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Lützkendorf Mücheln

LUBRICATING OIL MANUFACTURE

Specifications on gasolines and diesel oils manufactured att Lützkendorf.

The personnel interviewed at the plant on May 11, 1945, included Dr. Schneeberger, manager of the entire plant, Dr. Neumann, in charge of lubricating oil manufacture, and Dr. Billig, in charge of the chemical and engine testing laboratory.

The plant is of conventional design and includes installations for atmospheric crude distillation, vacuum distillation of the atmospheric residue, propane deasphalting and deresining, phenol extraction and propane dewaxing, as well as conventional acid treating and clay contacting. The crude throughput was about 60,000 bbls./month.

A mixture of Hannover and Austrian crude was processed mostly, but more recently Austrian crude only was used. Typical data on two Austrian crudes are shown in Table I. The atmospheric distillation gave the following yields for overhead, three side-streams and bottoms, respectively:

Product	% by volume of crude	Bbls. / Month
Gasoline	10.6	6,350
Kerosine	20.0	12,000
Spindle Oil	16.7	10,000
Light Neutral dist. (about 130 SSU / 100°F)	3.0	1,800
Residue	43.6	26,200
Loss	6.1	3,650

Vacuum distillation of the atmospheric residue yielded the following distillates:

vols. of phenol yielding about 41% by wt. of raffinate (calcd. on vacuum residue charged). The raffinate was propane dewaxed and clay treated with an ultimate yield of automotive bright stock of about 28% by wt. of the vacuum residue. In case that aviation bright stock was required, the raffinate from the phenol extraction was freed from phenol and again phenol treated (total volume of phenol used in both stages: 500) yielding a raffinate which represented about 28% of the vacuum residue. The final yield of aviation bright stock after propane dewaxing and clay treating was approximately 18.5% by wt. of the vacuum residues. The inspection data for the two grades of bright stock are given in Table 5.

Propane deasphalting was carried out in a two-stage unit comprising 4 horizontal contactors and precipitated asphalts and resins were removed separately. Both of these products were destructively hydrogenated. The yield of deasphalted oil averaged 50% on charge.

Phenol extraction was carried out in a Kellogg unit built in 1938. It has a conventional tower type unit with perforated trays and water injection was employed to improve the selectivity of the solvent.

When automotive bright stocks were processed, the normal solvent ratio was 150%, the tower top temperature 90°C. and the temperature gradient 10°C. Aviation bright stocks on the other hand are solvent extracted twice, first under the above conditions and then re-extracted with 500% of phenol at 110 - 120°C.

Dewaxing was carried out in a Dorr rotary pressure filter using discontinuous cooling. The charge stock was cooled from +86°F. to -40°F. in one hour. The design filtration rate was 7.5 gals. per cu. ft. per hour, but actually a rate of 19 gals. per cu. ft. per hour was obtained.

The working pressure was 150 - 200 mm. Hg. gauge. The double dilution technique was not employed and there was no repulping of the wax. The oil content of the finished wax averages 20%.

LUBRICATING OIL SPECIFICATIONS:

Motor Oils

Three grades were produced having viscosities at 50°C. of 8, 10 and 12°E. and a max. pole height of 2.24.

Aero Oils

The following specification was adhered to:

S.G. @ 20°C.	<0.90
Conradson Carbon Residue	max. 0.5
Viscosity @ 50°C.	17°E.
" @ 100°C.	2.5°E.
Pole Height	max. 2.0
Pour Point	-17°C. max.
(No Oxidation Test)	

It was stated that when production started at this refinery a 100 ton batch of aero oil to this specification was prepared and, after engine builders had carried out acceptance tests with satisfactory results, regular production began and continued without interruption.

Table 1

Austrian Crudes (Average for October 1943)

Name of Field	Hauskirchen	Neusiedel
Sp. gravity at 60°F	0.870	.872
A.P.I. gravity	31.1	30.8
Engler Distillation		
IBP	248	248
10%	383	383
20%	482	480
30%	563	559
% at 572°F	33	33
% Water	1.8	1.8
% BS & W	2.2	3.6
% Salt	0.046	0.019
Salt lbs./1000 bbls.	140	58
% Ash	0.03	0.03
% Paraffin	8.0	12.1
Solidification point of Paraffin, °F.	123	126
Neut. No.	0.12	0.18
% Sulfur	0.53	0.12

Table 2

	Benzine	Kerosine	Atmos. Spindle Oil	Atmos. Neutral Oil	Atmos. Residue	Vacuum Heavy Spindle Oil	Vacuum Neutral Oil	Vacuum Long Residuum
Sp. Gravity at 60°F	-	.824 - .844	.867	.886	.931	-	.903	.958
Octane No.	50	This material was soda washed and then sold to the railroads for use in signal lamps	-	-	-	-	-	-
Viscosity, °E.	Used for solvent manufacture but later sold as motor gasoline blended with hydro gasoline							
20°C.			2.21	-	-	-	-	-
50°C.			-	2.85	26.7	-	4.82	-
100°C.			-	-	-	-	-	16.9
I.B.P. °F.			545	-	-	-	-	-
% at 572°F			4	-	-	-	-	-
Flash (Open) °F.			280	383	356	-	437	563
Pour Pt. °F.			39	66	84	-	102	95
Wax, % wt.			4.26	16.1	12.0	-	18.6	8.76
M.P. °F.			118	125	129	-	127	133
Asphalt				0.004	0.3	-	0.009	0.49
Viscosity, SSU								
100°F	-		about 60.0	about 130	about 2000		about 350	
210°F								about 600

Table 3

Finished Neutral Oils

Distillate used in preparation of finished oil	Light Neutral	Heavy Neutral
Finished Oil		
Sp. gravity at 60°F.	0.896 - 0.901	0.913 - 0.918
API Gravity	25.5 - 26.5	22.6 - 23.5
Vis. at 50°C. °Engler	About 3.5 - 4.0	8.5 - 9.0
Vis. at 100°F. SSU	" 220	About 600
Pole height	" 2.15	2.4 - 2.5
Pour point, °F.	Zero to -5°F	+1 to -5°F.
Neut. No.	0.16	0.07
Sap. No.	0.22	0.17
Water %	0	0
Flash point, °F.	374	437

Table 4

Distillate used in preparation of finished oil	Heavy Neutral	Heavy Neutral
Finished Oil	Motor lube oil	Aviation lube oil
Sp. gravity at 60°F	0.891 - 0.901	0.881 - 0.886
API gravity	25.5 - 27.3	28.2 - 29.1
Vis. at 50°C. °Engler	6 - 7	5.5 - 6.0
Vis. at 100°F. SSU	About 440	About 350
Pole height	About 2.25	1.95 - 2.0
Pour point	Zero to -5°F.	Zero to -5°F.
Neut. No.	0.01 - 0.02	0.01 - 0.02
Sap. No.	0.05	0.05
Water %	0	0
Flash point, °F	428 - 437	446

Table 5

Bright stock from vacuum residue

	Automotive Bright Stock	Aviation Bright Stock
Sp. gravity at 60°F	0.901 - 0.906	0.891 - 0.896
A.P.I. gravity	24.7 - 25.5	26.4 - 27.3
Vis. at 50°C. °Engler	28 - 35	21 - 26
Vis. at 210°F. SSU	About 125	About 120
Pole height	2.25 - 2.3	1.95 - 1.99
Flash point, °F.	554 - 572	536 - 554
Pour point, °F.	Zero to -2.2	Zero
Conradson Carbon Residue, %	--	0.3 - 0.4

OTHER PRODUCTS

Gasolines Typical Data - March 1942

	Hydro	Fischer Tropsch
Sp. Gr. @ 20°C.	0.749	0.700
I.B.P., °C.	41	40
5%	60	58
20%	79	74
50%	98	99
70%	113	127
90%	138	165
95%	150	183
F.B.P., °C.	154	192
Octane No. - Clear	73.5	56.5
V.P. atm.	0.66	0.32

Hydro gasoline was formerly of 180°C. end point, but this was reduced to 150 - 155°C. when the Hydro Gas Oil pour point specification was limited to -40°C. max. Fischer Tropsch gasoline end point was later reduced for a similar reason, in this case the diesel oil cut being 160 - 320°C. of -12°C. pour point. Fischer Tropsch Gasoline of 160°C. end point had a clear Octane Number of ca. 60.

No aviation gasoline was produced at Lützkendorf.

DIESEL OILS

Fischer Tropsch hydro gas oils were dispatched separately from Lützkendorf to various WIFO blending stations, while a blend of petroleum kerosine and atmospheric spindle oil was used internally in tractors and by local transport organizations.

Typical inspection data for the first two materials during March 1942 are as follows:

	Hydro Gas Oil	Fischer Tropsch Gas Oil
Sp. Gr. @ 20°C.	0.865	0.743
I.B.P., °C.	179	173
20%	200	180
50%	224	195
70%	254	205
90%	298	224
F.B.P., °C.	329	256
Cloud Point, °C.	-25	-38
Pour Point, °C.	-41	-40
Filtration rate, secs.	38.4 @-28°C.	2.6 @-39°C.
Cetane Number	35.6	68.2

Hydro diesel oil specification called for a max. pour point of -40°C. and a Cetane Number of 40 - 45.

ENGINE TESTING

In the engine testing laboratory the following engines were installed:

I.G. Prüfmotor,
C.F.R. Motor Method Engine,
and Deutz Diesel Engine.

These were employed for routine Octane Number and Cetane Number determinations.

MERSOL MANUFACTURE

It was stated that a Fischer Tropsch fraction b.p. 320 to 340°C. was dispatched for Mersol manufacture, and that material boiling above 340°C. containing 10% wax was sent to Witten for fatty acid manufacture.

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