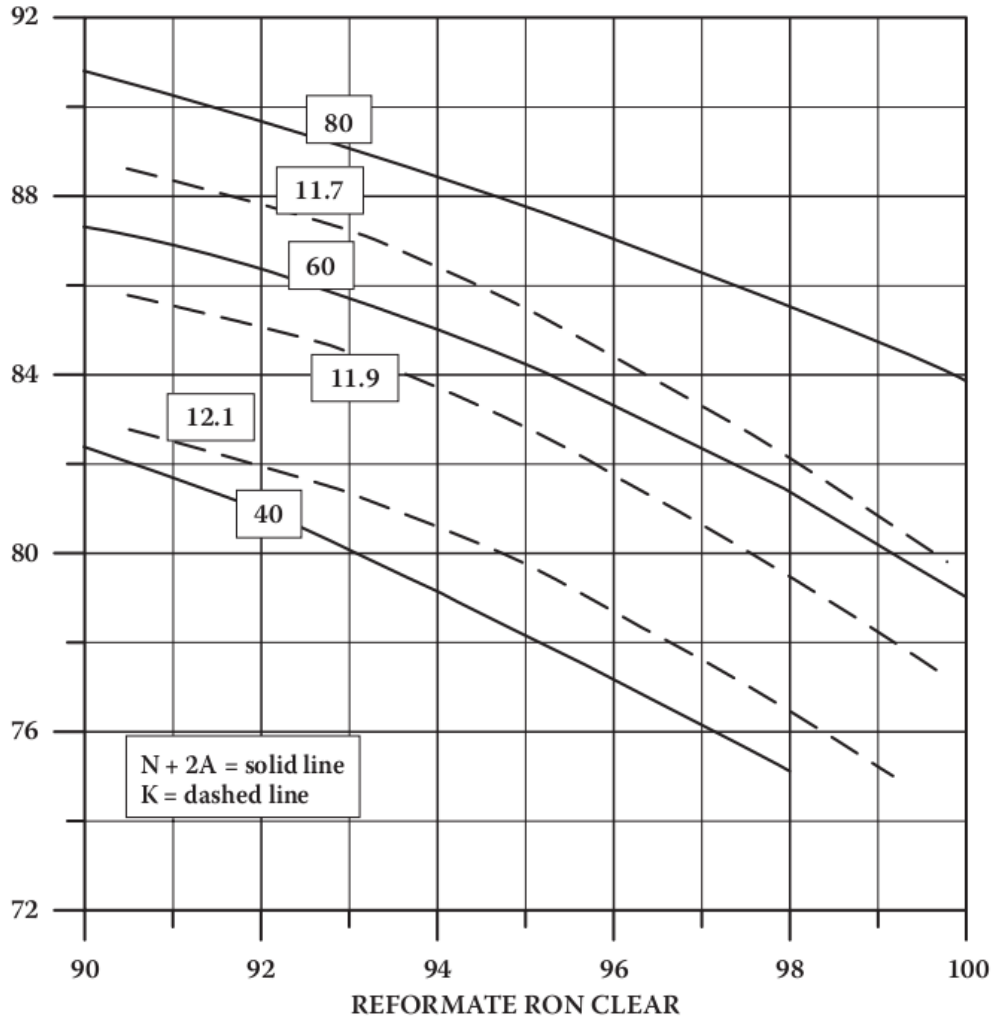

FIGURE 10.4 Catalytic reforming yield correlations.

Notes:

- Y-axis is C5+ gasoline yield
- Typically use the Watson K Factor of feed in Fig 10.4.

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Light Ends Production

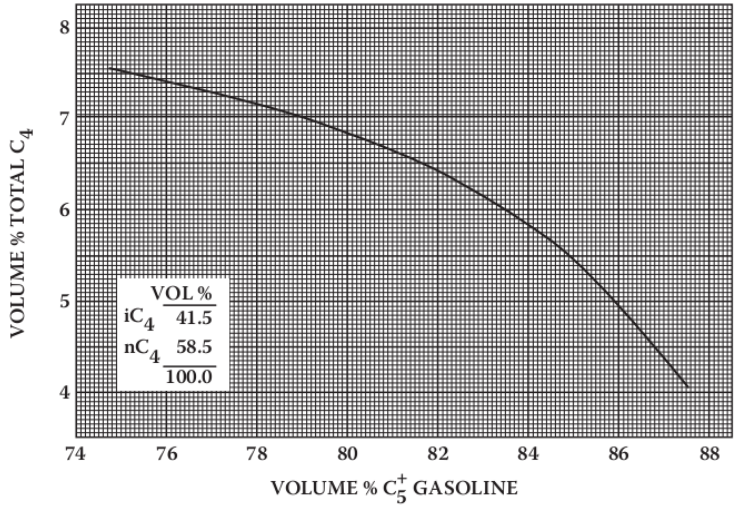

FIGURE 10.5 Catalytic reforming yield correlations.

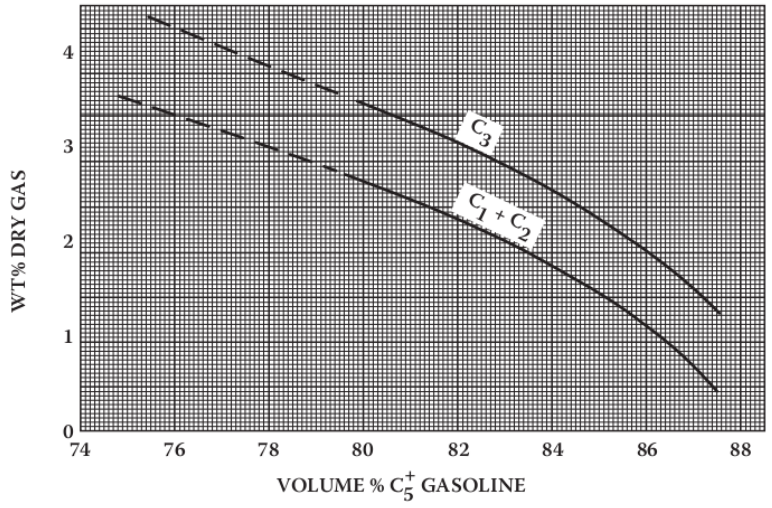

FIGURE 10.6 Catalytic reforming yield correlations.

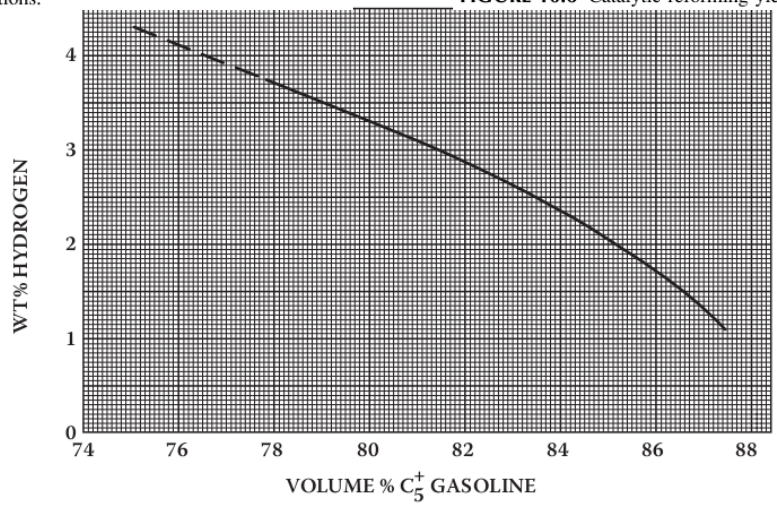

FIGURE 10.7 Catalytic reforming yield correlations.

Notes:

- Typical C4 Split: iC4=41.5%, nC4 = 58.5%

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Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates				Yields on Oil Feed		Standard Densities			Watson	Sulfur
	bbl/day	lb/day	mol/day	scf/day	vol%	wt%	°API	SpGr	lb/gal	K Factor	wt%
Feed	30,000	8,113,733					51.7	0.7724	6.439	11.8	0.1
H2S											
H2											
C1 + C2											
C3							147.6	0.5070	4.227		
Iso-butane (IC4)							119.9	0.5629	4.693		
n-butane (NC4)							110.8	0.5840	4.869		
C5+											
Total	0	0									

Uncorrected Yields	bbl/day	lb/day	mol/day	scf/day	vol%	wt%
Sulfur		8,114	253			
H2 (uncorrected)						
C4 (Total)						

Initialize calculations with specific data for the feedstock & characteristic properties for pure chemical species

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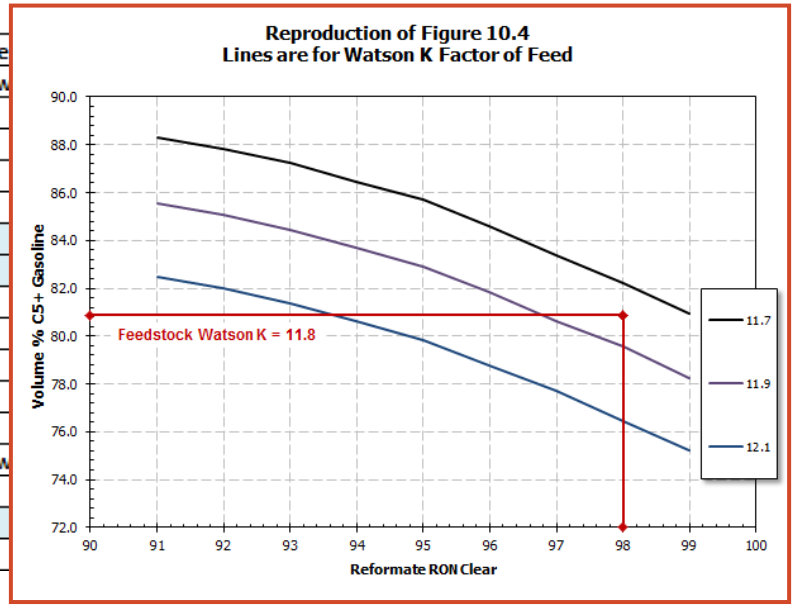
Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates bbl/day	lb/day	mol/day	scf/day	Yields on Oil Fe vol%	w
Feed	30,000	8,113,733				
H2S						
H2						
C1 + C2						
C3						
Iso-butane (IC4)						
n-butane (NC4)						
C5+	24,265				80.88	
Total	24,265	0				

Uncorrected Yields	bbl/day	lb/day	mol/day	scf/day	vol%	w
Sulfur		8,114	253			
H2 (uncorrected)						
C4 (Total)						



Determine the yield of reformate using Figure 10.4. Interpolate using feed's Watson K factor. Calculate actual volume.

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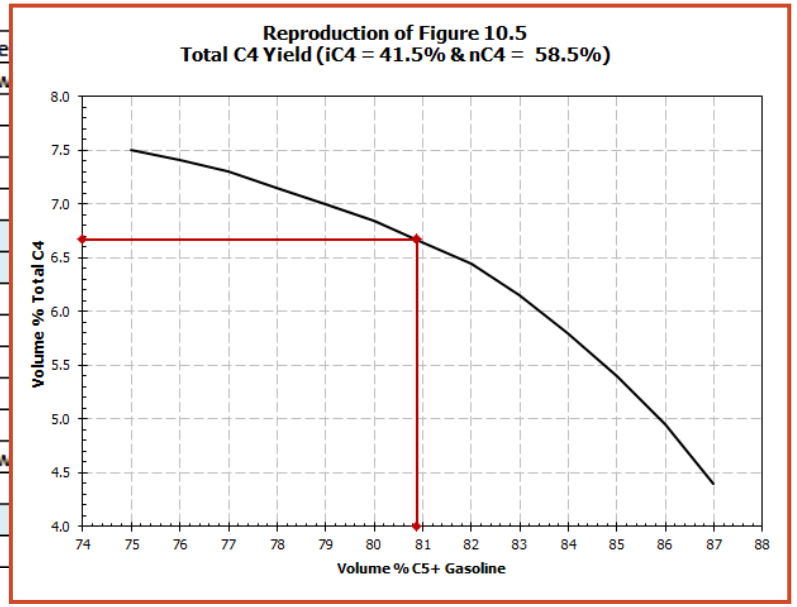
Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates bbl/day	lb/day	mol/day	scf/day	Yields on Oil Fe vol%	w
Feed	30,000	8,113,733				
H2S						
H2						
C1 + C2						
C3						
Iso-butane (IC4)						
n-butane (NC4)						
C5+	24,265				80.88	
Total	24,265	0				

Uncorrected Yields	bbl/day	lb/day	mol/day	scf/day	vol%	w
Sulfur		8,114	253			
H2 (uncorrected)						
C4 (Total)	2,002				6.67	



Calculate total yield C_4s using Figure 10.5.

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Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates bbl/day	lb/day	mol/day	scf/day	Yields on Oil Feed vol%	wt%	Standard Densities °API	SpGr	lb/gal	Watson K Factor	Sulfur wt%
Feed	30,000	8,113,733					51.7	0.7724	6.439	11.8	0.1
H2S											
H2											
C1 + C2											
C3							147.6	0.5070	4.227		
Iso-butane (IC4)	831	163,755			2.77		119.9	0.5629	4.693		
n-butane (NC4)	1,171	239,488			3.90		110.8	0.5840	4.869		
C5+	24,265				80.66						
Total	26,267	403,244									

Uncorrected Yields	bbl/day	lb/day	mol/day	scf/day	vol%	wt%
Sulfur		8,114	253			
H2 (uncorrected)						
C4 (Total)	2,002				6.67	

Split the C_4s using the iC_4/nC_4 ratio of 41.5/58.5. Calculate mass rates.

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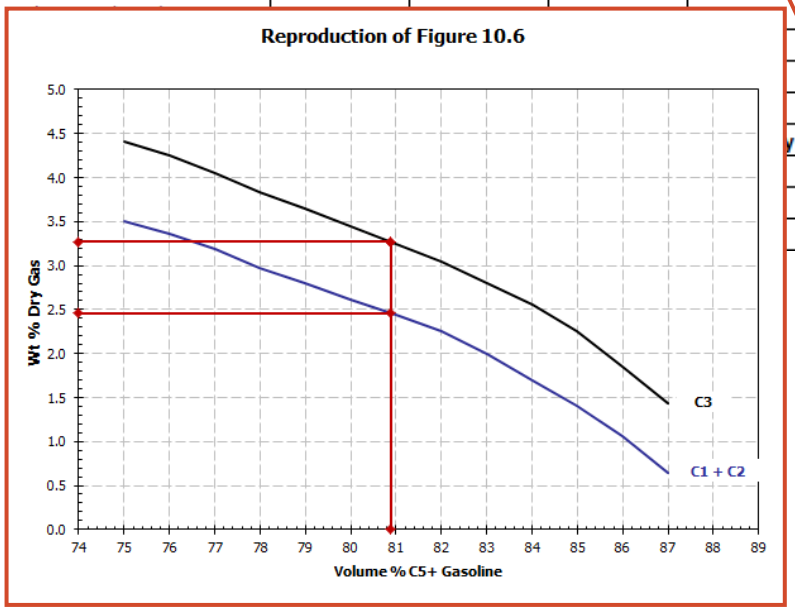
Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates bbl/day	Rates lb/day	Rates mol/day	Rates scf/day	Yields on Oil Feed vol%	Yields on Oil Feed wt%	Standard Densities °API	Standard Densities SpGr	Standard Densities lb/gal	Watson K Factor	Sulfur wt%
Feed	30,000	8,113,733					51.7	0.7724	6.439	11.8	0.1
H2S											
H2											
C1 + C2		199,660				2.46					
C3	1,496	265,569				3.27	147.6	0.5070	4.227		
Iso-butane (IC4)	831	163,755			2.77		119.9	0.5629	4.693		
					3.90		110.8	0.5840	4.869		
					80.88						

	vol%	wt%
	6.67	



Determine the amounts of gases & C_3 using Figure 10.6. Calculate C_3 volumes using standard liquid density.

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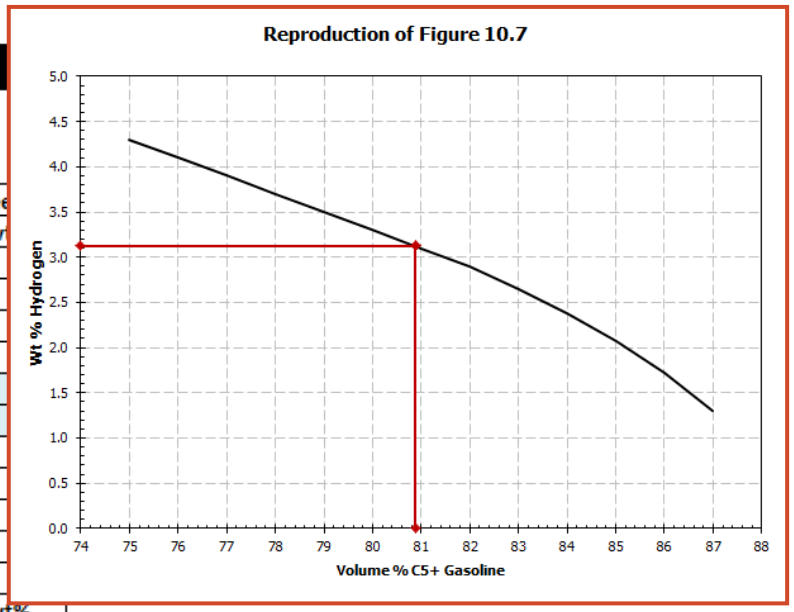
Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates bbl/day	lb/day	mol/day	scf/day	Yields on Oil Fe vol%	wt
Feed	30,000	8,113,733				
H2S						
H2						
C1 + C2		199,660				
C3	1,496	265,569				
Iso-butane (IC4)	831	163,755			2.77	
n-butane (NC4)	1,171	239,488			3.90	
C5+	24,265				80.88	
Total	27,763	868,473				

Uncorrected Yields	bbl/day	lb/day	mol/day	scf/day	vol%	wt%
Sulfur		8,114	253			
H2 (uncorrected)		253,398	125,445	47,604,552		3.12
C4 (Total)	2,002				6.67	



Determine the uncorrected amount of H_2 from Figure 10.7

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Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates				Yields on Oil Feed		Standard Densities			Watson	Sulfur
	bbl/day	lb/day	mol/day	scf/day	vol%	wt%	°API	SpGr	lb/gal	K Factor	wt%
Feed	30,000	8,113,733					51.7	0.7724	6.439	11.8	0.1
H2S		8,625	253	96,028							
H2		252,887	125,192	47,508,524							
C1 + C2		199,660				2.46					
C3	1,496	265,569				3.27	147.6	0.5070	4.227		
Iso-butane (IC4)	831	163,755			2.77		119.9	0.5629	4.693		
n-butane (NC4)	1,171	239,488			3.90		110.8	0.5840	4.869		
C5+	24,265				80.88						
Total	27,763	1,129,984									

Uncorrected Yields	bbl/day	lb/day	mol/day	scf/day	vol%	wt%
Sulfur		8,114	253			
H2 (uncorrected)		253,398	125,445	47,604,552		3.12
C4 (Total)	2,002				6.67	

Reduce the amount of H_2 to accommodate sulfur as H_2S

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Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates bbl/day	Rates lb/day	Rates mol/day	Rates scf/day	Yields on Oil Feed vol%	Yields on Oil Feed wt%	Standard Densities °API	Standard Densities SpGr	Standard Densities lb/gal	Watson K Factor	Sulfur wt%
Feed	30,000	8,113,733					51.7	0.7724	6.439	11.8	0.1
H2S		8,625	253	96,028							
H2		252,887	125,192	47,508,524							
C1 + C2		199,660				2.46					
C3	1,496	265,569				3.27	147.6	0.5070	4.227		
Iso-butane (IC4)	831	163,755			2.77		119.9	0.5629	4.693		
n-butane (NC4)	1,171	239,488			3.90		110.8	0.5840	4.869		
C5+	24,265	6,983,748			80.88		40.7	0.8219	6.853		
Total	27,763	8,113,733									

Uncorrected Yields	bbl/day	lb/day	mol/day	scf/day	vol%	wt%
Sulfur		8,114	253			
H2 (uncorrected)		253,398	125,445	47,604,552		3.12
C4 (Total)	2,002				6.67	

Determine mass amount reformate from difference. Calculate density from rates.

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Reformer Yield Example

Product Yields from Reformer

Operation Info: Target RON: 98.0

Fraction	Rates				Yields on Oil Feed		Standard Densities			Watson	Sulfur
	bbl/day	lb/day	mol/day	scf/day	vol%	wt%	°API	SpGr	lb/gal	K Factor	wt%
Feed	30,000	8,113,733					51.7	0.7724	6.439	11.8	0.1
H2S		8,625	253	96,028							
H2		252,887	125,192	47,508,524							
C1 + C2		199,660				2.46					
C3	1,496	265,569				3.27	147.6	0.5070	4.227		
Iso-butane (IC4)	831	163,755			2.77		119.9	0.5629	4.693		
n-butane (NC4)	1,171	239,488			3.90		110.8	0.5840	4.869		
C5+	24,265	6,983,748			80.88		40.7	0.8219	6.853		
Total	27,763	8,113,733									

Uncorrected Yields	bbl/day	lb/day	mol/day	scf/day	vol%	wt%
Sulfur		8,114	253			
H2 (uncorrected)		253,398	125,445	47,604,552		3.12
C4 (Total)	2,002				6.67	

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