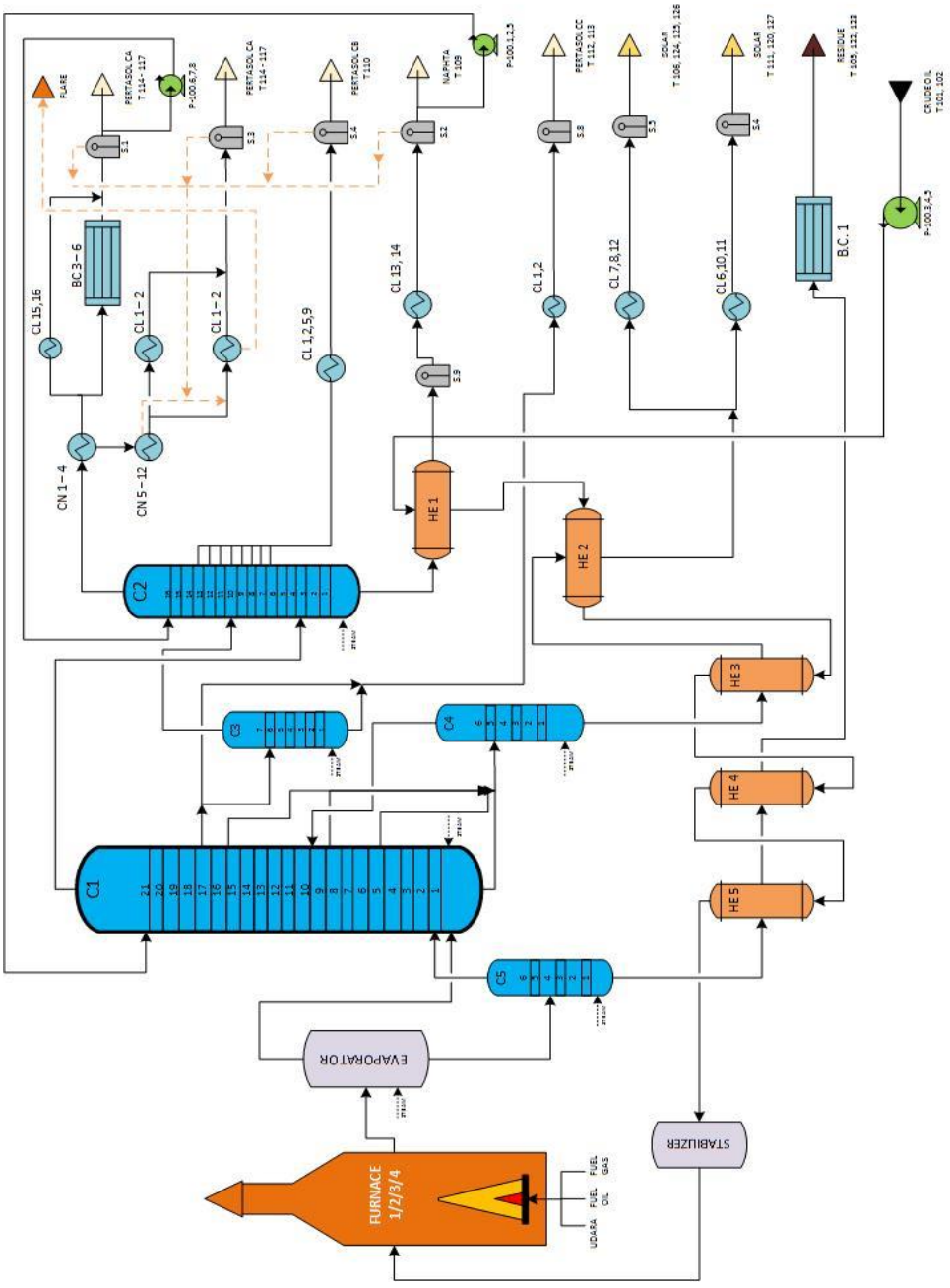
LAMPIRAN


FLARE
PERTASOL C4
T 114 - 117
PERTASOL C4
T 114 - 117
PERTASOL CB
T 110
NAPHTA
T 109
PERTASOL CC
T 112, 113
SOLAR
T 106, 124, 125, 126
SOLAR
T 111, 120, 127
RESIDUE
T 105, 122, 123
CRUDE OIL
T 101, 102
P-100 1,2,5
P-100 3,4,5
P-100 6,7,8
S1
S2
S3
S4
S5
S6
S9
BC 3 - 6
CL 1 - 2
CL 1 - 2
CL 15,16
CL 1,2,5,9
CL 13, 14
CL 1,2
CL 7,8,12
CL 6,10,11
B.C. 1
CN 1 - 4
CN 5 - 12
HE 1
HE 2
HE 3
HE 4
HE 5
C1
C2
C3
C4
C5
EVAPORATOR
STABILIZER
FURNACE 1/2/3/4
FUEL GAS
FUEL OIL
UDARA

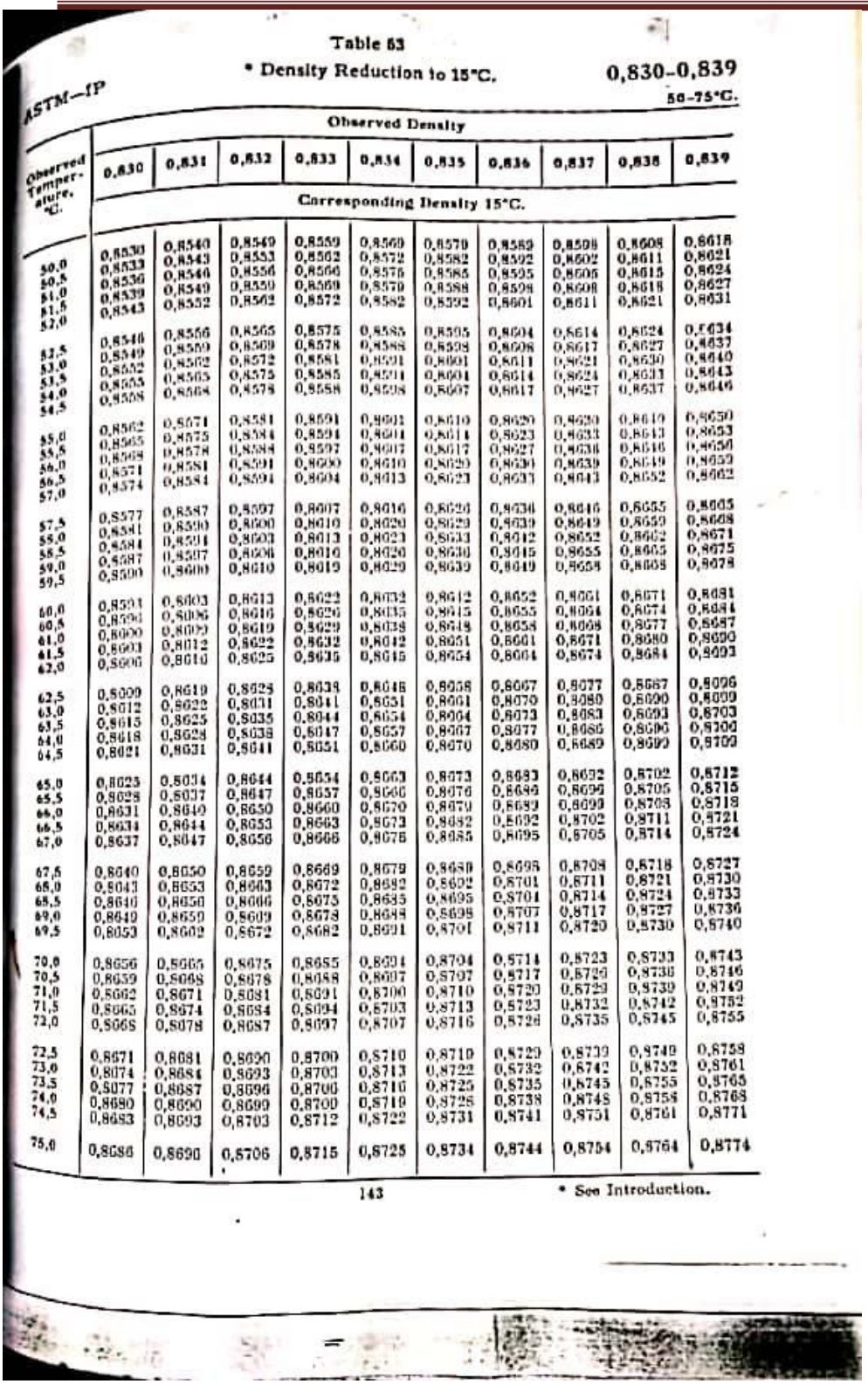


Table 53

ASTM—IP

* Density Reduction to 15°C. 0,830–0,839

50–75°C.

Observed Temperature, °C.	Observed Density 0,830	0,831	0,832	0,833	0,834	0,835	0,836	0,837	0,838	0,839
	Corresponding Density 15°C.									
50,0	0,8530	0,8540	0,8549	0,8559	0,8569	0,8579	0,8589	0,8598	0,8608	0,8618
50,5	0,8533	0,8543	0,8553	0,8562	0,8572	0,8582	0,8592	0,8602	0,8611	0,8621
51,0	0,8536	0,8546	0,8556	0,8566	0,8575	0,8585	0,8595	0,8606	0,8615	0,8624
51,5	0,8539	0,8549	0,8559	0,8569	0,8579	0,8588	0,8598	0,8608	0,8618	0,8627
52,0	0,8543	0,8552	0,8562	0,8572	0,8582	0,8592	0,8601	0,8611	0,8621	0,8631
52,5	0,8546	0,8556	0,8565	0,8575	0,8585	0,8595	0,8604	0,8614	0,8624	0,8634
53,0	0,8549	0,8559	0,8569	0,8578	0,8588	0,8598	0,8608	0,8617	0,8627	0,8637
53,5	0,8552	0,8562	0,8572	0,8581	0,8591	0,8601	0,8611	0,8621	0,8630	0,8640
54,0	0,8555	0,8565	0,8575	0,8585	0,8594	0,8604	0,8614	0,8624	0,8633	0,8643
54,5	0,8558	0,8568	0,8578	0,8588	0,8598	0,8607	0,8617	0,8627	0,8637	0,8646
55,0	0,8562	0,8571	0,8581	0,8591	0,8601	0,8610	0,8620	0,8630	0,8640	0,8650
55,5	0,8565	0,8575	0,8584	0,8594	0,8604	0,8614	0,8623	0,8633	0,8643	0,8653
56,0	0,8568	0,8578	0,8588	0,8597	0,8607	0,8617	0,8627	0,8636	0,8646	0,8656
56,5	0,8571	0,8581	0,8591	0,8600	0,8610	0,8620	0,8630	0,8639	0,8649	0,8659
57,0	0,8574	0,8584	0,8594	0,8604	0,8613	0,8623	0,8633	0,8643	0,8652	0,8662
57,5	0,8577	0,8587	0,8597	0,8607	0,8616	0,8626	0,8636	0,8646	0,8655	0,8665
58,0	0,8581	0,8590	0,8600	0,8610	0,8620	0,8629	0,8639	0,8649	0,8659	0,8668
58,5	0,8584	0,8594	0,8603	0,8613	0,8623	0,8633	0,8642	0,8652	0,8662	0,8671
59,0	0,8587	0,8597	0,8606	0,8616	0,8626	0,8636	0,8645	0,8655	0,8665	0,8675
59,5	0,8590	0,8600	0,8610	0,8619	0,8629	0,8639	0,8649	0,8658	0,8668	0,8678
60,0	0,8593	0,8603	0,8613	0,8622	0,8632	0,8642	0,8652	0,8661	0,8671	0,8681
60,5	0,8596	0,8606	0,8616	0,8626	0,8635	0,8645	0,8655	0,8664	0,8674	0,8684
61,0	0,8600	0,8609	0,8619	0,8629	0,8638	0,8648	0,8658	0,8668	0,8677	0,8687
61,5	0,8603	0,8612	0,8622	0,8632	0,8642	0,8651	0,8661	0,8671	0,8680	0,8690
62,0	0,8606	0,8616	0,8625	0,8635	0,8645	0,8654	0,8664	0,8674	0,8684	0,8693
62,5	0,8609	0,8619	0,8628	0,8638	0,8648	0,8658	0,8667	0,8677	0,8687	0,8696
63,0	0,8612	0,8622	0,8631	0,8641	0,8651	0,8661	0,8670	0,8680	0,8690	0,8699
63,5	0,8615	0,8625	0,8635	0,8644	0,8654	0,8664	0,8673	0,8683	0,8693	0,8703
64,0	0,8618	0,8628	0,8638	0,8647	0,8657	0,8667	0,8677	0,8686	0,8696	0,8706
64,5	0,8621	0,8631	0,8641	0,8651	0,8660	0,8670	0,8680	0,8689	0,8699	0,8709
65,0	0,8623	0,8634	0,8644	0,8654	0,8663	0,8673	0,8683	0,8692	0,8702	0,8712
65,5	0,8628	0,8637	0,8647	0,8657	0,8666	0,8676	0,8686	0,8696	0,8705	0,8715
66,0	0,8631	0,8640	0,8650	0,8660	0,8670	0,8679	0,8689	0,8699	0,8708	0,8718
66,5	0,8634	0,8644	0,8653	0,8663	0,8673	0,8682	0,8692	0,8702	0,8711	0,8721
67,0	0,8637	0,8647	0,8656	0,8666	0,8676	0,8685	0,8695	0,8705	0,8714	0,8724
67,5	0,8640	0,8650	0,8659	0,8669	0,8679	0,8689	0,8698	0,8708	0,8718	0,8727
68,0	0,8643	0,8653	0,8663	0,8672	0,8682	0,8692	0,8701	0,8711	0,8721	0,8730
68,5	0,8646	0,8656	0,8666	0,8675	0,8685	0,8695	0,8704	0,8714	0,8724	0,8733
69,0	0,8649	0,8659	0,8669	0,8678	0,8688	0,8698	0,8707	0,8717	0,8727	0,8736
69,5	0,8653	0,8662	0,8672	0,8682	0,8691	0,8701	0,8711	0,8720	0,8730	0,8740
70,0	0,8656	0,8665	0,8675	0,8685	0,8694	0,8704	0,8714	0,8723	0,8733	0,8743
70,5	0,8659	0,8668	0,8678	0,8688	0,8697	0,8707	0,8717	0,8726	0,8736	0,8746
71,0	0,8662	0,8671	0,8681	0,8691	0,8700	0,8710	0,8720	0,8729	0,8739	0,8749
71,5	0,8665	0,8674	0,8684	0,8694	0,8703	0,8713	0,8723	0,8732	0,8742	0,8752
72,0	0,8668	0,8678	0,8687	0,8697	0,8707	0,8716	0,8726	0,8735	0,8745	0,8755
72,5	0,8671	0,8681	0,8690	0,8700	0,8710	0,8719	0,8729	0,8739	0,8749	0,8758
73,0	0,8674	0,8684	0,8693	0,8703	0,8713	0,8722	0,8732	0,8742	0,8752	0,8761
73,5	0,8677	0,8687	0,8696	0,8706	0,8716	0,8725	0,8735	0,8745	0,8755	0,8765
74,0	0,8680	0,8690	0,8699	0,8709	0,8719	0,8728	0,8738	0,8748	0,8758	0,8768
74,5	0,8683	0,8693	0,8703	0,8712	0,8722	0,8731	0,8741	0,8751	0,8761	0,8771
75,0	0,8686	0,8696	0,8706	0,8715	0,8725	0,8734	0,8744	0,8754	0,8764	0,8774

143

* See Introduction.

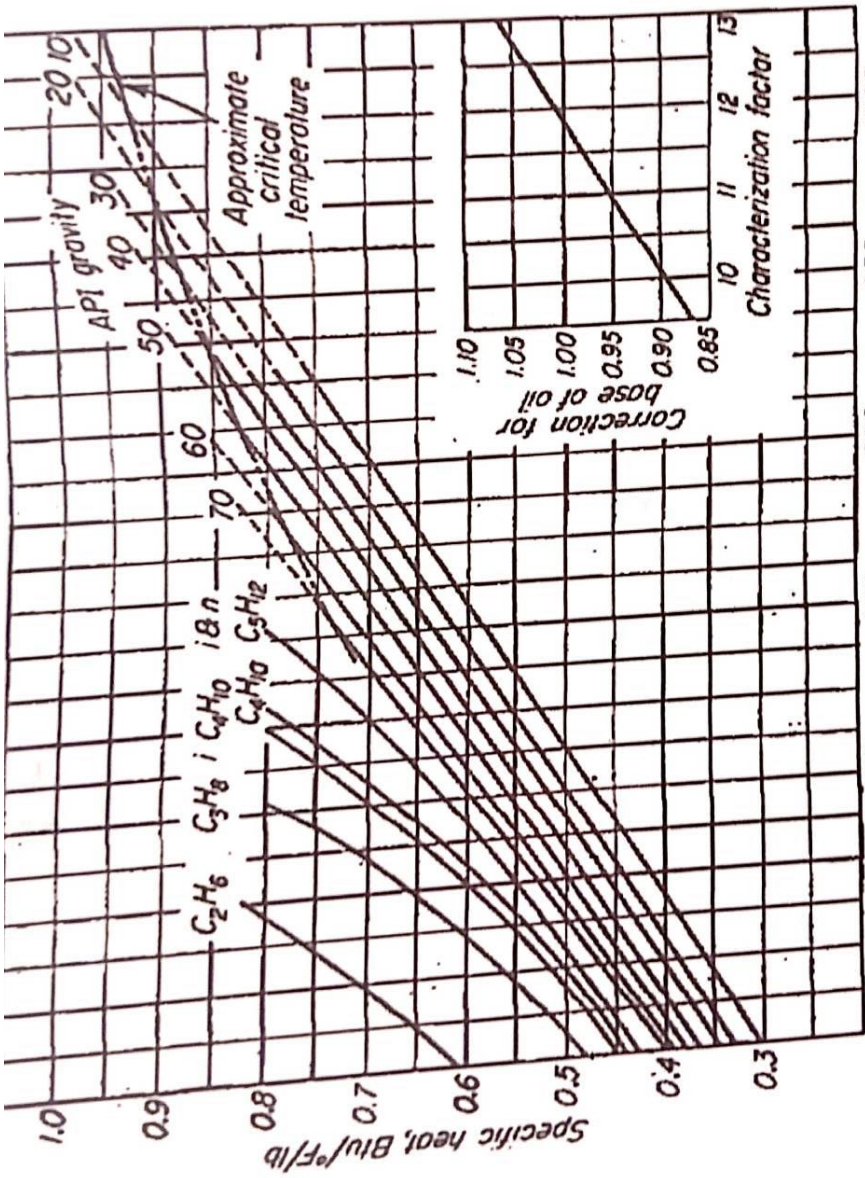
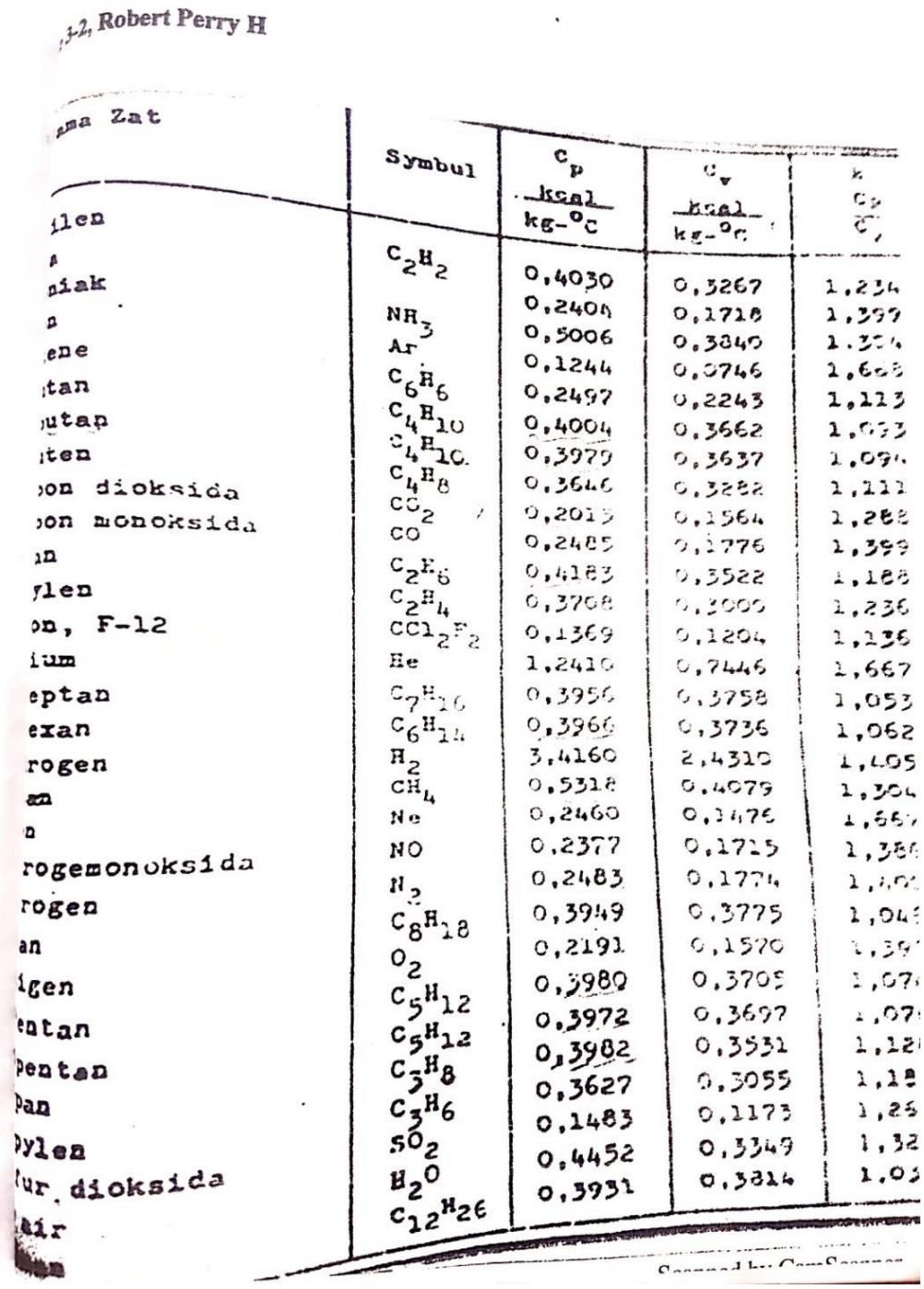
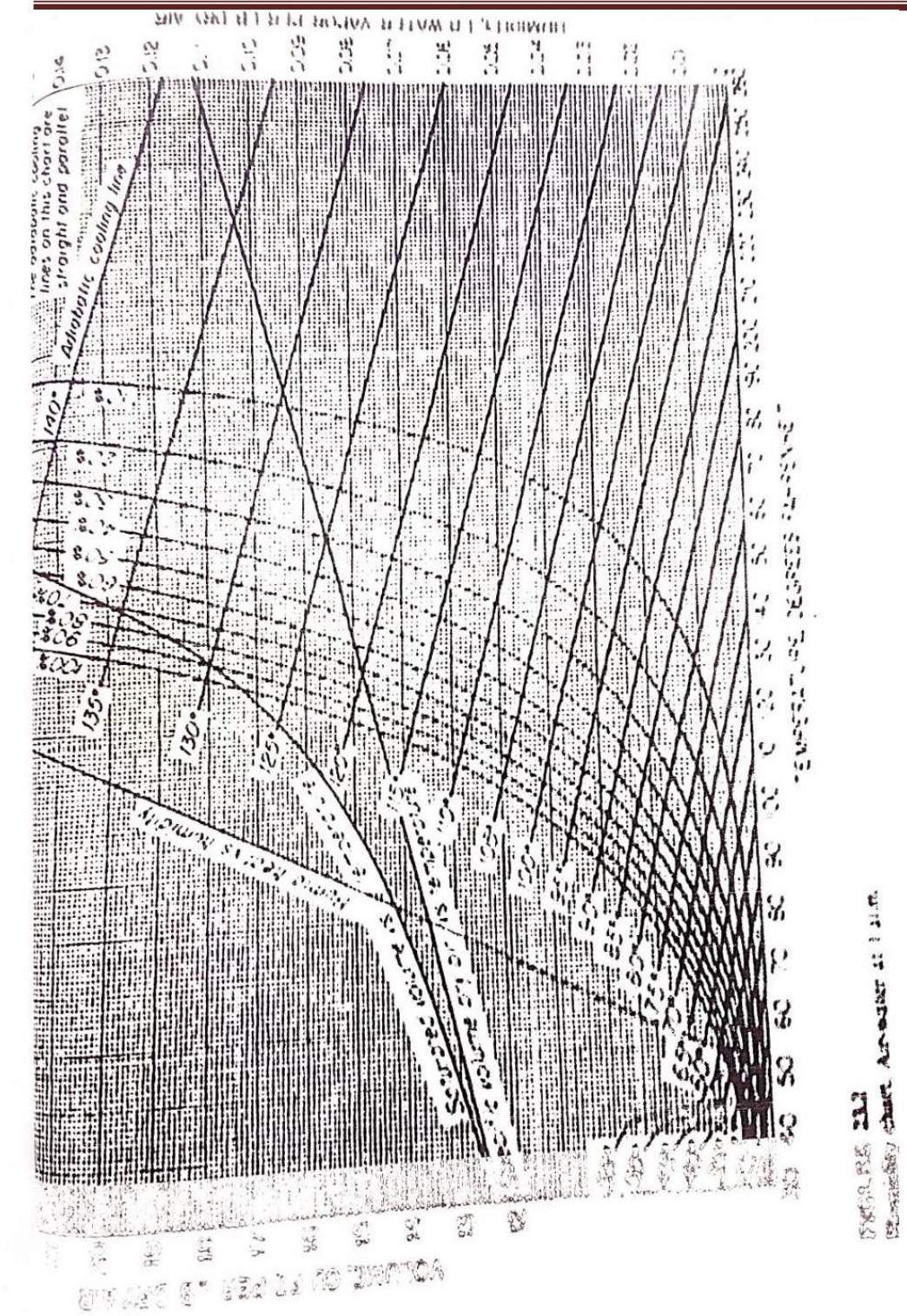


FIG. 5-1: Specific heats of Mid Continent liquid oils with a correction factor for other bases of oils.



,3-2, Robert Perry H

ama Zat	Symbul	C_p kcal/kg-°C	C_v kcal/kg-°C	k C_p/C_v
ilen	C_2H_2	0,4030	0,3267	1,234
niak	NH_3	0,2404	0,1718	1,399
n	Ar	0,5006	0,3840	1,304
ene	C_6H_6	0,1244	0,0746	1,668
tan	C_4H_{10}	0,2497	0,2243	1,113
utan	C_4H_{10}	0,4004	0,3662	1,093
iten	C_4H_8	0,3979	0,3637	1,094
on dioksida	CO_2	0,3646	0,3282	1,111
on monoksida	CO	0,2013	0,1564	1,288
an	C_2H_6	0,2485	0,1776	1,399
ylen	C_2H_4	0,4183	0,3522	1,188
on, F-12	CCl_2F_2	0,3708	0,3000	1,236
ium	He	0,1369	0,1204	1,136
eptan	C_7H_{16}	1,2410	0,7446	1,667
exan	C_6H_{14}	0,3956	0,3758	1,053
rogen	H_2	0,3966	0,3736	1,062
an	CH_4	3,4160	2,4310	1,405
n	Ne	0,5318	0,4079	1,304
rogemonoksida	NO	0,2460	0,1476	1,667
rogen	N_2	0,2377	0,1715	1,386
an	C_8H_{18}	0,2483	0,1774	1,400
igen	O_2	0,3949	0,3775	1,045
entan	C_5H_{12}	0,2191	0,1570	1,397
pentan	C_5H_{12}	0,3980	0,3709	1,073
pan	C_3H_8	0,3972	0,3697	1,074
pylen	C_3H_6	0,3982	0,3531	1,128
fur dioksida	SO_2	0,3627	0,3055	1,187
air	H_2O	0,1483	0,1173	1,264
	$C_{12}H_{26}$	0,4452	0,3349	1,329
		0,3931	0,3814	1,031


Adiabatic cooling line
straight and parallel
135°
130°
125°

where W = lb material (lb-moles in Fig. 14-1)
T_2 = final temperature, °F
T_1 = initial temperature, °F
C_p = average sp ht at constant pressure, Btu per lb through the temperature range of T_2 and T_1

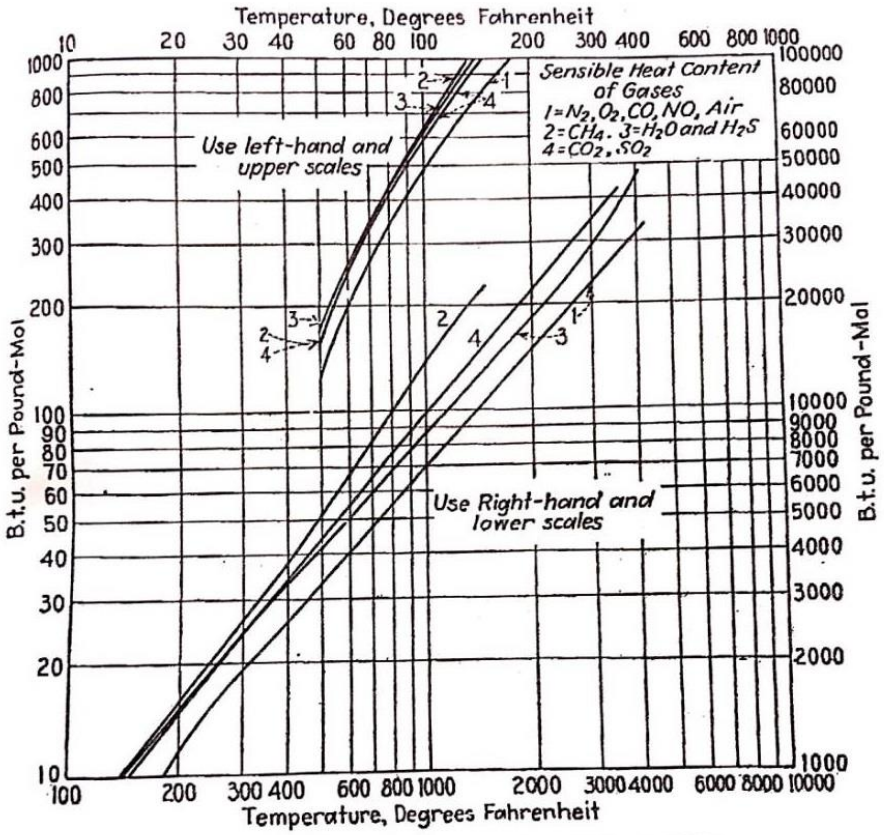


FIG. 14-1. Sensible heat of common gases (basis 32°F).

Figure 14-1 is plotted on a mole basis because the diatomic gases—oxygen, nitrogen, carbon monoxide, air, etc.—can be represented by a single curve. The same applies to other groups of gases. The figure gives the number of Btu required to raise the temperature of 1 lb-mole of gas from 32°F to the desired temperature. The upper and left scales are for temperatures up to about 150°F, and the lower and right scales are for higher temperatures.

Example 14-4. Use of Sensible Heat Chart for Gases (Fig. 14-1). One thousand cubic feet of a flue gas is cooled from 1000 to 100°F. Analysis of gas: CO_2, 10 per

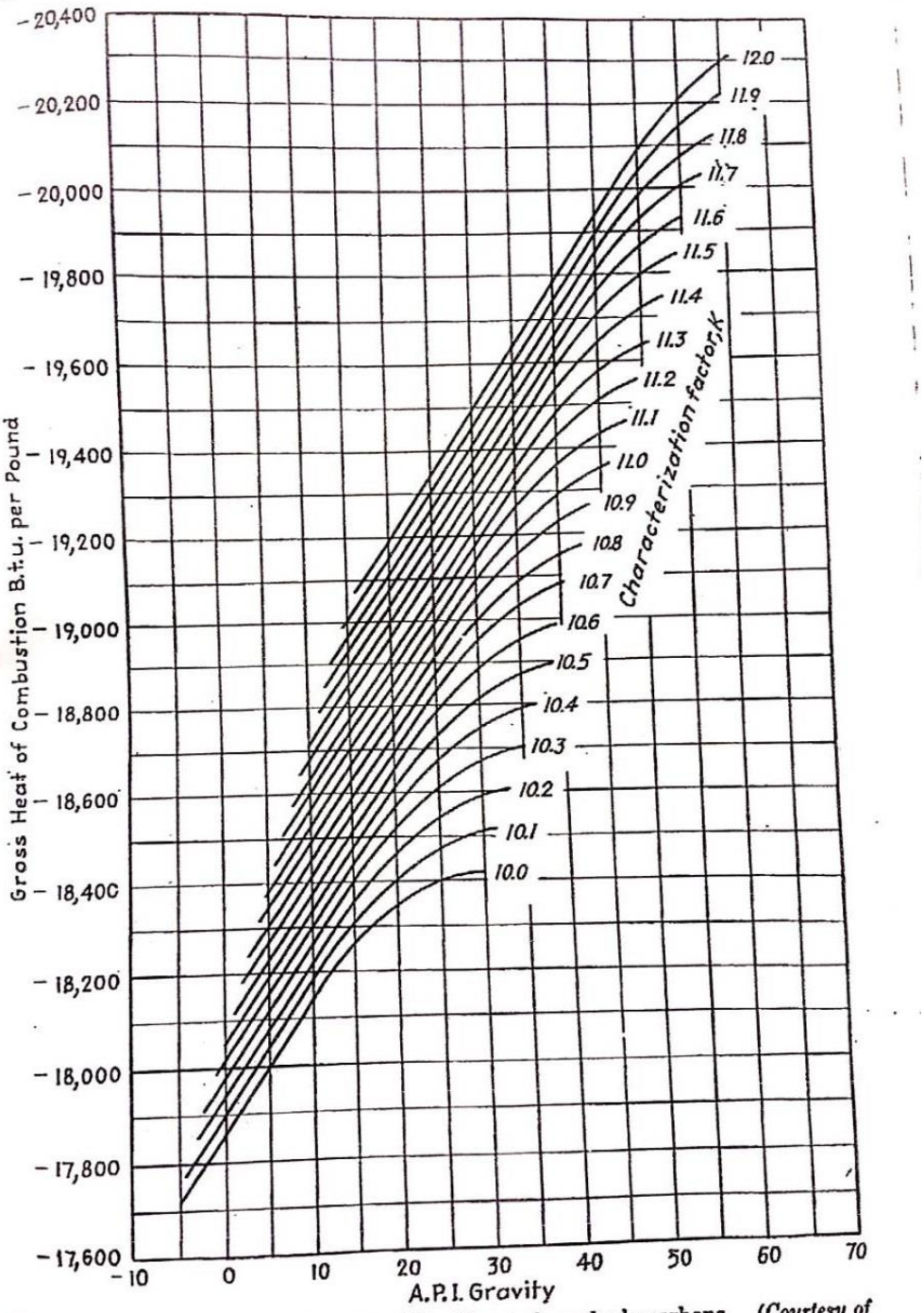


FIG. 5-22. Gross heats of combustion of liquid petroleum hydrocarbons. (*Courtesy of Hougen and Watson, "Chem. Process Principles," vol. 1, John Wiley & Sons, Inc.*)

TABLE 5-2. PROPERTIES OF PARAFFIN HYDROCARBONS[a]

Property	Methane	Ethane	Propane	Isobutane	Butane	Isopentane
Molecular weight	16.03	30.05	44.06	58.08	58.08	72.09
Carbon-hydrogen ratio	2.98	3.97	4.46	4.76	4.76	4.96
Liquid gravity:						
Specific 60/60	0.300	0.374	0.509	0.563	0.584	0.625
Density, lb per gal at 60°F	2.5	3.12	4.24	4.70	4.86	5.20
API at 60°F	340	247	147	120	111	94.9
Vapor gravity:						
Relative to air	0.559	1.037	1.521	2.004	2.004	2.494
Cu ft at 60°F, per gal liquid	59.1	39.2	36.5	30.6	31.8	27.3
Boiling point, °F	−259	−128	−44	10.9	31.1	82.2
Critical temperature, °R	344	549	665	733	765	829
Critical pressure, psia	673	715	616	543	550	483
Critical volume, cu ft per lb-mole	1.59	2.29	3.12	3.99	4.14	4.93
Critical viscosity, micropoises	159	210	228	239	239	240
Specific heat:						
Vapor	$0.543^{15.6}$	$0.410^{15.6}$	0.473^{15}	0.462^{15}	0.459^{15}	0.471^{104}
Liquid at 60°F	....	0.78	0.6	0.56	0.55	0.53
Ratio at 60°F	1.31	1.18	1.15	1.11	1.10	
Coefficient of expansion	0.00368^{9-100}	0.0038	$0.00324^{10-47.7}$	$0.00230^{10-47.7}$	$0.00203^{10-47.7}$	0.00155^{9-18}
Inflammability limits:						
Low	5.3	3.3	2.4	1.8	1.9	1.3
High	14.0	12.5	9.5	8.4	8.5	
Heat of combustion:						
Gross, Btu per lb	23,920	22,350	21,690	21,290	21,340	21,060
Net, Btu per lb	21,540	20,450	19,960	19,650	19,700	19,470
Gross, Btu per cu ft[b]	1,011	1,770	2,520	3,261	3,266	4,004
Latent heat, Btu per lb	225	210	183	158	165	146
Vapor pressure, at 100°F, psia	....	221[e]	189	73.5	52	20.3
Octane number, Motor method	100+	100+	97	97	90	90.3
ρ_1/ω_1, expansion constant for liquids[d]	3.679	4.416	4.803	....	5.002	

184

Specific heats of gases by Holcomb and Brown[3] are shown in Fig. 5-2, which is said to be accurate to ±0.02 Btu per lb per °F. Dotted lines are used above 700°F as a warning that thermal decomposition occurs at such temperatures.

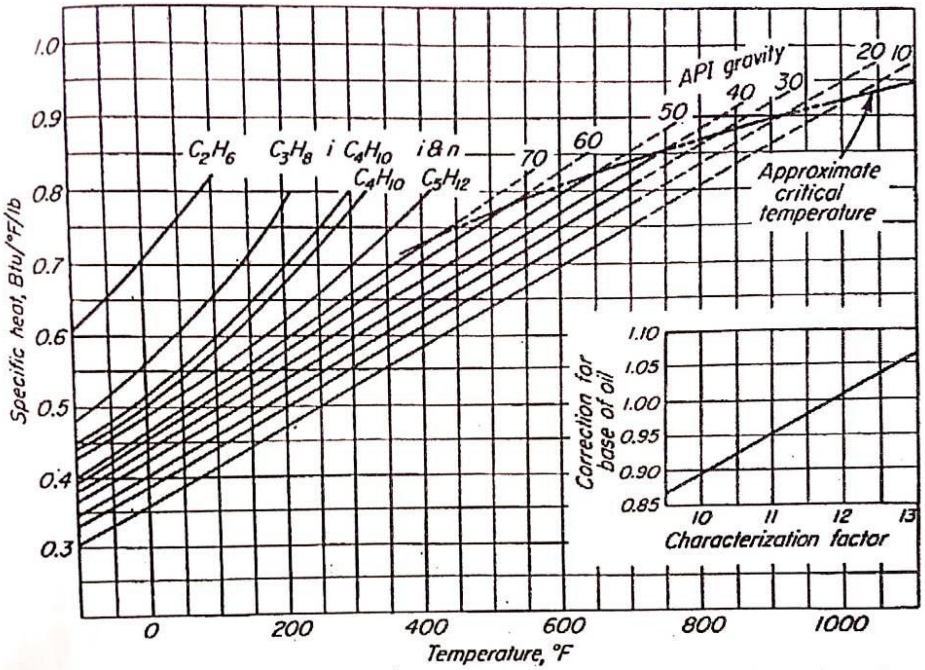


FIG. 5-1. Specific heats of Mid Continent liquid oils with a correction factor for other bases of oils.

The Characterization Factor[4] found to be so useful in cataloguing crude oils (Table 4-1) is of even greater value in accounting for the degree of paraffinicity of individual fractions.

$$K = \frac{\sqrt[3]{T_B}}{s}$$

where K = U.O.P. Characterization Factor
T_B = average boiling point, °R = (°F + 460)
s = specific gravity at 60°F

The factor has been useful in correlating many properties, among which are hydrogen content, aniline point, thermal expansion, and Viscosity Index, as well as the relationships employed in this chapter.

Total Heat Content and the Effect of Pressure. The heat content or enthalpy of petroleum liquids and gases can be obtained most conven-

[3] Thermodynamic Properties of Light Hydrocarbons, *Ind. Eng. Chem.*, 34, 590 (1942).

[4] Egloff et al., The Modern Cracking Process, *Oil Gas J.*, July 2, 1936, p. 34.

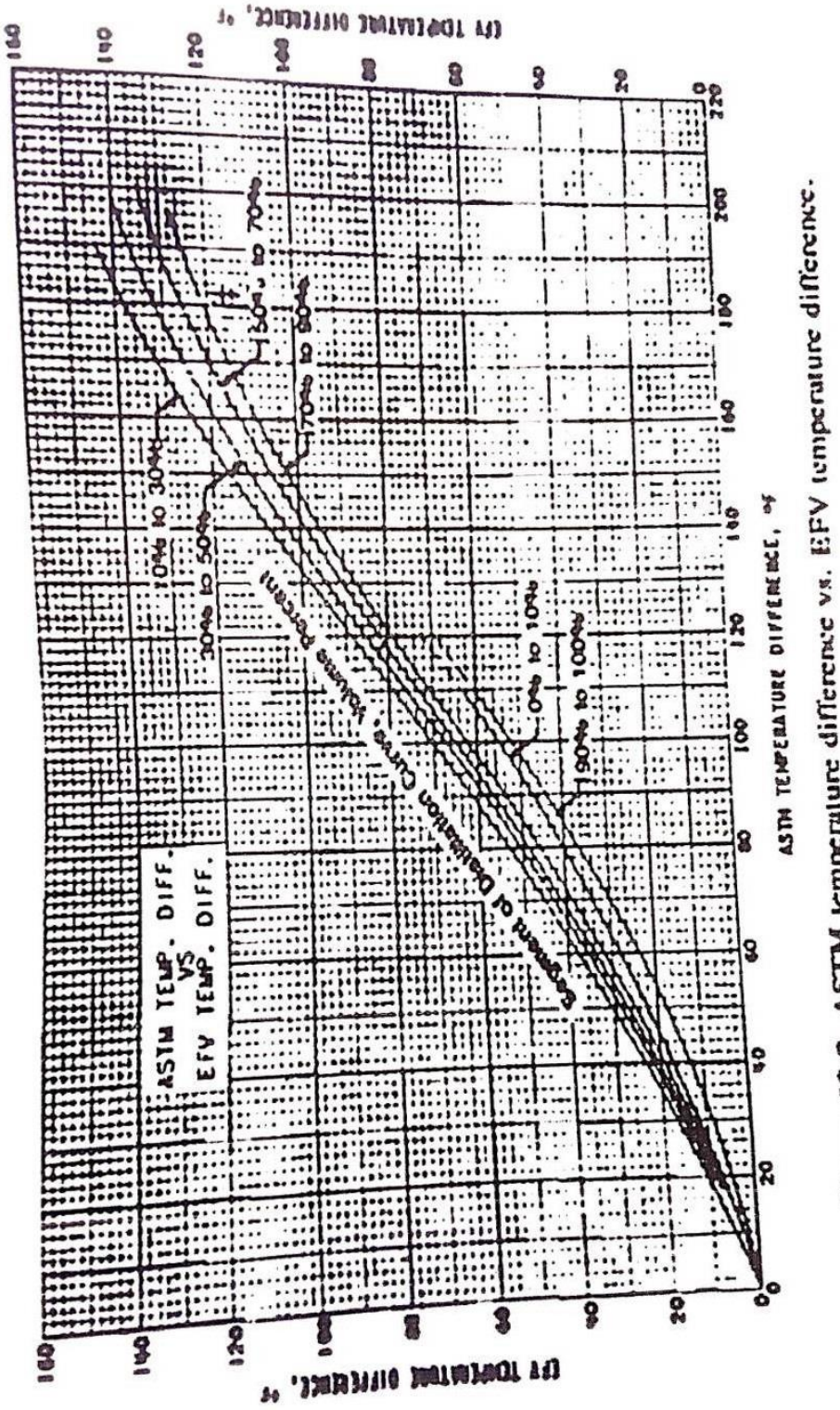


Figure 12.9. ASTM temperature difference vs. EFV temperature difference.

ASTM 50 *Percent Temperature* vs. EFV 50 *Percent Temperature* (Figure 12.8 Edmister, *Hydrocarbon Thermodynamics* pg. 122)

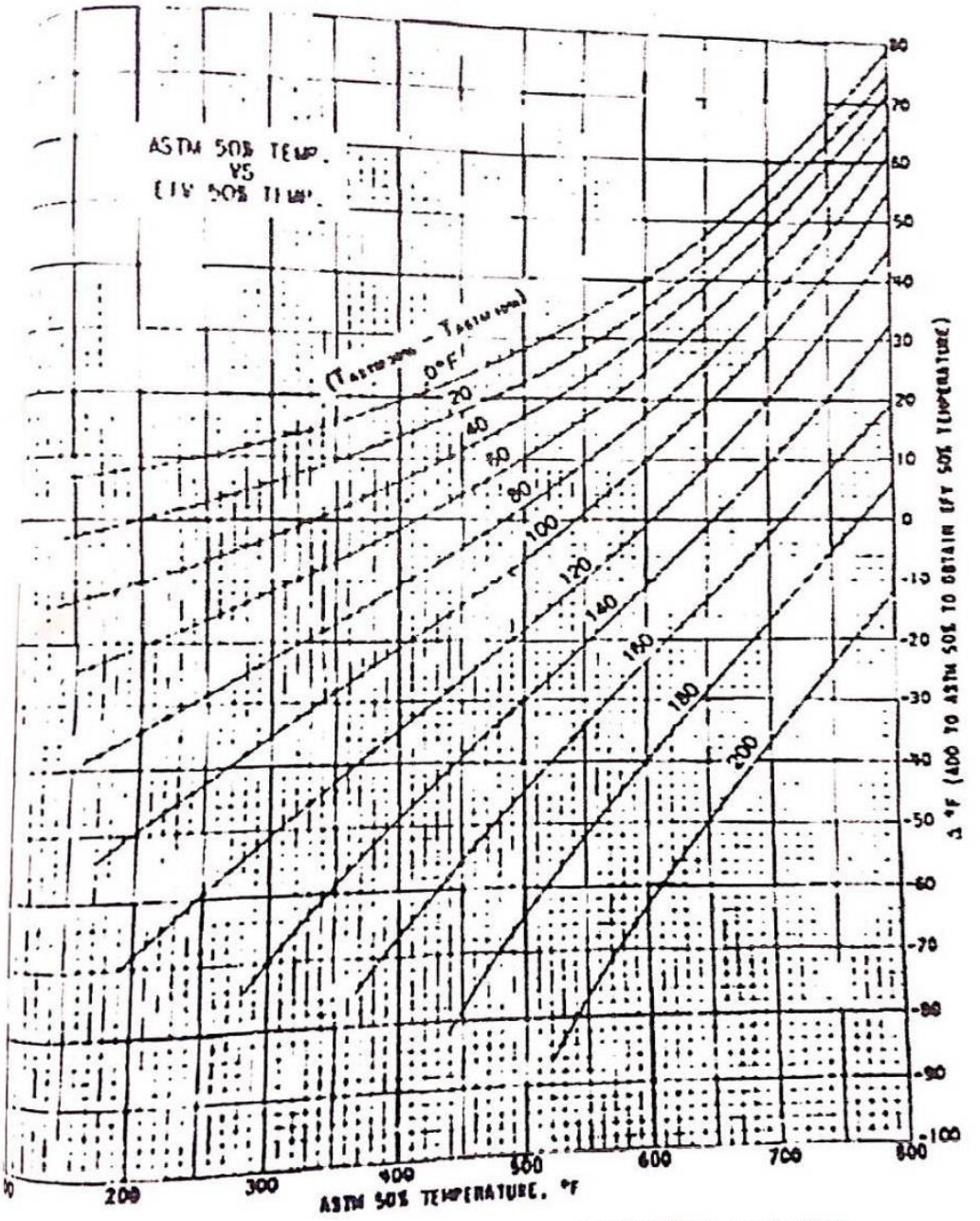
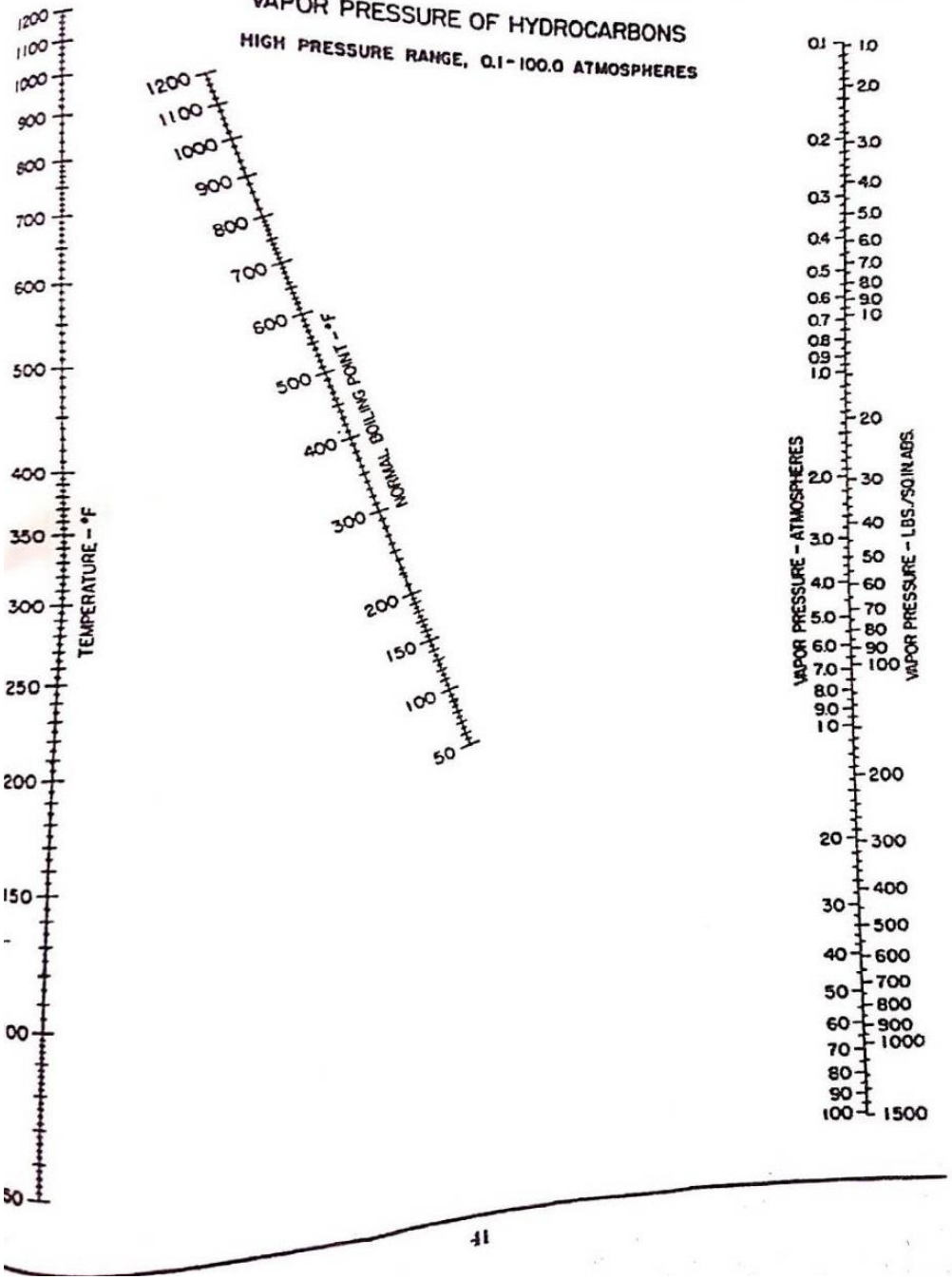
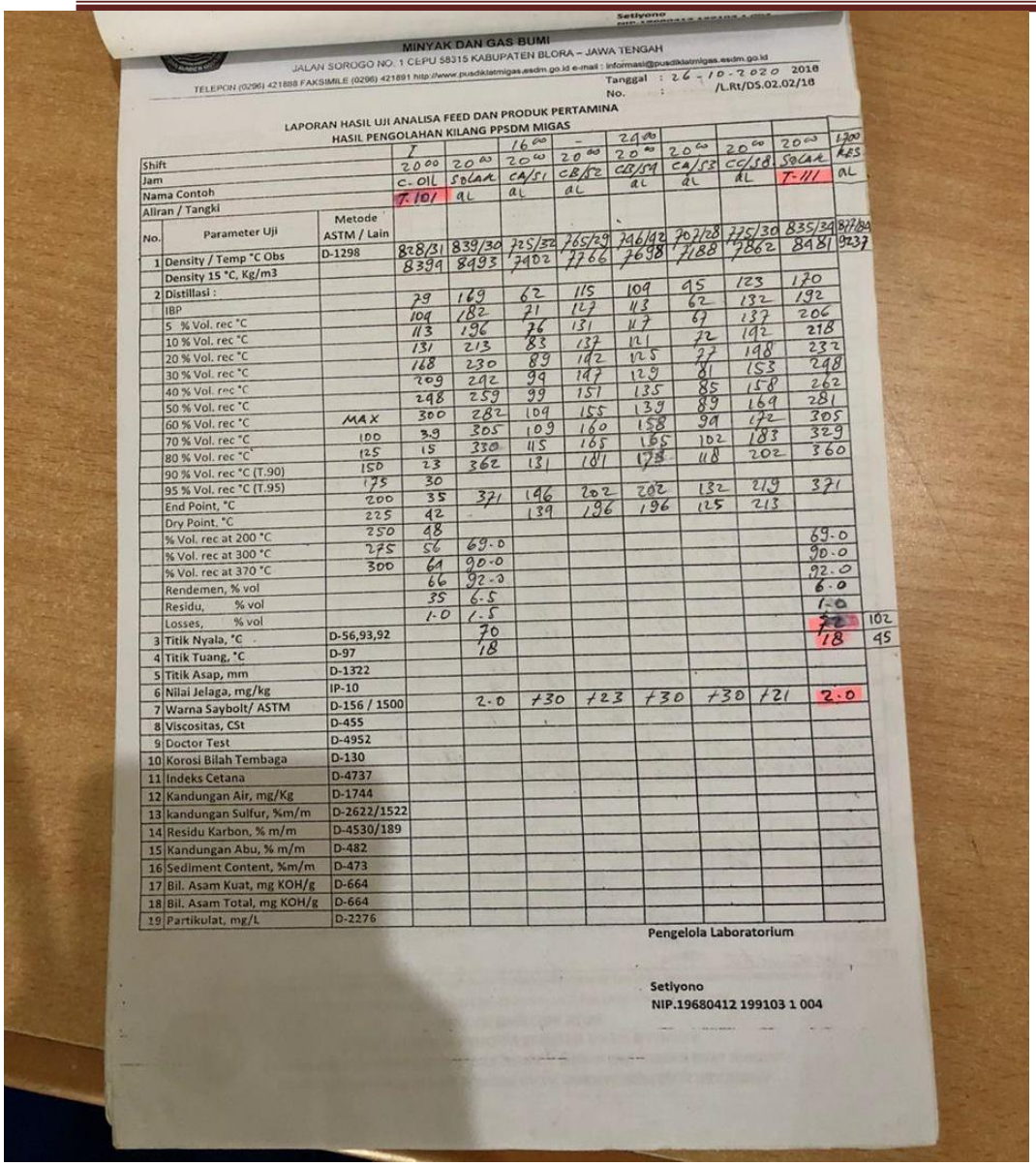


Figure 12.8. ASTM 50% temperature vs. EFV 50% temperature

105

afik Penentuan Temperatur dan Tekanan Uap Hidrokarbon (Maxwell, Data *Handbook on drocarbon* pg. 4)





MINYAK DAN GAS BUMI

JALAN SOROGO NO. 1 CEPU 58315 KABUPATEN BLORA – JAWA TENGAH

TELEPON (0296) 421888 FAKSIMILE (0296) 421891 http://www.pusdiklatmigas.esdm.go.id e-mail : informasi@pusdiklatmigas.esdm.go.id

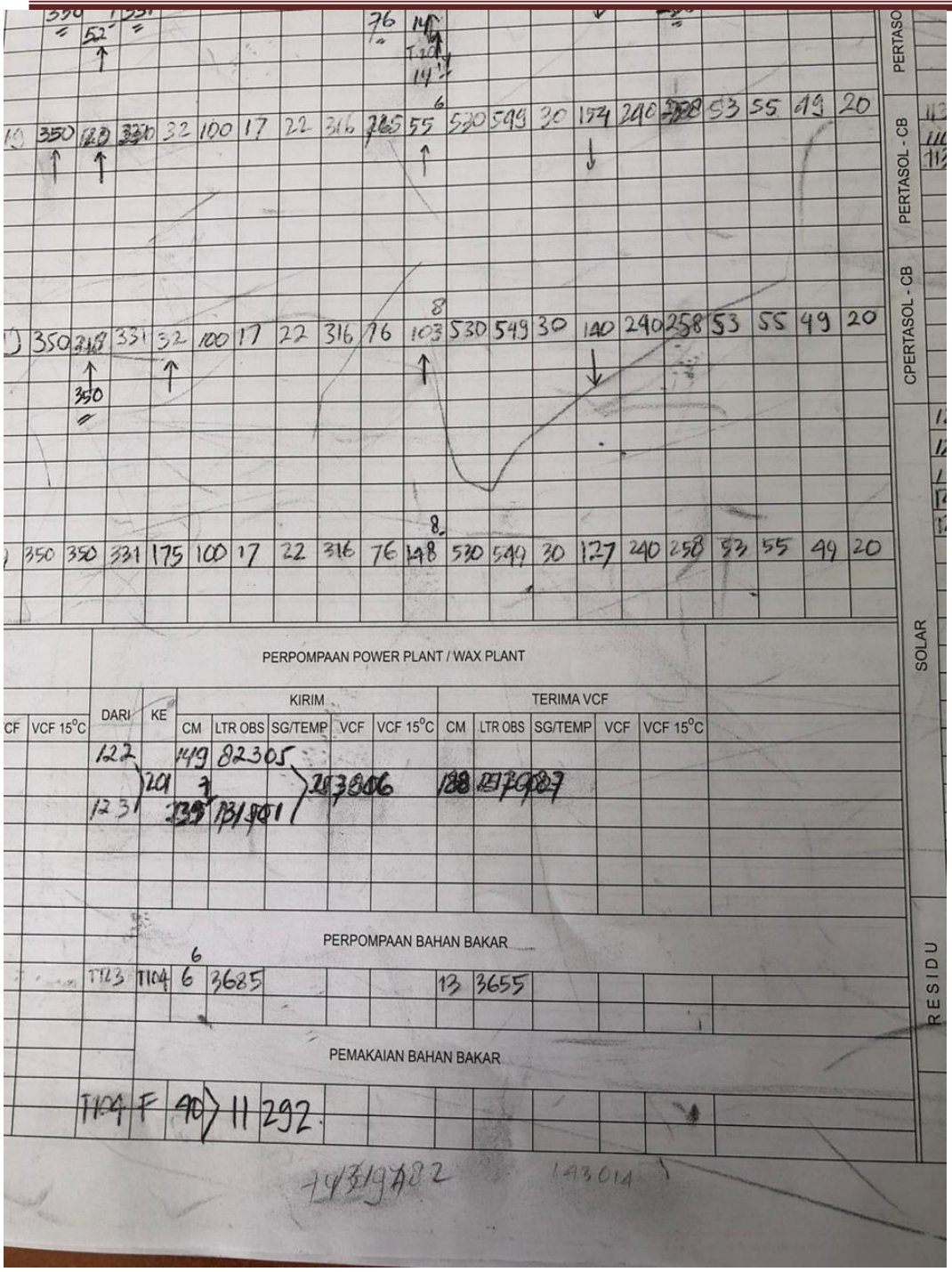
Tanggal : 26-10-2020
No. : /LRt/DS.02.02/18

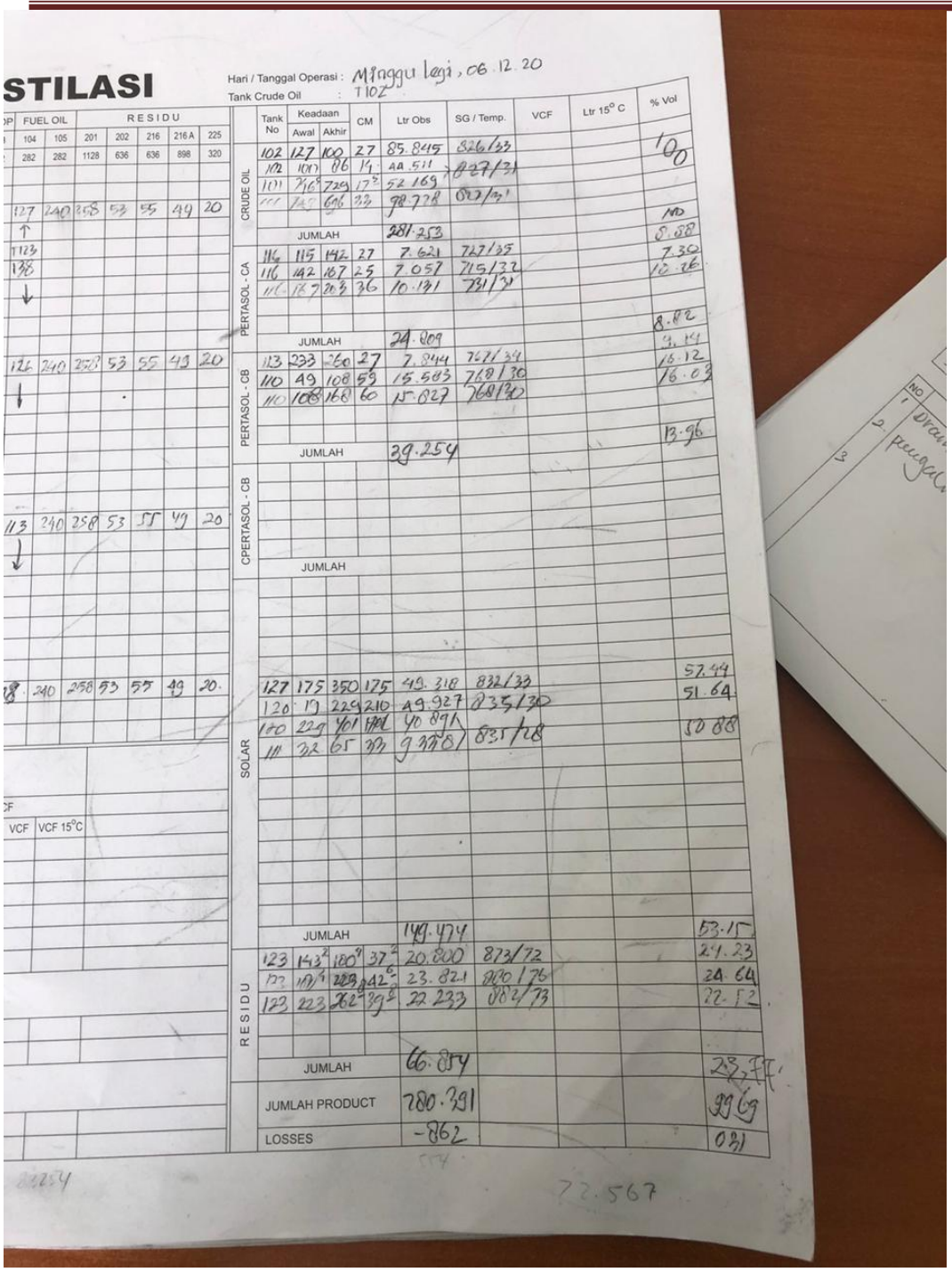
LAPORAN HASIL UJI ANALISA FEED DAN PRODUK PERTAMINA
HASIL PENGOLAHAN KILANG PPSDM MIGAS

No.	Parameter Uji	Metode ASTM / Lain									
	Shift		I									
	Jam		2000	2000	1600	-	2400	2000	2000	2000	1200
	Nama Contoh		C-OIL	SOLAR	CA/51	CB/52	CB/54	CA/53	CC/58	SOLAR	KES
	Aliran / Tangki		T.101	QL	QL	QL	QL	QL	QL	T-111	QL
1	Density / Temp °C Obs	D-1298	838/31	839/30	725/32	765/29	746/42	707/28	725/30	835/34	837/34
	Density 15 °C, Kg/m3		8399	8493	7402	7766	7698	7188	7362	8481	8437
2	Distillasi :										
	IBP		79	169	62	115	109	95	123	170	
	5 % Vol. rec °C		109	182	71	127	43	62	132	192	
	10 % Vol. rec °C		113	196	76	131	47	69	137	206	
	20 % Vol. rec °C		131	213	83	137	121	72	192	218	
	30 % Vol. rec °C		168	230	89	142	125	77	198	232	
	40 % Vol. rec °C		209	292	99	147	129	81	153	248	
	50 % Vol. rec °C		248	259	99	151	135	85	158	262	
	60 % Vol. rec °C	MAX	300	282	109	155	139	89	169	281	
	70 % Vol. rec °C	100	3.9	305	109	160	158	99	172	305	
	80 % Vol. rec °C	125	15	330	115	165	155	102	183	329	
	90 % Vol. rec °C (T.90)	150	23	362	131	181	175	118	202	360	
	95 % Vol. rec °C (T.95)	175	30								
	End Point, °C	200	35	371	146	202	202	132	219	371	
	Dry Point, °C	225	42		139	196	196	125	213		
	% Vol. rec at 200 °C	250	48							69.0	
	% Vol. rec at 300 °C	275	56	69.0						90.0	
	% Vol. rec at 370 °C	300	64	90.0						92.0	
	Rendemen, % vol		66	92.0						6.0	
	Residu, % vol		35	6.5						1.0	
	Losses, % vol		1.0	1.5						72	102
3	Titik Nyala, °C	D-56,93,92		70						18	45
4	Titik Tuang, °C	D-97		18							
5	Titik Asap, mm	D-1322									
6	Nilai Jelaga, mg/kg	IP-10									
7	Warna Saybolt/ ASTM	D-156 / 1500		2.0	+30	+23	+30	+30	+21	2.0	
8	Viscositas, CSt	D-455									
9	Doctor Test	D-4952									
10	Korosi Bilah Tembaga	D-130									
11	Indeks Cetana	D-4737									
12	Kandungan Air, mg/Kg	D-1744									
13	kandungan Sulfur, %m/m	D-2622/1522									
14	Residu Karbon, % m/m	D-4530/189									
15	Kandungan Abu, % m/m	D-482									
16	Sediment Content, %m/m	D-473									
17	Bil. Asam Kuat, mg KOH/g	D-664									
18	Bil. Asam Total, mg KOH/g	D-664									
19	Partikulat, mg/L	D-2276									

Pengelola Laboratorium

Setiyono
NIP.19680412 199103 1 004


PERTASO
PERTASOL - CB
CPERTASOL - CB
SOLAR
RESIDU
PERPOMPAAN POWER PLANT / WAX PLANT
KIRIM
TERIMA VCF
DARI
KE
CM
LTR OBS
SG/TEMP
VCF
VCF 15°C
PERPOMPAAN BAHAN BAKAR
PEMAKAIAN BAHAN BAKAR


STILASI
Hari / Tanggal Operasi : Minggu lagi, 06.12.20
Tank Crude Oil : T102
FUEL OIL
RESIDU
Tank No
Keadaan
Awal
Akhir
CM
Ltr Obs
SG / Temp.
VCF
Ltr 15° C
% Vol
CRUDE OIL
JUMLAH
PERTASOL - CA
JUMLAH
PERTASOL - CB
JUMLAH
CPERTASOL - CB
JUMLAH
SOLAR
JUMLAH
RESIDU
JUMLAH
JUMLAH PRODUCT
LOSSES