

UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
OFFICE OF SYNTHETIC LIQUID FUEL,
LOUISIANA, MISSOURI

1511

From Dr. M. Pier's files

T-443

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February 25, 1948

Nov. 6, 1941

High Pressure Experiments, Ludwigshafen
Lu 558

ESTIMATION OF COSTS: POLITZ - LU. CO. 25, 1941

The estimate is based on the production of LHD gasoline from 170 gasoline, 60% of which is obtained from mineral oil and 40% from bituminous coal and tar hydrogenation. The production factor is therefore

an intermediate between that for the hydrogenation of coal and petroleum gasoline as raw materials, that is about 1.3, an average of 1.25 and 1.35.

Appendix I, contains the foundation and the methods of computation for the calculations of the Politz newly constructed stalls with a yearly production of 140,000 tons of LHD gasoline, and the designed installation at Oppau is 200,000 tons per year of LHD gasoline.

We may remark with reference to the Politz computations that the capital interest is referred to 13.5 million installation cost. This amount is composed of 9.5 millions for the LHD installation proper, including distillations, and 3.8 millions for the increased power plant installation.

Power, however, is estimated in the calculations in the preliminary distillation and the final distillation (including stabilization) and we have here therefore double charges. On the other hand the installation costs of auxiliary units have not been included.

The costs of supervision and general expenses are not included in the Pölit's calculations. The estimate for repairs amounts to 1.05 Mk. per ton of LSD gasoline, that is 1.05% of the installation capital, and as such much too low. It is computed in Oppau as being 6.5%.

In Appendix II. the Pölit's calculations are compared with the estimates for the Oppau 200,000 tons per year installation, and the latter computations are carried out for normal calculations as well as for the prescribed government calculation form (LSÖ). The table also contains the LSÖ calculations for the Ludwigshafen 25,000 tons per year installation.

The underscored figures in the Pölit's calculations on the table (Appendix II.) apply to costs calculated with the inclusion of the expenses for preliminary distillation, redistillation and for stabilization, that is the entry of 11.06 Mk. was distributed among energy, wages and salaries, repairs, amortization, taxes and interest.

High Pressure Experiments. DuPont Report. Nov. 5, 1941

Lu 558

APPENDIX I.

COMPARISON OF INITIAL INVESTMENT AND OPERATING COSTS

ESTIMATED COSTS:

200,000 te/yr. of DMD gasoline	201.00	100,000 te/yr. of DMD gasoline	100.00
Yield DMD gasoline/initial gasoline = 77% (initial gasoline 100% from mineral oil)		76.4% of starting gasoline, 67% from mineral oil, 10% from coal by subjection products.	
heavy gasoline/initial gasoline = 83%		87.5%	
Redistillation of residue = 3.9% of injection (heavy oil)		3.95%	
Gas credit = 2.75×10^6 heat units/te of DMD gasoline		2.95×10^6 heat units/te of DMD gasoline	
Installation costs 12.5 million inclusive of stabilization and washing in distillation and auxiliary installations		12.5 million inclusive of stabilization and energy requirements	
Amortization = 20% of main installation and auxiliary installation costs		20% of installation costs	
Interest = calculated profit, 10% of the manufacturing costs including profits		10% of manufacturing costs	
Depreciation = 2% of main installation and auxiliary installation costs		2% of installation costs	
Patent = 5% of manufacturing costs of DMD gasoline		5% of manufacturing costs	
Management costs 2% of production costs		2% of production costs	
Taxes: 2% of main installation and auxiliary installation costs (\$1.25)		2% of installation costs	
Shipping charges 1.00		1.00	
Auxiliary installation and maintenance costs			
Residue 0.2% of main installation and auxiliary installation costs			

1514 APPENDIX II.

DHD - CALCULATIONS
STARTING WITH GASOLINE FROM MINERAL OIL

Nov. 6, 1941

Ludwigshafen Installation 25,000 te/yr. DHD gasoline LSO Calculation	OPPAU INSTALLATION 200,000 te/yr. DHD gasoline LSO Calculation	OPPAU INSTALLATION 200,000 te/yr. DHD gasoline (Normal cost estimate)	POLITZ INSTALLATION Calculations of Oct. 23, 1941				
M/te of DHD gasoline	M/te of DHD gasoline	M/te of DHD gasoline	M/te of DHD gasoline				
A) Raw material:							
Gasoline 1.4 te @ 290.-	406.--	1.35 te @ 290.-	392.--	1.35 te @ 290.-	392.--	1.3 te gasoline ³⁾	390.00
Other materials	3.40		3.40	Catalyst	3.40	@ 300.-	390.00
				Credit for gas		Cat. / H ₂ / N ₂	4.06
				2750 m ³ @ 0.6 Pf.	-16.50	Credits:	
					378.90	Fuel gas 133 kg	
						@ 0.15 Mk	-20.--
						Residual gas 1550 m ³	
						@ 0.45 Pf.	-6.98
						Residue redis-	
						tillation .55 kg.	
						@ 10 Pf.	-5.50
							361.58
B) Operating costs:							
a) Expenses	64.70		19.50	Utilities:		Utilities:	
b) Amortization 20% of 4.7 million	37.60	20% of 12.5 million	12.50	1000 m ³ of fuel gas			
c) Shipping charges	1.80		1.80	@ 0.6 Pf.	6.--		
	513.50		429.20	High pressure steam			
				0.23 te @ 3.80	0.87		
				Low pressure steam			
				0.74 te @ 3.20	2.37		
				water 65 m ³ @ 1 Pf.	0.65		
				Elec. power 160 Kwh			
				@ 1.4 Pf.	2.24		
					12.13		9.70
							7.47
C) Cost of management:							
9% of A) / B) ¹⁾	22.28	9% ¹⁾	15.50	wages & Salaries:		wages & Salaries:	
				wages 48 M/shift =			
				2.12/menhour @ 1.65	3.50		4.56
				Salaries 20%	0.70	Unforeseen	5.18
				Operating mat. 10%	0.35		
				Laboratory & misc.			0.43
				costs 10%	0.35		10.17
					4.90		13.22
D) Special costs:							
Contribution to profit fund and the deashing costs of the DHD process	5.--		5.--	Repairs:		Repairs:	
Sum of C) / D)	27.28		20.50	6.5% of 12.5 million	4.06		1.03
Sum of A) to D)	540.78		449.70	Amortization:		Amortization	
E) Calculated profits:							
10% of A) to E) ¹⁾	30.53	10% ¹⁾	21.30	20% of 12.5 million	12.50	9% of 13.3 million	8.55
Sum of A) to E)	571.31		471.--	Fire Protection & Taxes:		Taxes:	
Deduct credit for fuel gas 1.7 x 10 ⁶ heat unit	-10.--	1.75 x 10 ⁶ heat unit	-10.50	2% of 12.5 million	1.25		5.00
					17.81		18.94
				Manufacturing costs:	413.74	Manufacturing costs:	393.80
				General expenses:			
				2.5% of mfg. costs	10.30		
				Interest:		Interest:	
				3% on 12.5 million	1.87	5% on 13.3 million	
						6.17	4.75
				5% on 1.9 million ²⁾	0.48		
				Royalty:	5.--	Royalty:	7.00
					17.65		11.75
				Costs of distillation & stabilization in the above		Costs of distillation & stabilization	
					431.39		11.06
							416.61

- 1) The cost of the starting gasoline was estimated at 100 Mk/ton
2) 15% of additional capital requirements referred to main
plus auxiliary installation costs.
3) 60% mineral oil gasoline, 40% gasoline liquefaction products of coal

1515

T-443

12/9/41

SUMMARY

For plants--Production referred to 1 to oil production

Balance balance -- upper figure
 September " -- middle "
 October " -- bottom "

Tar-pitch (1111) 1300 kg 1065 " 1050 "	Pasting oil catchpot heavy oil 1000 kg 22/3 " 1795 "	Recirc. HOLD 650 kg 1576 " 1669 "	Flush. oil 130 kg 296 " 208 "
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total gas prod. 327 kg 736 " 632 "	Stalls 700 atm 3.57 atm = L 0.23 5.25 " = L 0.19 9.35 " = L 0.10%	Circulation gas 3250 cbm 21,100 " 9,386 "
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Make-up gas 1) 1360 cbm 100% H ₂ 2680 " 2380 "
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Recirculation 1576 " 1669 "	HOLD 1660 " 25% " 2057 " 24% "	Catchpot bottoms 1910 kg 3562 " 3117 "
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Heavy Oil →

LTC 178 kg 30% sol 408 kg 378 "	Distillation 2010 kg 3718 " 3134 "
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Parts 60 kg 135 " 246 "	Oil 100 kg = 80% yield 120 " to catchpot 162 " " " " "	1000 kg g. H.O. 84 kg gasol) 816 " H.O.) 210 kg gasoline) 782 " H.O.)	1000 kg heavy oil = 50% con. 2699 kg H.O. - 27% con. 2117 = 31% con.
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Max. identifiable losses

recirculated as flush. oil, etc.

34 kg
20 "

- 1) 1000 cbm H₂ for working up of hard pitch only
- 2) 400 kg total gas " " " " " "
- 3) 1005 kg hard pitch " " " " " "

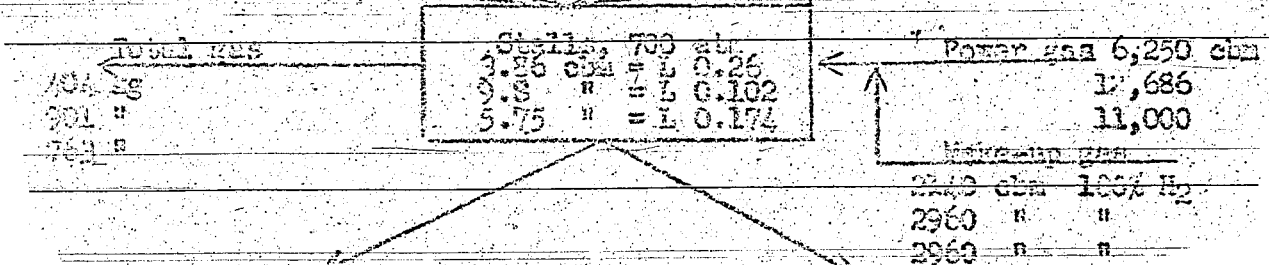
1516

POLITZ

Coal phase: Prod. referred to 1 to oil prod.

Upper figures Ludwigshafen balance (orig. black)
 Middle " Politz, September (" red)
 Bottom " " October (" green)

Coal feeds:	Pasting oil	Slide oil	Flush. oil
4.45 ash	9% sol.	178 kg	99 kg
3.45 H ₂ O	2130 kg	88 "	442 "
1690 kg	4913 "	23%	
3007	2795		
2877			



HOLD	Catchpot bottoms
2600 kg 25% sol.	2050 kg
4028 " " "	2930 "
3012 " 29% "	2621 "

Catchpot H oil + LTC oil

LTC oil

Past. oil

1970 kg	Centrifugal
4560 "	2540 kg 16% sol.
3947 "	5762 " 18.1% "
	4547 " 19% "

Distillation

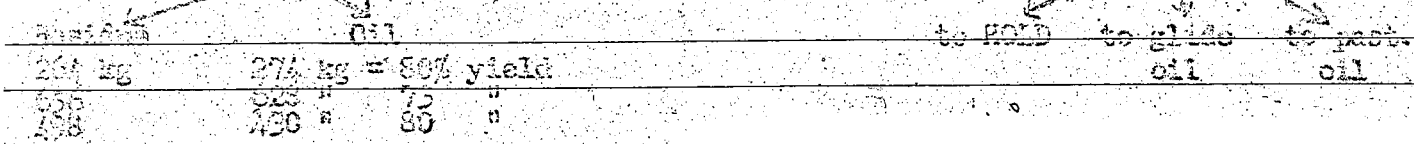
2320 kg
3123 "
2854 "

H₂O

550 kg
122 "
1000 "

260 kg g. (-200°C) + 740 kg no. 325°C

161 " "	639 " "	1230 kg H ₂ O.
229 " "	770 " "	2107 " "
		1363 " "



Non explain. loss. —
 44
 59

COMPARISON OF DHD and HZ Calculations for Induschhafen, Politz, Leitz, and Moosbierbaum

	Induschhafen	Politz	Merseburg	Moosbierbaum
	Acc. to agreement 6/27/41 27 000 te Prod.	From estimate and various data 170 000 te Prod.	Letter of 9/20/41 345 000 te Prod.	Calc. of 4/16 and letter of 9/20 100 000 te Prod.
A) Raw Materials:				
Gasoline	1.4 te @ 100.- RM ¹) 140.-	1.3 te @ 100.- RM ¹) 130.-	1.265 te @ 100.- 126.50	1.37 te @ 100.- 137.-
Other Materials	3.40	4.06	5.90	11.10
B) Operating Costs:				
a) Costs	64.70	34.60	34.60	66.-
b) Amortization	20% of 4.7 Mill. 37.60	9% of 13.3 Mill. 8.55	20% equipment apparatus 15.-	28.50
			7% for buildings	
c) Shipping costs	1.80	Included in costs	Included in costs	Included in costs
C) Administration:				
9% of A + B	22.25	15.10	16.40	21.50
D) Special Costs:				
Contribution towards development costs of the process	5.-	7.-	5.-	9.90
A to D	274.78		203.40	274.30
E) Calculated Profit:				
5% of 13.3 Mill. RM. 4.75			Assumed 10% of A-B 22.60(?)	30.50
Product credit for fuel gas, power gas and distillation residue	Or. 10.-	Cr. 32.50	?	Cr. 12.40
Increase in cost of raw materials	1.4 te @ 235.2) 329.-	1.3 te @ 300.4) 390.-	?	?
Total costs, without taxes	624.40	561.56		

1) The 100.- RM/te gasoline is a fictitious price used as a basis for the calculation of the entire.

2) An estimate of the Politz costs, of which we merely knew that they total to 70.- RM:

Power	12.- RM/te
Wages and salaries	8.- RM/te
Repairs	4.- "
Amortization, 9% of 13.3 Mill.	8.50
Taxes	5.-
	37.50
	5.62
	43.15
	8.55 amort. = 34.60

Unforeseen

3) According to theoretical calculations, Politz will perhaps later be in position to produce gasoline from bituminous coal for use in the DHD for 300.- RM/te. For the present the cost of 400.- RM is used.

Calculation of Basic Costs, Politz

Estimate in Politz

Ideal Estimates, Ludwigshafen

	A September 1941	I Feed: Coal	II Feed: Mixture of Tar and pitch	III Feed: Raw Oil	IV Feed Corresponding to the Politz September Feed
Production of L-Gasoline	19 092 te/month	20 000 te/month	20 000 te/month	20 000 te/month	20 000 te/month
	Amounts/month M/te gaso-line	Amounts/month M/te gaso-line	Amounts/month M/te gaso-line	Amounts/month M/te gaso-line	Amounts/month M/te gaso-line
1. Outside Power	4.676 x 10 ⁶ KW @ 29600.-	16.4 x 10 ⁶ KW @ 20000.-	-	-	4.43 x 10 ⁶ KW @ 20000.-
2. Coal/fuel	21262 te @ 13.80 3804 te " 17.80	31800 te @ 13.80	34500 te @ 13.80	12050 te @ 13.80	21220 te @ 13.80
/Heating Gas	17349 te @ 18.80 6652 te " 27.90	15100 te @ 18.80	14151 te @ 18.80	5240 te @ 18.80	8970 te @ 18.80
3. Coke	1908 te @ 32.80	21850 te @ 30.-	18000 te @ 30.-	6560 te @ 30.-	12640 te @ 30.-
Sum 1-3	56.26	85.35	61.60	23.08	46.54
4. Feed:	156.75				
Hydrogenation Coal	16187.5 te @ 24.30	43900 te @ 24.30	53.40	-	11860 te @ 24.30
Pitch Mixture	-	-	31500 te @ 60.-	-	5350 te @ 60.-
Raw Oil	-	-	-	25000 te @ 140.-	14000 te @ 140.-
5. Intermediates	Cr. 63.49	1230 te @ 55.- Cr. 3.38	920 te @ 55.- Cr. 2.53	403 te @ 55.- Cr. 1.11	710 te @ 55.- Cr. 1.95
Sum 4-5	113.86	50.02	91.97	173.89	126.47
6. a.) Wages	654 935 men-hrs. @ 0.90	428000 men-hrs. @ 0.85	319000 men-hrs. @ 0.85	163000 men-hrs. @ 0.85	260900 men-hrs. @ 0.85
Extras 58.9%	18.18	14.20	10.58	5.40	8.65
b) Repair Hours	230000 @ 3.50	232000 @ 3.40	195000 @ 3.40	92500 @ 3.40	147600 @ 3.40
7. Salaries 351x400 Extras 48.8%	7.35 3.59	24% of wages + extras	7.75	2.96	4.74
8. Cat. and Chemicals	20.87	7.83	15.10	3.79	6.81
9. Operating Materials	6.55	20% of wages	2.70	1.38	2.22
Sum 6-9	129.57	90.93	80.85	36.15	58.57
10. Amortization	255 Mill. 9%	203.5 Mill. 9%	172 Mill. 9%	79.8 Mill. 9%	128.8 Mill. 9%
11. Interest	5% of "	5.53% of 234 Mill.	6% of 198 Mill.	6% of 91.8 Mill.	5.8% of 148 Mill.
12. Supervision	0.436% "	2% of 203.5 "	2% of 172 "	2% of 79.8 "	2% of 128.8 "
Sum 10-12	160.67	144.82	128.30	59.55	94.71
Sum 1-12	460.38	371.15	362.72	292.67	326.29
Credit for LPG	4433 te @ 250.- Cr. 58.05	5820 te @ 250.- Cr. 72.80	6120 te @ 250.- Cr. 76.50	3060 te @ 250.- Cr. 38.20	4320 te @ 250.- Cr. 54.-
Manufacturing Costs	402.32	298.35	286.22	254.47	272.29