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LOUISIANA, MISSOURI

1499

From Dr. H. Pier's files

T - 440

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High Pressure Experiments
Ludwigshafen, 558

10-28-1941, Wehr

COMPARATIVE COST ESTIMATES OF MOTOR GASOLINE, A GASOLINE
(AVIATION GASOLINE) AND -170°C GASOLINE ONE AS STARTING
GASOLINE FOR DED.

Capacity 2,000,000 cc/year of motor gasoline.

The price of the starting material for the DED step can only be estimated under certain assumptions to bring it in line with the costs of motor and aviation gasoline. The reason for it is, that the DED step is not simply part of hydrogenation, but is shunted in between stabilization and scrubbing, since only the high-power fuel is stabilized and washed (after the addition of light gasoline). The stabilization and scrubbing appear therefore in the cost evaluation of the DED as components of the DED stage. Stabilization in this case is limited, however, only to the removal of propane and butane from the DED stage, but the hydrogenation gases do not play any important role in costs. On the other hand, the cost of production of light ends and high BTU gases (power gas), which is done in one installation for the hydrogenation and the DED off-gases, were considered hydrogenation costs because of their considerable magnitude as well as for reasons of installation and expense. The price of the -170°C gasoline refers to the C₄-free gasoline.*

It must be mentioned with reference to the stabilization residues of DED, that it is not credited in the cost estimation of DED, and does not therefore appear as a debit in the hydrogenation. Its working up is taken into consideration in the comparative cost evaluation.

* without, however, the costs of stabilization. See above.

1500

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~~The figures in the left part of the 17000 gasoline~~
~~out column of the cost evaluation are the costs of the~~
~~17000 gasoline, when the DHD residue is debited to~~
~~the raw material debit in the price of the gasoline~~
~~+ middle oil. In this case the residue should be~~
~~credited in an evaluation of the DHD stage.~~

1952 ESTIMATES
 COSTS (S-GASOLINE + MIDDLE OIL COSTS ESTIMATED) WITHOUT POWER GAS PRODUCTION

GASOLINE -1550		GASOLINE -1500	
M/te Gasoline		M/te Gasoline	
GASOLINE -1700 (EXCLUDING INCLUDING WORKING UP OF MID RESIDUES)		M/te Gasoline	
0.039 to 3 225.- (costs of -170 gasoline)		2.77	
1.112 to		250.20	1.21 to
586 m ³ H ₂		48.30	993 m ³ H ₂
480 m ³ H ₂ gas		-3.76	500 m ³ H ₂ gas
121 kg power gas @ 15 pf		18.20	175 kg power gas
		277.14	255.60
0.181 li.		2.26	0.188 li.
0.143 li.		0.60	0.143 "
5 kg NaOH		0.75	5 kg NaOH
		3.61	0.72
0.141 to		0.42	0.37 to
0.59 to		1.52	0.67 to
820 m ³		5.40	835 m ³
100 m ³			111 m ³
242 kw		4.82	258 kw
		13.18	14.61
72 men/shift = 2.6		2.21	79 men/shift = 3.1
		1.72	2.64
		0.94	2.05
		0.44	1.13
		5.31	0.53
			6.26
21.63 mill.		5.75	6.78
-5.42 mill.		0.24	0.52
		6.19	7.30
27.05 mill.		9.95	11.71
		2.21	2.61
		12.16	14.32
Costs of -1700 gasoline 226.36		217.59	242.88
2.5%		7.93	6.58
21.1 mill.		7.62	9.02
		7.50	9.02
		23.05	25.10
		340.64	367.98
		349.65	

1952 ESTIMATES
 COSTS (S-GASOLINE + MIDDLE OIL COSTS ESTIMATED) WITHOUT POWER GAS PRODUCTION

POWER TABLE

Gasoline -185° MIDDLE OIL (85% -135°/325°) AND MOTOR GASOLINE -135°, C. - FREE GASOLINE -170° and AVIATION GASOLINE -155°. CAPACITY: 250,000 TB/HR MOTOR GASOLINE.

	High pressure - hrs.	Low pressure - hrs.	Gas	Water	High volt	Low volt	Man/shift
Gasoline -185°							
Prehydrogenation	0.53	2.72	6,200	834	1,638	258	26
Benzination	1.3	4.91	14,698	1,459	2,763	478	26
Gasoline removal power gas	1.53	0.50	-	152	570	-	8
Gasoline stabilization	5.05	0.49	-	288	-	69	3
Gasoline scrubbing	-	0.6	-	9	-	24	2
Intermediate tankage	-	3.9	-	-	-	433	-
Commercial tank farm Hydraz Offices, laboratories	0.5	6.25	332	122	32	252	10
	9.36	19.77	21,202	2,625	5,061	1,513	75
32.5	1.5	0.65	678	94	160	49	
Gasoline -170° (including DHD residue)							
Prehydrogenation	0.53	2.82	6,400	865	1,700	267	26
Benzination	1.57	5.92	17,700	1,770	3,340	578	26
Gasoline removal	2.20	0.72	-	216	815	-	10
Tank farm etc.	-	8.4	300	210	30	675	10
	4.30	17.86	24,400	3,061	5,885	1,520	72
30.6	0.57	0.59	82	100	192	50	
Gasoline -150°							
Prehydrogenation	0.53	2.72	6,200	834	1,638	258	26
Benzination	1.57	5.92	17,200	1,750	3,340	570	26
Gasoline removal	2.3	1.07	-	330	1,200	-	12
Gasoline stabilization and scrubbing	5.05	1.49	-	277	-	87	5
Tank farm etc.	-	7.75	270	194	20	620	10
	10.45	18.95	23,470	3,385	6,206	1,535	79
28.2	0.97	0.67	335	111	203	55	

8 - GASOLINE MIDDLE OIL (8% - 135/325) INTO MOTOR GASOLINE -1700 AVIATION GASOLINE -1550

-1850	Costs of -1700 Gasoline Cut	-1700	-1550
1,000 kg s-ga. + m.o. 80% C, 11% H available 26 kg C gasified carbon number 2.4 958 kg catchpot bottoms 4 kg dist. losses 261 kg ga. 85/17.5 696 kg m.o. 87.5/14 278 kg b-m.o. 1,071 kg	+ 34 kg 27 995 329 561 410 1,071	850 kg s-ga. + m.o. 86% C, 11% H available 26 kg C gasified, carbon number 2.4 958 kg catchpot bottoms 4 kg dist. loss 261 kg ga. 85/17 696 kg m.o. 87.5/14 278 kg b-m.o. 1,071 kg	1,000 kg s-ga. + m.o. 80% C, 11% H available 26 kg C gasified carbon number 3.4 957 kg catchpot bottoms 5 kg dist. losses 257 kg ga. 85/17.0 690 kg total ga.
H ₂ Consumption 428 20 20 468 356 824 m ³ /te s-ga. + m.o. 993 m ³ aviation gasoline Ev-gas Formed 26 kg @ 13,860 = 360,000 122 kg @ 13,300 = 1,620,000 58 kg @ 2,360 = 137,000	H ₂ Consumption 428 20 20 468 356 824 m ³ /te s-ga. + m.o. 993 m ³ aviation gasoline Ev-gas Formed 26 kg @ 13,860 = 360,000 122 kg @ 13,300 = 1,620,000 58 kg @ 2,360 = 137,000	H ₂ Consumption 428 20 20 468 356 824 m ³ /te s-ga. + m.o. 993 m ³ aviation gasoline Ev-gas Formed 26 kg @ 13,860 = 360,000 122 kg @ 13,300 = 1,620,000 58 kg @ 2,360 = 137,000	H ₂ Consumption 428 20 20 468 356 824 m ³ /te s-ga. + m.o. 993 m ³ aviation gasoline Ev-gas Formed 26 kg @ 13,860 = 360,000 122 kg @ 13,300 = 1,620,000 58 kg @ 2,360 = 137,000
2,025,000	2,025,000	2,025,000	2,025,000

OPERATIONS

2-GASOLINE MIDDLE OIL (8% -135°/325°) MOTOR GASOLINE -135° ± 0, FREE GASOLINE
AND AVIATION GASOLINE -135°, CAPACITY: 250,000 ts/ann. MOTOR GASOLINE OR 34.0
TS/HR 2-GASOLINE + MIDDLE OIL

	-135°	-170° (PHZ)	-150°
<u>Prehydrogenation:</u>			
Injection pumps	34.3 ts/hr	35.2 ts/hr (including LHQ res.)	34.0 ts/hr
Water pumps	3.4 "	3.5 "	3.4 "
Gas circulation	122,000 m ³	176,000 m ³	136,000 m ³
Throughput	0.8	0.8	0.8
Catalysts volume	42.5 m ³	44 m ³	42.5 m ³
Converter System	5.2 converters	5.25 converters	5.2 converters
Stalls	2	2	2
Catchpot distillation	32.6 ts/hr	32.8 ts/hr	32.6 ts/hr
Off-gas of column	32.45 "	31.2 "	31.83 "
<u>Denaturation:</u>			
Injection pumps	30.2 ts/hr	36.42 ts/hr	35.6 ts/hr
Water pumps	3.0 "	3.6 "	3.6 "
Gas circulation	60,400 m ³	72,800 m ³	72,800 m ³
Space-time yield	0.6	0.6	0.25
Catalyst volume	31.4 m ³	34.8 m ³	42.8 m ³
Converter system	3.8 converters	4.25 converters	5.2 converters
Stalls	2	1+1	2
Catchpot distillation	29.2 ts/hr	35.0 ts/hr	32.24 ts/hr
Off-gas of column	18.55 "	20.9 "	19.3 "
L.P.O.	2.06 "	3.7 "	4.9 "
Gasoline removal	1.6 ts/hr (5%)	1.8 ts/hr (5.6%)	2.8 ts/hr (10)
Gasoline stabilization	31.3 "	32.1 "	28.2 "
Gasoline scrubbing	31.3 "	30.6 "	28.2 "
<u>H₂ - Consumption</u>	25,100 m ³ /hr	27,100 m ³ /hr	28,000 m ³ /hr
<u>H₂ - gas formed</u>	33.5 x 10 ⁶ h.u./hr	55.4 x 10 ⁶ h.u./hr	63.5 x 10 ⁶ h.u./hr

ESTIMATED INSTALLATION COSTS

5-GASOLINE + MIDDLE OIL (8% - 135°/325°) TO MOTOR GASOLINE - 135°; 0-FREE GASOLINE
 1000 AND AVIATION GASOLINE - 155°. CAPACITY: 250 GPD PER HOUR MOTOR GASOLINE

	-135°	-170°	-155°
	Mill. \$k.	Mill. \$k.	Mill. \$k.
Injection pumps and gas circulation pumps)	2.9	3.0	3.0
Vapor phase still	9.8	10.3	10.8
Transfer for light oils	1.7	1.7	1.7
Distillation	1.7	1.7	1.8
Gasoline removal + IFO + distillation	0.18	(0.17)	0.15
High and low pressure (loop lines)	1.7	1.38	1.34
and filling stations	0.7	0.7	0.7
Filter press pit, foam fire extinguisher, piping	0.15	0.15	0.15
	20.85	21.63 (22.4)	23.60

*) Calculated together with the installation of the gasoline phase.