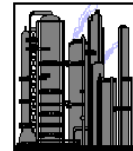


Crude Oil Assay Example #2

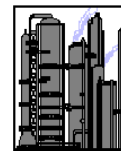
HIBERNIA - SUMMARY OF MAJOR CUTS

	Whole Crude	Light Naphtha	Medium Naphtha	Heavy Naphtha	Kero	Atm Gas Oil	Light VGO	Heavy VGO	Vacuum Resid	Atm Resid
TBP Temp At Start, °C	Start	10	80	150	200	260	340	450	570	340
TBP Temp At End, °C	End	80	150	200	260	340	450	570	End	End
TBP Temp At Start, °F	Start	55	175	300	400	500	650	850	1050	650
TBP Temp At End, °F	End	175	300	400	500	650	850	1050	End	End
Yield at Start, vol%		1.6	7.3	21.3	30.9	41.6	56.7	74.3	86.6	56.7
Yield at End, vol%		7.3	21.3	30.9	41.6	56.7	74.3	86.6	100.0	100.0
Yield of Cut (wt% of Crude)		4.5	12.6	8.9	10.4	15.1	18.4	13.3	15.6	47.3
Yield of Cut (vol% of Crude)		5.7	14.0	9.6	10.7	15.1	17.6	12.3	13.4	43.3
Gravity, °API	35.9	81.0	53.9	48.6	40.7	35.2	28.1	22.8	13.0	21.6
Specific Gravity	0.8454	0.6660	0.7632	0.7857	0.8218	0.8489	0.8868	0.9168	0.9791	0.9240
Sulfur, wt%	0.34	0.00	0.00	0.01	0.02	0.15	0.40	0.53	1.07	0.66
Mercaptan Sulfur, ppm		1	2	2	3	3	3			
Nitrogen, ppm	1035		0	1	1	51	710	1837	4186	2170
Hydrogen, wt%		16.1	15.9	15.4	14.6	14.0	13.2	12.5		
Viscosity @ 40 °C (104 °F), cSt	5.09			1.07	1.74	4.06	16.9	168	69661	257
Viscosity @ 50 °C (122 °F), cSt	3.55			0.938	1.47	3.26	12.2	93.8	20100	141
Viscosity @ 100 °C (212 °F), cSt	1.04			0.563	0.797	1.46	3.84	13.6	465	19.1
Viscosity @ 135 °C (275 °F), cSt	0.610			0.438	0.591	0.994	2.27	6.03	110	8.21
Freeze Point, °C				-58.000	-31.000	2.00	45.0			
Freeze Point, °F				-72	-23	36	113			
Pour Point, °C	13		-87	-60	-34	-1	34	51	35	29
Pour Point, °F	55		-125	-76	-29	31	93	124	95	84
Smoke Point, mm (ASTM)				25	20	17	15			
Aniline Point, °C				52	60	71	86	98		
Aniline Point, °F				125	140	160	187	208		
Total Acid Number, mg KOH/g	0.11	0.0	0.0	0.0	0.0	0.0	0.1	0.2		
Cetane Index, ASTM D976				37	46	52				
Diesel Index				61	57	56	52	48		
Characterization Factor (K Factor)	11.6	12.7	11.6	11.8	11.8	11.9	12.0	12.2	12.0	12.0
Research Octane Number, Clear		64.8	56.4	34.2						
Motor Octane Number, Clear		63.0								
Paraffins, vol%		83.1	48.1	51.2	46.9	40.0	30.6			
Naphthenes, vol%		16.9	35.2	30.4	31.8	33.0	36.1			
Aromatics, vol%		0.0	16.7	18.4	21.2	27.0	33.3			
Thiophenes, vol%										
Molecular Weight	233	103	112	143	176	227	326	471	824	436
Gross Heating Value, MM BTU/bbl	5.81	4.86	5.38	5.52	5.71	5.85	6.03	6.18	6.42	6.20
Gross Heating Value, kcal/kg	10900	11580	11190	11140	11050	10940	10800	10690	10390	10660
Gross Heating Value, MJ/kg	45.6	48.5	46.8	46.6	46.2	45.8	45.2	44.7	43.5	44.6
Heptane Asphaltenes, wt%	0.9								5.6	1.9
Micro Carbon Residue, wt%	1.2								8.0	2.6
Ramsbottom Carbon, wt%	1.2								7.6	2.5
Vanadium, ppm	1								6	2
Nickel, ppm	1								6	2
Iron, ppm										



Crude Oil Assay Example #2

	Whole Crude	Light Naphtha	Medium Naphtha	Heavy Naphtha	Kero	Atm Gas Oil	Light VGO	Heavy VGO	Vacuum Resid	Atm Resid
TBP Temp At Start, °C	Start	10	80	150	200	260	340	450	570	340
TBP Temp At End, °C	End	80	150	200	260	340	450	570	End	End
TBP Temp At Start, °F	Start	55	175	300	400	500	650	850	1050	650
TBP Temp At End, °F	End	175	300	400	500	650	850	1050	End	End
Yield at Start, vol%		1.6	7.3	21.3	30.9	41.6	56.7	74.3	86.6	56.7
Yield at End, vol%		7.3	21.3	30.9	41.6	56.7	74.3	86.6	100.0	100.0
Yield of Cut (wt% of Crude)		4.5	12.6	8.9	10.4	15.1	18.4	13.3	15.6	47.3
Yield of Cut (vol% of Crude)		5.7	14.0	9.6	10.7	15.1	17.6	12.3	13.4	43.3
Gravity, °API	35.9	81.0	53.9	48.6	40.7	35.2	28.1	22.8	13.0	21.6
Specific Gravity	0.8454	0.6660	0.7632	0.7857	0.8218	0.8489	0.8868	0.9168	0.9791	0.9240
Sulfur, wt%	0.34	0.00	0.00	0.01	0.02	0.15	0.40	0.53	1.07	0.66
Calculate Start °F from °C										
Difference from Reported										
Calculate Gravity from °API										?
Difference from Reported										?
Calculate wt% Yield from Gravities										
Difference from Reported										
Yield at Mid-Point, vol%										
Yield at Start, wt%										
Yield at End, wt%										
Yield at Mid-Point, wt%										
TBP Temp at Mid-Point (vol%), °F										
Watson K Factor Using Mid-Point °F										

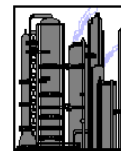


Oil Assay Example #2

Calculate consistency of reported values. Gravities OK. °C/°F values not – choose to use °F values.

	Light Naphtha	Medium Naphtha	Heavy Naphtha	Kero	Atm Gas Oil	Light VGO	Heavy VGO	Vacuum Resid	Atm Resid	
T	10	80	150	200	260	340	450	570	340	
T	80	150	200	260	340	450	570	End	End	
T	55	175	300	400	500	650	850	1050	650	
T	175	300	400	500	650	850	1050	End	End	
Y	1.6	7.3	21.3	30.9	41.6	56.7	74.3	86.6	56.7	
Y	7.3	21.3	30.9	41.6	56.7	74.3	86.6	100.0	100.0	
Y	4.5	12.6	8.9	10.4	15.1	18.4	13.3	15.6	47.3	
Y	5.7	14.0	9.6	10.7	15.1	17.6	12.3	13.4	43.3	
Gravity, °API	5.9	81.0	53.9	48.6	40.7	35.2	28.1	22.8	13.0	21.6
Specific Gravity	0.8453	0.6660	0.7632	0.7857	0.8218	0.8489	0.8868	0.9168	0.9791	0.9240
Sulfur, wt%	0.3	0.00	0.00	0.01	0.02	0.15	0.40	0.53	1.07	0.66
Calculate Start °F from °C	50	176	302	392	500	644	842	1058	644	
Difference from Reported	-5	1	2	-8	0	-6	-8	8	-6	
Calculate Gravity from °API	0.8453	0.6659	0.7632	0.7857	0.8217	0.8488	0.8866	0.9170	0.9792	0.9242
Difference from Reported	-0.0001	-0.0001	0.0000	0.0000	-0.0001	-0.0001	-0.0002	0.0002	0.0001	0.0002
Calculate wt% Yield from Gravities	4.5	12.6	8.9	10.4	15.2	18.5	13.3	15.5	47.3	
Difference from Reported	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0	
Yield at Mid-Point, vol%										
Yield at Start, wt%										
Yield at End, wt%										
Yield at Mid-Point, wt%										
TBP Temp at Mid-Point (vol%), °F										
Watson K Factor Using Mid-Point °F										





Oil Assay Example #2

Calculate as arithmetic average of yields at start & end.

	Light Naphtha	Medium Naphtha	Heavy Naphtha	Kero	Atm Gas Oil	Light VGO	Heavy VGO	Vacuum Resid	Atm Resid
	10	80	150	200	260	340	450	570	340
	80	150	200	260	340	450	570	End	End
	55	175	300	400	500	650	850	1050	650
	175	300	400	500	650	850	1050	End	End
	1.6	7.3	21.3	30.9	41.6	56.7	74.3	86.6	56.7
	7.3	21.3	30.9	41.6	56.7	74.3	86.6	100.0	100.0
	4.5	12.6	8.9	10.4	15.1	18.4	13.3	15.6	47.3
Yield of Cut (vol% of Crude)	5.7	14.0	9.6	10.7	15.1	17.6	12.3	13.4	43.3
Gravity, °API	85.9	81.0	53.9	48.6	40.7	35.2	28.1	22.8	13.0
Specific Gravity	0.6660	0.7632	0.7857	0.8218	0.8489	0.8868	0.9168	0.9791	0.9240
Sulfur, wt%	0.00	0.00	0.01	0.02	0.15	0.40	0.53	1.07	0.66
Calculate Start °F from °C	50	176	302	392	500	644	842	1058	644
Difference from Reported	-5	1	2	-8	0	-6	-8	8	-6
Calculate Gravity from °API	0.8453	0.6659	0.7632	0.7857	0.8217	0.8488	0.8866	0.9170	0.9242
Difference from Reported	-0.0001	0.0001	0.0000	0.0000	-0.0001	-0.0001	-0.0002	0.0002	0.0001
Calculate wt% Yield from Gravities	4.5	12.6	8.9	10.4	15.2	18.5	13.3	15.5	47.3
Difference from Reported	0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0
Yield at Mid-Point, vol%	4.5	14.3	26.1	36.3	49.2	65.5	80.5	93.3	78.4
Yield at Start, wt%									
Yield at End, wt%									
Yield at Mid-Point, wt%									
TBP Temp at Mid-Point (vol%), °F									
Watson K Factor Using Mid-Point °F									





Crude Oil Assay Example

Back calculate from final end (100%) using reported wt% increments.

	Whole Crude	Light Naphtha	Medium Naphtha	Heavy Naphtha	Kero	Atm Gas Oil				
TBP Temp At Start, °C	Start	10	80	150	200	260				
TBP Temp At End, °C	End	80	150	200	260	340				
TBP Temp At Start, °F	Start	55	175	300	400	500				
TBP Temp At End, °F	End	175	300	400	500					
Yield at Start, vol%		1.6	7.3	21.3	30.9					
Yield at End, vol%		7.3	21.3	30.9						
Yield of Cut (wt% of Crude)		4.5	12.6	8.9		15.1				
Yield of Cut (vol% of Crude)		5.7	14.0	9.6		15.1	17.6	12.3	13.4	43.3
Gravity, °API	35.9	81.0	53.9		40.7	35.2	28.1	22.8	13.0	21.6
Specific Gravity	0.8454	0.6660	0.7632		0.8218	0.8489	0.8868	0.9168	0.9791	0.9240
Sulfur, wt%	0.34	0.00	0.00	0.01	0.02	0.15	0.40	0.53	1.07	0.66
Calculate Start °F from °C		50		302	392	500	644	842	1058	644
Difference from Reported		-5		2	-8	0	-6	-8	8	-6
Calculate Gravity from °API	0.8453	0.6660	0.7632	0.7857	0.8217	0.8488	0.8866	0.9170	0.9792	0.9242
Difference from Reported	-0.0001	0.0001	0.0000	0.0000	-0.0001	-0.0001	-0.0002	0.0002	0.0001	0.0002
Calculate wt% Yield from Gravities		4.5	12.6	8.9	10.4	15.2	18.5	13.3	15.5	47.3
Difference from Reported		0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0
Yield at Mid-Point, vol%		4.5	14.3	26.1	36.3	49.2	65.5	80.5	93.3	78.4
Yield at Start, wt%		1.2	5.7	18.3	27.2	37.6	52.7	71.1	84.4	52.7
Yield at End, wt%		5.7	18.3	27.2	37.6	52.7	71.1	84.4	100.0	100.0
Yield at Mid-Point, wt%		3.5	12.0	22.8	32.4	45.2	61.9	77.8	92.2	76.4
TBP Temp at Mid-Point (vol%), °F										
Watson K Factor Using Mid-Point °F										

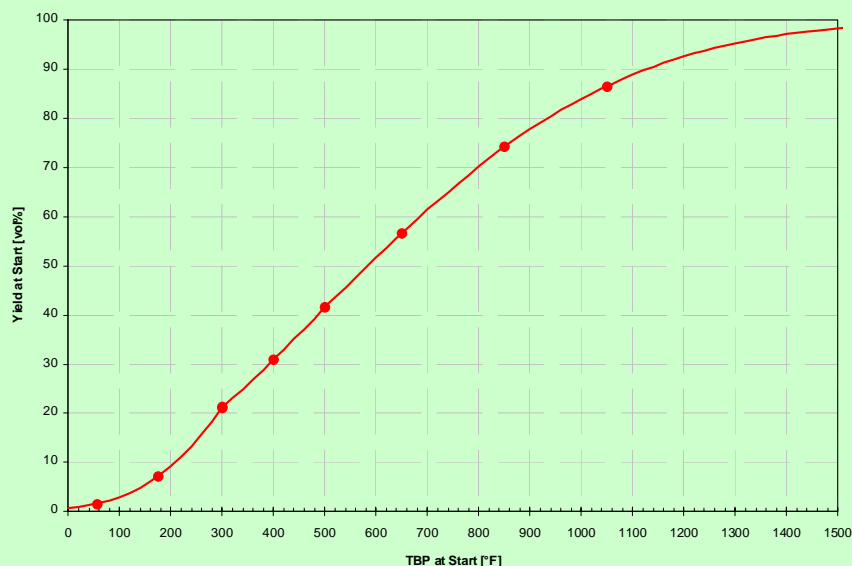




Crude Oil As

Determine from TBP @ Start vs Yield @ Start curve.

	Whole Crude	Light Naphtha	Medium Naphtha
TBP Temp At Start, °C	Start	10	80
TBP Temp At End, °C	End	80	150
TBP Temp At Start, °F	Start	55	175
TBP Temp At End, °F	End	175	300
Yield at Start, vol%		1.6	7.3
Yield at End, vol%		7.3	21.3
Yield of Cut (wt% of Crude)		4.5	12.6
Yield of Cut (vol% of Crude)		5.7	14.0
Gravity, °API	35.9	81.0	52.0
Specific Gravity	0.8454	0.6660	0.8632
Sulfur, wt%	0.34	0.00	0.00
Calculate Start °F from °C		50	
Difference from Reported		-5	
Calculate Gravity from °API	0.8453	0.6660	0.8632
Difference from Reported	-0.0001	0.0000	0.0000
Calculate wt% Yield from Gravities			12.6
Difference from Reported		0.0	0.0
Yield at Mid-Point, vol%		4.5	14.3
Yield at Start, wt%		1.2	5.7
Yield at End, wt%		5.7	18.3
Yield at Mid-Point, wt%		3.5	12.0
TBP Temp at Mid-Point (vol%), °F		132.1	248.5
Watson K Factor Using Mid-Point °F			

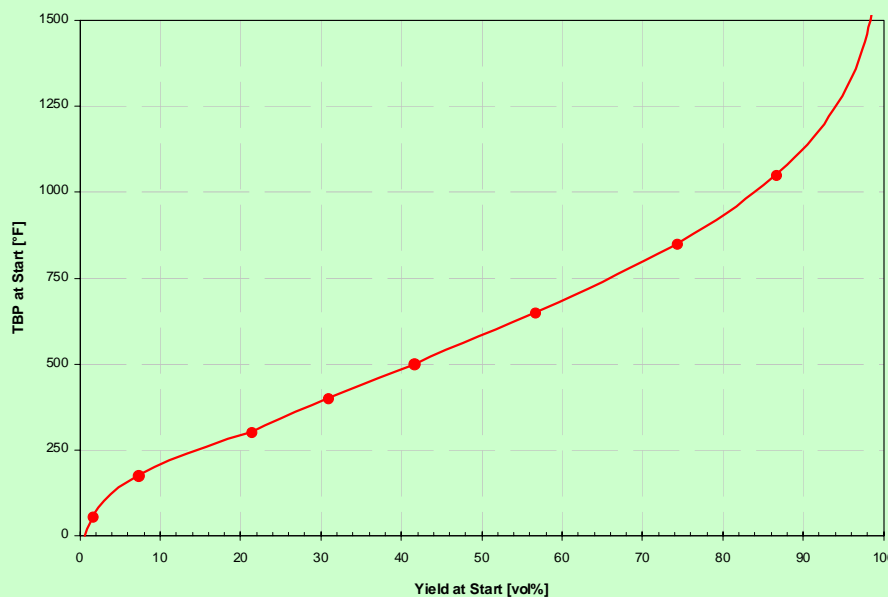




Crude Oil As

	Whole Crude	Light Naphtha	Medium Naphtha
TBP Temp At Start, °C	Start	10	80
TBP Temp At End, °C	End	80	150
TBP Temp At Start, °F	Start	55	175
TBP Temp At End, °F	End	175	300
Yield at Start, vol%		1.6	7.3
Yield at End, vol%		7.3	21.3
Yield of Cut (wt% of Crude)		4.5	12.6
Yield of Cut (vol% of Crude)		5.7	14.0
Gravity, °API	35.9	81.0	52.0
Specific Gravity	0.8454	0.6660	0.8632
Sulfur, wt%	0.34	0.00	0.00
Calculate Start °F from °C		50	
Difference from Reported		-5	
Calculate Gravity from °API	0.8453	0.6660	0.8632
Difference from Reported	-0.0001	0.0000	0.0000
Calculate wt% Yield from Gravities			12.6
Difference from Reported		0.0	0.0
Yield at Mid-Point, vol%		4.5	14.3
Yield at Start, wt%		1.2	5.7
Yield at End, wt%		5.7	18.3
Yield at Mid-Point, wt%		3.5	12.0
TBP Temp at Mid-Point (vol%), °F		132.1	248.5
Watson K Factor Using Mid-Point °F		352.4	451.3

More typically expressed as Vol% vs °F.

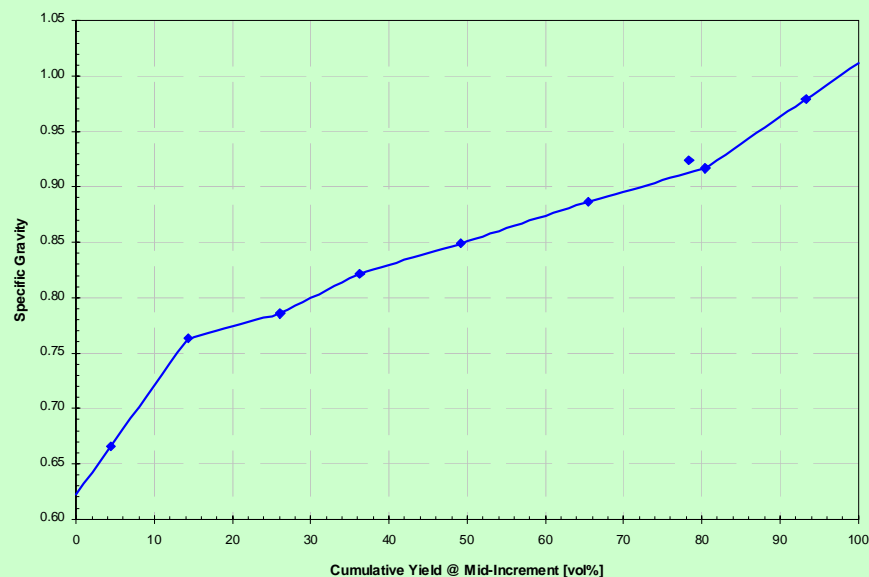




Crude Oil As

Can also plot trend of bulk property vs yield at mid-increment.

	Whole Crude	Light Naphtha	Medium Naphtha
TBP Temp At Start, °C	Start	10	80
TBP Temp At End, °C	End	80	150
TBP Temp At Start, °F	Start	55	175
TBP Temp At End, °F	End	175	300
Yield at Start, vol%		1.6	7.3
Yield at End, vol%		7.3	21.3
Yield of Cut (wt% of Crude)		4.5	12.6
Yield of Cut (vol% of Crude)		5.7	14.3
Gravity, °API	35.9	81.0	
Specific Gravity	0.8454	0.6660	
Sulfur, wt%	0.34	0.5	
Calculate Start °F from °C			
Difference from Reported			
Calculate Gravity from °API	0		0.7632
Difference from Reported		0.0001	0.0000
Calculate wt% Yield from Gravities		4.5	12.6
Difference from Reported		0.0	0.0
Yield at Mid-Point, vol%		4.5	14.3
Yield at Start, wt%		1.2	5.7
Yield at End, wt%		5.7	18.3
Yield at Mid-Point, wt%		3.5	12.0
TBP Temp at Mid-Point (vol%), °F		132.1	248.5
Watson K Factor Using Mid-Point °F			

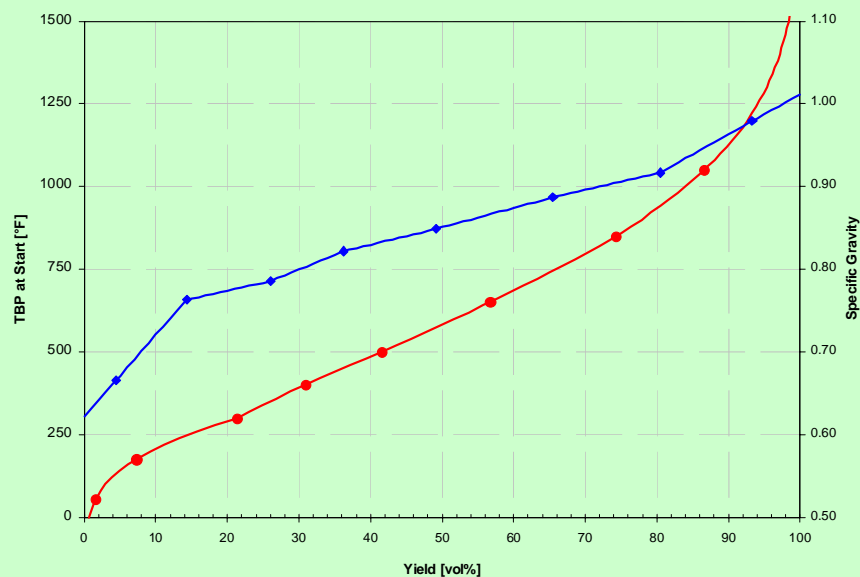




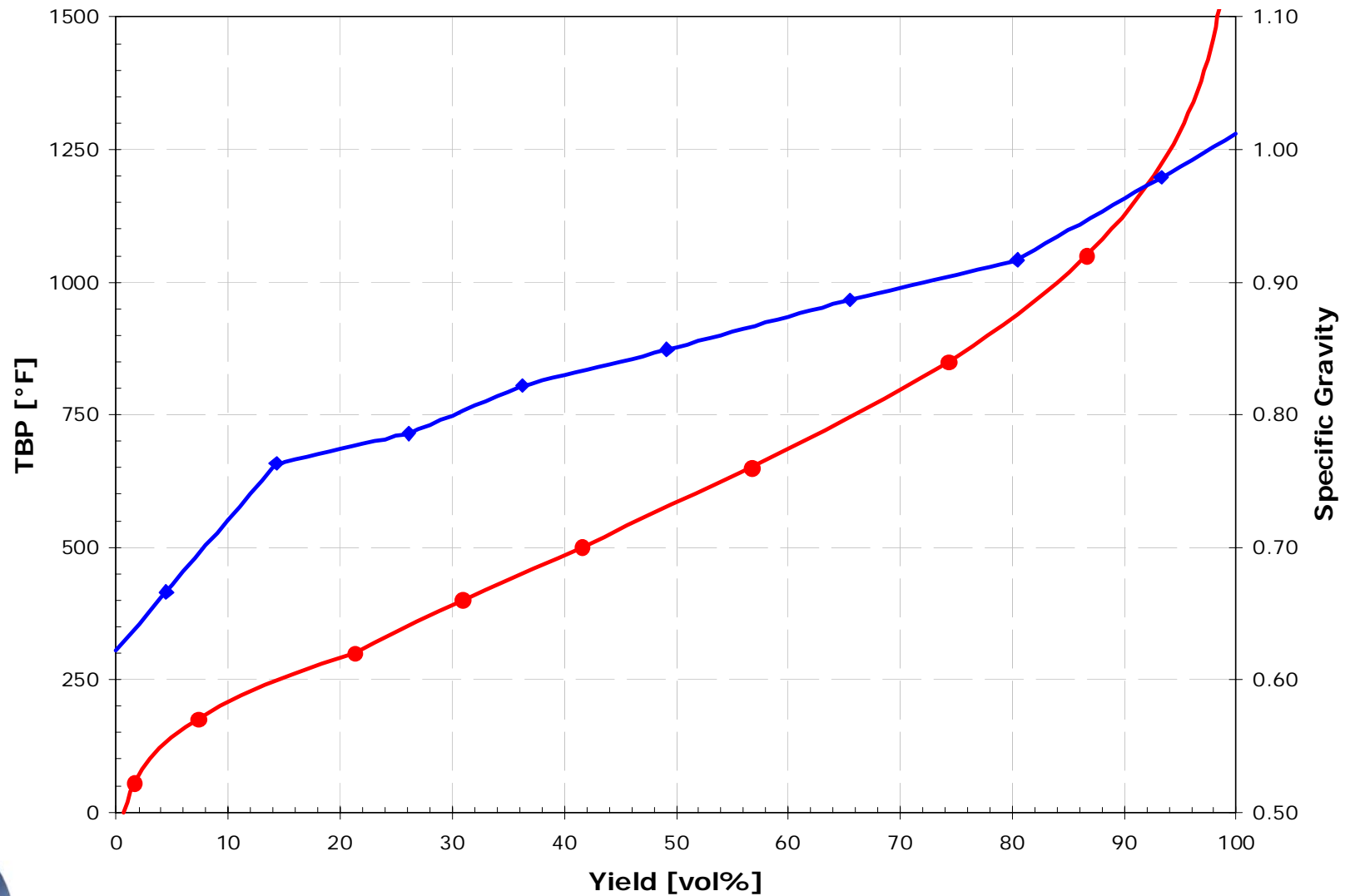
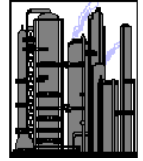
Crude Oil As

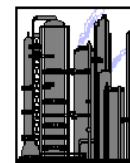
Can overlay these charts to estimate properties for new cut points.

	Whole Crude	Light Naphtha	Medium Naphtha							
TBP Temp At Start, °C	Start	10	80							
TBP Temp At End, °C	End	80	150							
TBP Temp At Start, °F	Start	55	175							
TBP Temp At End, °F	End	175	300							
Yield at Start, vol%		1.6	7.3							
Yield at End, vol%		7.3	21.3							
Yield of Cut (wt% of Crude)		4.5	12.6							
Yield of Cut (vol% of Crude)		5.7	14.0							
Gravity, °API	35.9	81.0	53.9							
Specific Gravity	0.8454	0.6660	0.7632							
Sulfur, wt%	0.34	0.00	0.00							
Calculate Start °F from °C		50	176							
Difference from Reported		-5	1							
Calculate Gravity from °API	0.8453	0.6659	0.7632							
Difference from Reported	-0.0001	-0.0001	0.0000							
Calculate wt% Yield from Gravities		4.5	12.6							
Difference from Reported		0.0	0.0							
Yield at Mid-Point, vol%		4.5	14.3	26.1	36.3	49.2	65.5	80.5	93.3	78.4
Yield at Start, wt%		1.2	5.7	18.3	27.2	37.6	52.7	71.1	84.4	52.7
Yield at End, wt%		5.7	18.3	27.2	37.6	52.7	71.1	84.4	100.0	100.0
Yield at Mid-Point, wt%		3.5	12.0	22.8	32.4	45.2	61.9	77.8	92.2	76.4
TBP Temp at Mid-Point (vol%), °F		132.1	248.5	352.4	451.3	575.2	745.1	940.2	1221.8	907.8
Watson K Factor Using Mid-Point °F										

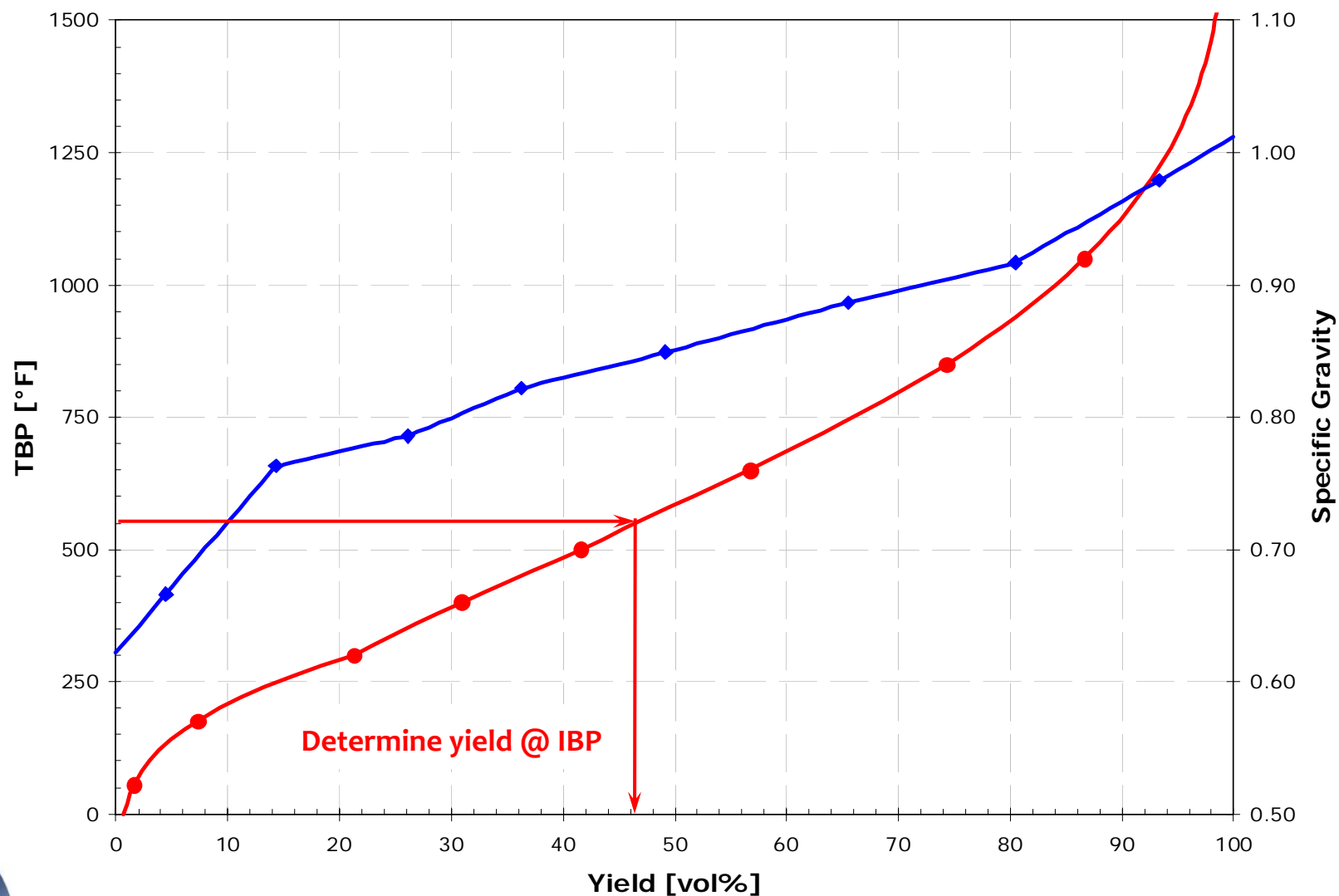


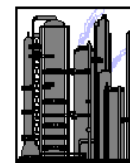
Estimate Properties for New Cuts



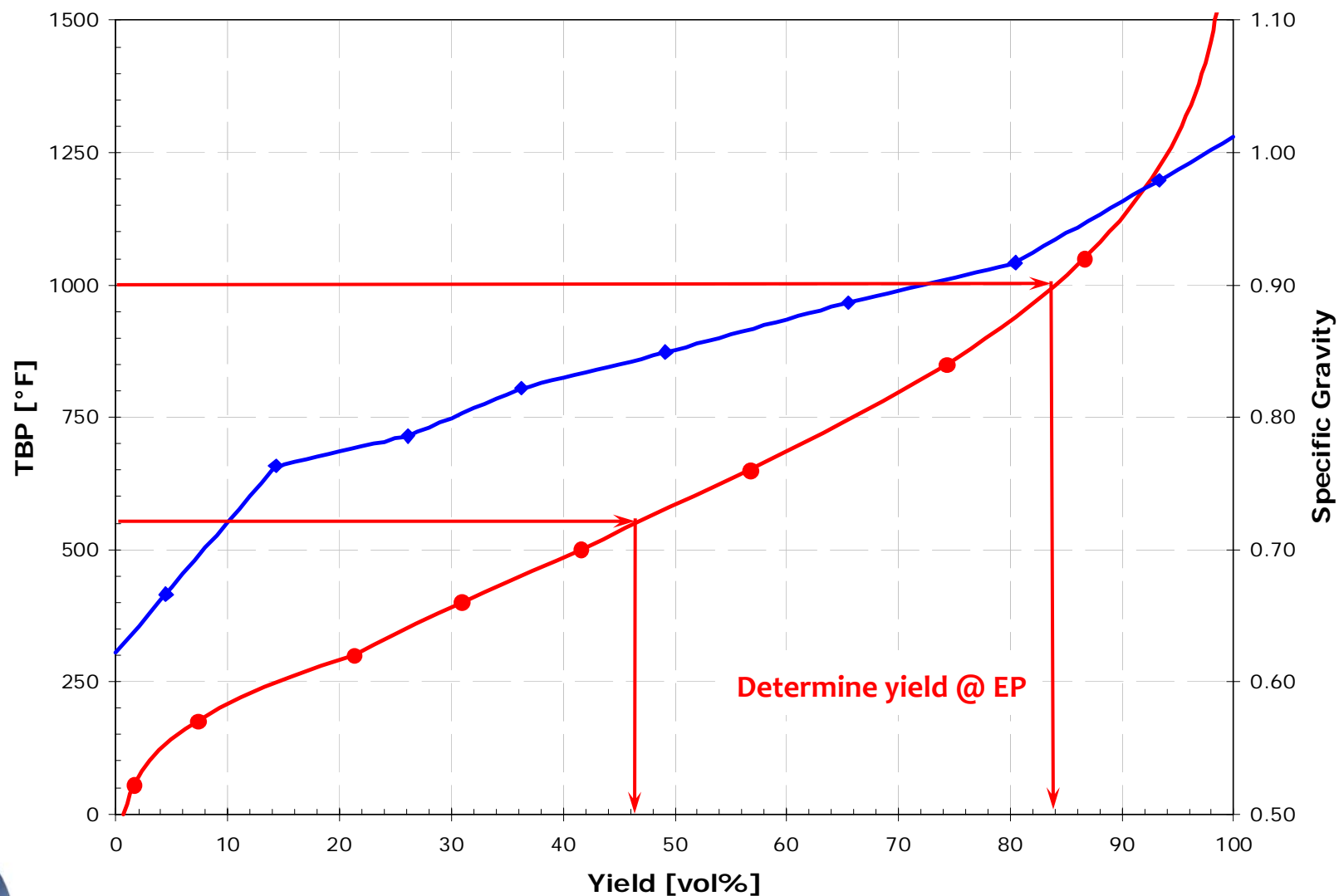


Estimate Properties for New Cuts

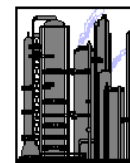




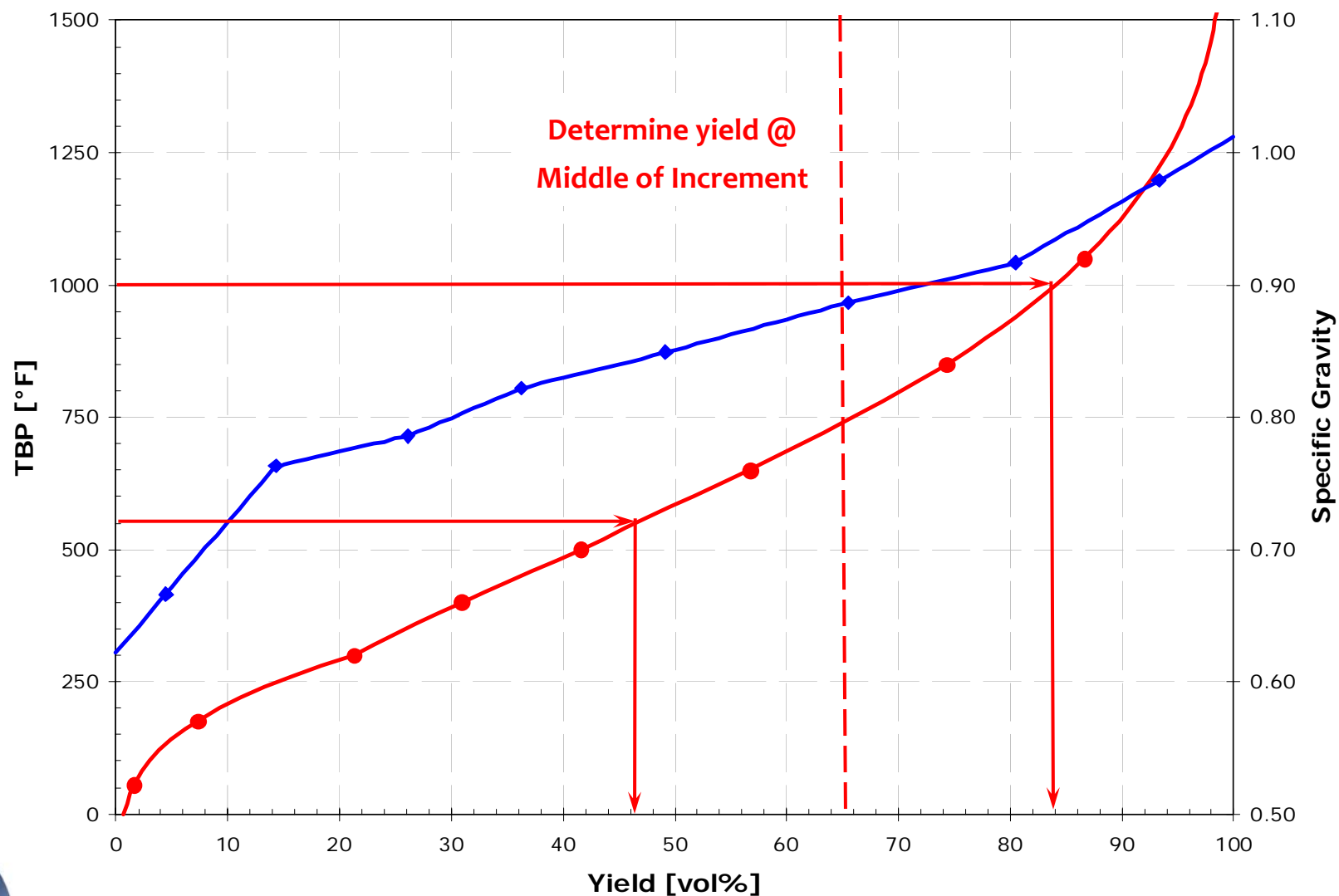
Estimate Properties for New Cuts

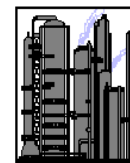


Determine yield @ EP

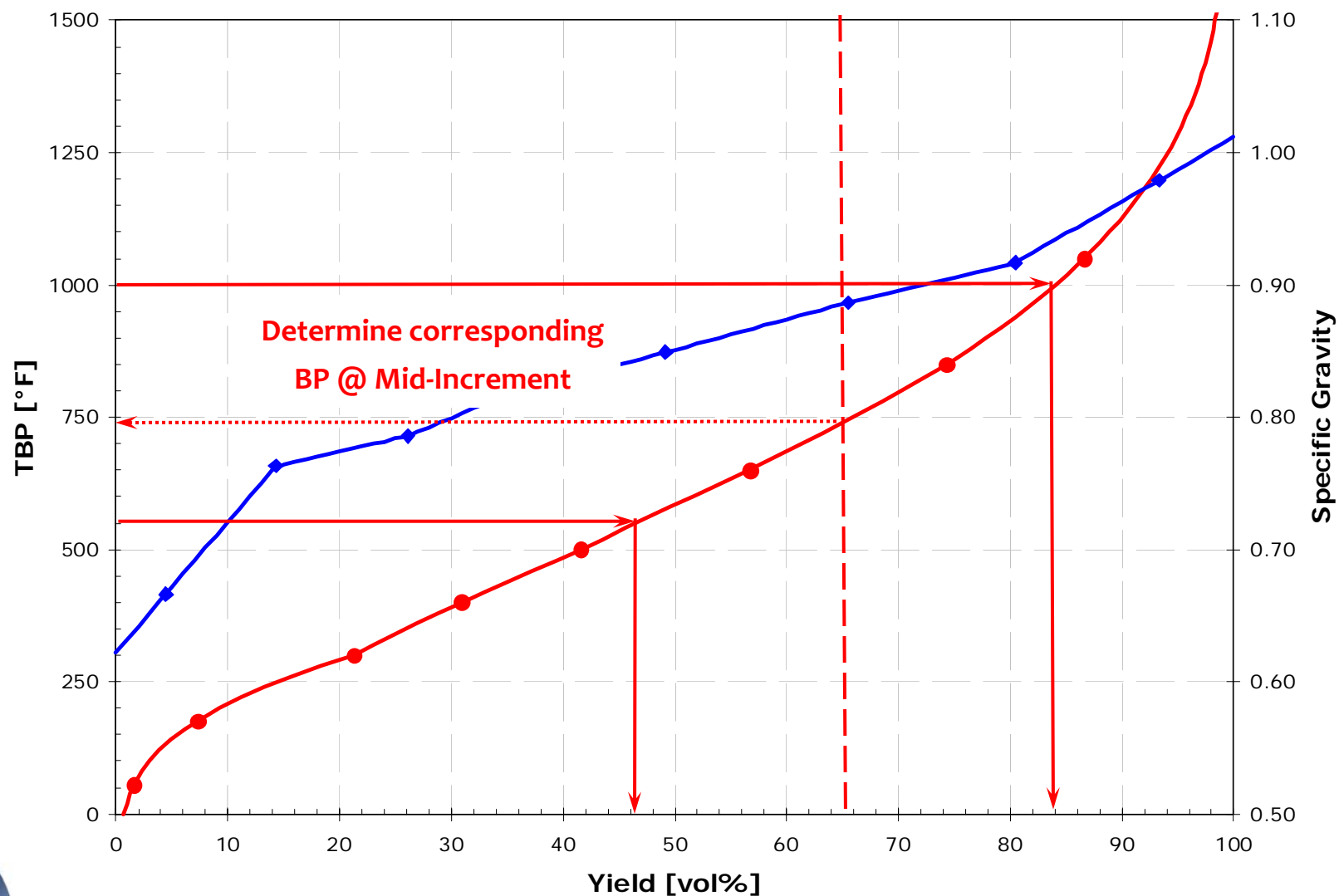


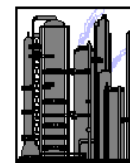
Estimate Properties for New Cuts



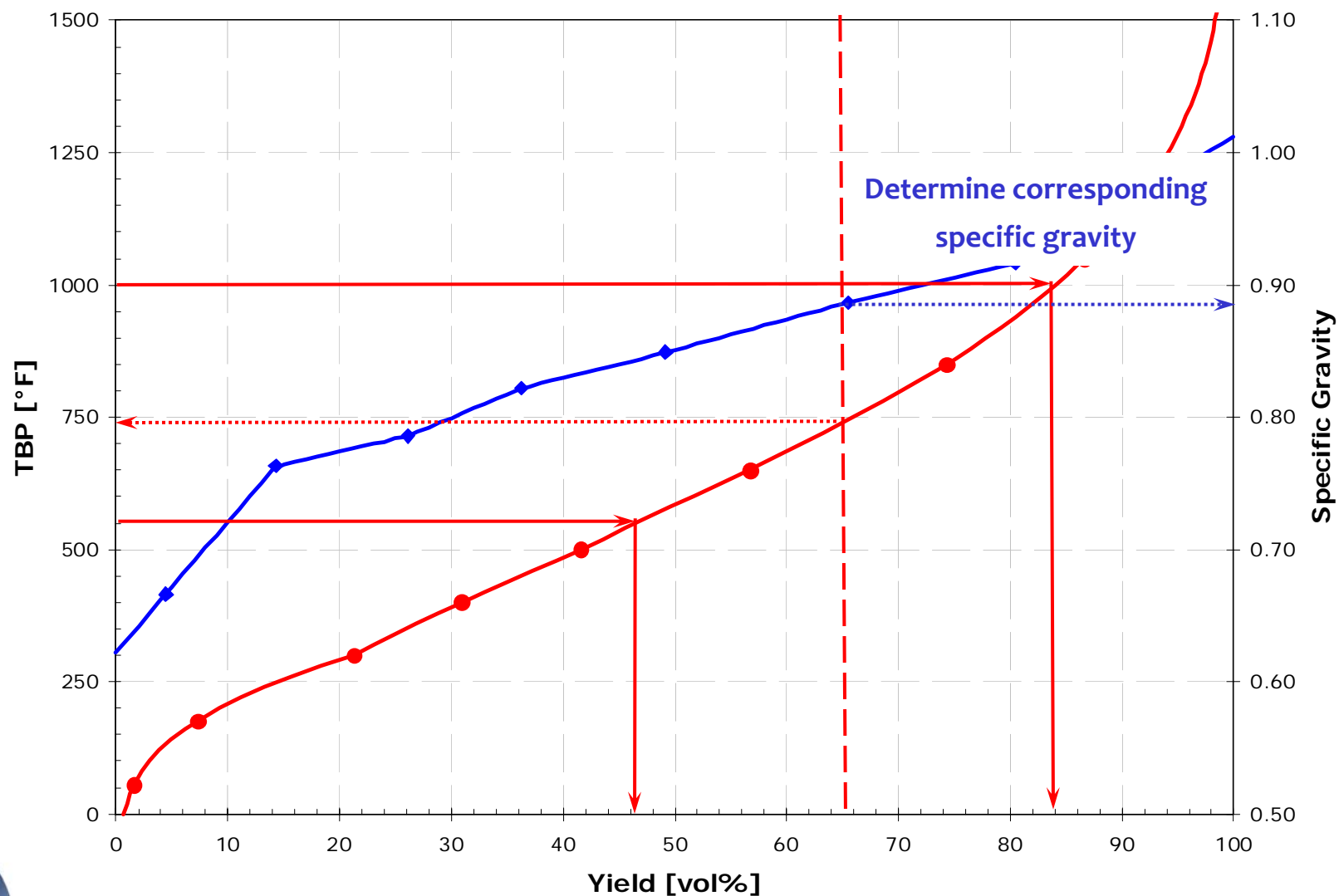


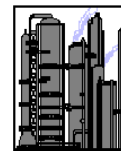
Estimate Properties for New Cuts





Estimate Properties for New Cuts





Crude Oil Assay Example #2

	Whole Crude	Light Naphtha	Medium Naphtha	Heavy Naphtha	Kero	Atm Gas Oil	Light VGO	Heavy VGO	Vacuum Resid	Atm Resid
TBP Temp At Start, °C	Start	10	80	150	200	260	340	450	570	340
TBP Temp At End, °C	End	80	150	200	260	340	450	570	End	End
TBP Temp At Start, °F	Start	55	175	300	400	500	650	850	1050	650
TBP Temp At End, °F	End	175	300	400	500	650	850	1050	End	End
Yield at Start, vol%		1.6	7.3	21.3	30.9	41.6	56.7	74.3	86.6	56.7
Yield at End, vol%		7.3	21.3	30.9	41.6	56.7	74.3	86.6	100.0	100.0
Yield of Cut (wt% of Crude)		4.5	12.6	8.9	10.4	15.1	18.4	13.3	15.6	47.3
Yield of Cut (vol% of Crude)		5.7	14.0	9.6	10.7	15.1	17.6	12.3	13.4	43.3
Gravity, °API	35.9	81.0	53.9	48.6	40.7	35.2	28.1	22.8	13.0	21.6
Specific Gravity	0.8454	0.6660	0.7632	0.7857	0.8218	0.8489	0.8868	0.9168	0.9791	0.9240
Sulfur, wt%	0.34	0.00	0.00	0.01	0.02	0.15	0.40	0.53	1.07	0.66
Calculate Start °F from °C		50	176	302	392	500	644	842	1058	644
Difference from Reported		-5	1	2	-8	0	-6	-8	8	-6
Calculate Gravity from °API	0.8453	0.6659	0.7632	0.7857	0.8217	0.8488	0.8866	0.9170	0.9792	0.9242
Difference from Reported	-0.0001	-0.0001	0.0000	0.0000	-0.0001	-0.0001	-0.0002	0.0002	0.0001	0.0002
Calculate wt% Yield from Gravities		4.5	12.6	8.9	10.4	15.2	18.5	13.3	15.5	47.3
Difference from Reported		0.0	0.0	0.0	0.0	0.1	0.1	0.0	-0.1	0.0
Yield at Mid-Point, vol%		4.5	14.3	26.1	36.3	49.2	65.5	80.5	93.3	78.4
Yield at Start, wt%		1.2	5.7	18.3	27.2	37.6	52.7	71.1	84.4	52.7
Yield at End, wt%		5.7	18.3	27.2	37.6	52.7	71.1	84.4	100.0	100.0
Yield at Mid-Point, wt%		3.5	12.0	22.8	32.4	45.2	61.9	77.8	92.2	76.4
TBP Temp at Mid-Point (vol%), °F		132.1	248.5	352.4	451.3	575.2	745.1	940.2	1221.8	907.8
Watson K Factor Using Mid-Point °F		12.6	11.7	11.9	11.8	11.9	12.0	12.2	12.1	12.0

