

CostsGeneral

It was thought that the best picture of the costs would be obtained by presenting the detailed cost data for the most efficient of the atmospheric pressure plants, Essener Steinkohle, and the most efficient medium pressure plant, Moesch-Benzin. This is done in the next two sections, and before going on to consider them, there are only two general points which should be mentioned.

Firstly, in making a comparison between the atmospheric and the medium pressure processes, Rheinpreussen say that technically and economically there is nothing to choose between the two processes, and in deciding which it would be better to develop the only factor to be considered is what product is desired.

Secondly, Lurgi point out that the whole cost situation can be radically improved if synthesis is combined with the production of town's gas. They did tests at their plant at Böhlen in which they passed the gas from the pressure gasification plant through a synthesis unit at a high gas rate and used the residual gas as town's gas. As a result, they calculated that the cost of production of town's gas could be reduced from 2.5 to 2.0 Rpf./cu.m. They are negotiating with the Russian authorities for the construction of such a combination to provide all the town's gas required by the city of Moscow, and this plant would have 120 synthesis reactors and would produce 1,200,000 cu.m. town's gas/year.

Essener Steinkohle

Table 25 shows how the total costs of Essener Steinkohle for the year 1944-2 are divided up among the individual steps in the process and between the various cost items. Tables 26 and 32 show how the cost items for these steps are divided up in much greater detail. They refer to the month of April, 1944.

Table 26 continued

	Price per unit	Cost for April 1944		Cost per cu. m. for the business year 1944
		Total RM	per cu. m. Rpfg.	
<u>Net Production Costs (I + II + III)</u>		745,451.36	1.45	1.46
IV.				
Administration Costs		20,466.92	0.04	0.04
Taxes		30,234.55	0.08	0.07
Interest (calculated)		31,376.10	0.06	0.05
Total		80,078.57	0.18	0.16
<u>Total Costs (I + II + III + IV)</u>		837,442.91	1.63	1.62
Amortization (10% of the capital value of the plant: - RM. 40,904,550)		89,047.--	0.16	0.17
Total Costs		926,490.51	1.79	1.79

Table 27.
Synthesis Gas Production and Purification, April 1944.

Production 51,753,000 cu.m.
 (= 43,411,000 cu.m. inert-free)

	Cost for April 1944		Cost per cu.m. for the business year Rpfg.
	Total RM	per cu.m. Rpfg	
I. <u>Input</u> Synthesis Gas (before purification)	926,489.91	1.79	1.79
II. <u>Working Costs</u>			
a) <u>Materials</u>			
Active Carbon (Desorex)	11,100.00	0.02	0.02
Purification Material - removal of H ₂ S	6,200.00	0.01	0.01
Purification Material - removal of organic S	18,600.00	0.04	0.04
Total	35,900.00	0.07	0.07
b) <u>Energy</u>			
Electric Power Purchased	3,633.06	0.01	0.01
Generated	3,247.09	0.01	-
Residual Gas	10,163.40	0.02	0.02

Table 27 (Continued)

	Costs for April 1944		Cost per cu.m. for the business year kpfg.
	Total RM	per cu.m. kpfg.	
Fresh Water	3,028.57	-	0.01
Total	20,072.12	0.04	0.04
<u>c) Other Working Costs</u>			
Wages	9,303.59	0.02	0.02
Salaries (technical)	1,622.23	-	-
Stores Materials	1,327.53	-	-
Replacements	172.50	-	0.01
Repairs	1,146.92	-	-
Workshop Costs	371.98	-	-
Auxiliary Working Costs	154.38	-	-
Laboratory Costs	3,111.33	0.01	0.01
General	8,523.05	0.02	0.02
Total	25,733.51	0.05	0.06
<u>Total Working Costs II (a + b)</u>	31,705.63	0.16	0.17
III. <u>Credit from sale of used purification material</u>	6,959.09	0.01	0.01
<u>Total Working Costs (II - III)</u>	75,646.54	0.15	0.16

Table 27 (Continued)

	Costs for April 1944		Cost per cu.m. for the business year Rpfgr.
	Total RM	per cu.m. Rpfgr	
<u>Total Net Production Cost (I + II - III)</u>	1,002,136.45	1.94	1.95
IV. Administration Costs	5,508.87	0.02	0.01
Taxes	11,067.82	0.02	0.02
Interest (calculated)	18,305.70	0.03	0.03
Total	34,882.39	0.07	0.06
<u>Total Costs (I + II - III + IV)</u>	1,037,018.84	2.01	2.01
Amortization (10% of the capital value of the plants - RM. 6,362,250.)	51,954.00	0.09	0.11
<u>Total Costs</u>	1,088,972.84	2.10	2.12

Table 28.

Synthesis

Production of 2,890,695 kg. Crude Oil
 3,297,315 kg. Crude Motor Spirit
 681,345 kg. Crude Power Gas
 130,920 kg. Catalyst Wax
7,000,275 kg.

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
I. <u>Input</u> Synthesis Gas (purified)	1,088,972.84	15.56	15.70
II. <u>Working Costs</u>			
a) <u>Materials</u>			
Catalyst	115,500.00	1.65	1.71
Active Carbon	5,000.00	0.07	0.09
Total	120,500.00	1.72	1.80
b) <u>Energy</u>			
Electric Power Purchased	10,072.81	0.14	0.18
Generated	8,999.59	0.13	0.11

90.

Table 28 (Continued)

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
Steam	621.24	0.01	0.02
Residual Gas	916.50	0.02	0.02
Fresh Water	3,781.45	0.05	0.06
Boiler Feed Water	6,140.82	0.08	0.08
Canal Water	2,028.59	0.04	0.03
Total	32,561.00	0.47	0.50
c) <u>Other Working Costs</u>			
Wages	24,163.78	0.35	0.29
Salaries (technical)	3,885.31	0.05	0.06
Stores Materials	2,434.17	0.03	0.03
Replacements	4,587.50	0.07	0.05
Repairs	6,625.00	0.09	0.08
Workshop Costs	743.97	0.02	0.01
Auxiliary Working Costs	689.88	0.01	0.01
Laboratory Costs	6,637.52	0.09	0.08
General	25,203.96	0.36	0.40
Total	74,921.09	1.07	1.01
<u>Total Working Costs (II a + b)</u>			
	227,982.09	3.26	3.31

Table 26 (Continued)

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
<u>Total Production Cost (I + II)</u>	1,316,954.93	18.82	19.01
III. <u>Credits</u> Steam	12,123.85	0.18	0.06
<u>Net Production Cost (I + II - III)</u>	1,304,831.08	18.64	18.95
IV. Administration Costs	18,830.90	0.27	0.26
Taxes	35,693.96	0.51	0.46
Interest (calculated)	48,045.90	0.69	0.67
Total	102,570.76	1.47	1.39
<u>Total Costs (I + II - III + IV)</u>	1,407,401.84	20.11	20.34
Amortization (10% of the capital value of the plant:- RM. 16,698,550)	136,360.00	1.94	1.91
<u>Total Costs</u>	1,543,761.84	22.05	22.25

Table 29.

Distillation

Production of 443,400 kg. Distilled Motor Spirit
 720,580 kg. Heavy Oil
 1,115,870 kg. Diesel Oil
 564,440 kg. Wax
2,844,290 kg. Total

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
I. <u>Input</u> Crude Oil	636,714.73	22.39	22.52
II. <u>Working Costs</u> a) <u>Energy</u> Electric Power Purchased Generated Steam Fresh Water Residual Gas Total	675.00 603.60 2,632.09 3,024.78 2,646.80 9,582.27	0.02 0.02 0.09 0.11 0.10 0.34	0.03 0.02 0.09 0.11 0.08 0.33

Table 29 (Continued)

	Costs for April 1964		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
b) <u>Other Working Costs</u>			
Wages	2,491.17	0.03	0.08
Salaries (technical)	2,386.16	0.08	0.08
Stores Materials	30.47	-	-
Replacements	-	-	-
Repairs	-	-	-
Workshop Costs	82.56	-	-
Auxiliary Working Costs	-	-	-
Laboratory Costs	2,903.92	0.10	0.06
General	8,575.61	0.30	0.16
Total	16,477.99	0.57	0.38
<u>Total Working Costs (II a + b)</u>	26,060.26	0.91	0.71
III. <u>Credits</u>			
Sale of Fatty Acid Solution	-	-	0.02
<u>Net Working Costs (II - III)</u>	26,060.26	0.91	0.69
<u>Total Production Costs (I + II - III)</u>	662,774.99	23.30	23.21

Table 29 (Continued)

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
Despatch of Diesel Oil	1,178.91	0.04	0.04
IV. Net Production Costs	663,953.90	23.34	23.25
V. Expenses			
Administration Costs	1,541.67	0.05	0.09
Taxes	3,642.81	0.13	0.12
Interest (calculated)	1,864.80	0.07	0.06
Total	7,049.28	0.25	0.27
<u>Total Costs (IV + V)</u>	671,003.18	23.59	23.52
Amortization (10% of the capital value of the plant:- RM. 647,980)	5,291.00	0.19	0.19
<u>Final Total Cost</u>	676,294.18	23.78	23.71

Table 30.

Stabilization

Production of 3,027,261 kg. Motor Spirit
 288,468 kg. Power Gas
3,315,729 kg.

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
I. <u>Input</u>			
Crude Motor Spirit	734,948.73	22.17	22.18
Distilled Motor Spirit	-	-	0.06
Total	734,948.73	22.17	22.24
II. <u>Working Costs</u>			
a) <u>Energy</u>			
Electric Power			
Purchased	1,858.72	0.06	0.07
Generated	1,661.72	0.05	0.04
Fresh Water	3,403.11	0.10	0.10
Canal and Pool Water	1,014.29	0.03	0.04
Total	7,937.84	0.24	0.25

Table 30 (Continued)

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
b) <u>Other Working Costs</u>			
Wages	2,070.38	0.06	0.07
Salaries (technical)	505.46	0.02	0.01
Stores Materials	280.24	0.01	-
Replacements	812.50	0.02	0.01
Repairs	765.32	0.02	-
Workshop Costs	82.66	-	-
Auxiliary Working Costs	88.21	-	-
Laboratory Costs	207.42	0.01	0.03
General	1,393.92	0.04	0.05
Total	6,206.11	0.18	0.17
<u>Total Working Costs (II a + b)</u>	14,143.95	0.42	0.42
<u>Production Costs (I + II)</u>	749,092.68	22.59	22.66
In addition:			
Distribution Of Products	231.68	0.01	-
Storage	106.77	-	0.01
Despatch	3,253.30	0.10	0.09
III. <u>Total Production Costs</u>	752,684.43	22.70	22.76

Table 30 (Continued)

	Costs for April 1974		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
IV. <u>Charges</u>			
Administration Costs	1,253.34	0.04	0.04
Taxes	2,509.08	0.08	0.07
Interest (calculated)	4,291.35	0.12	0.12
Total	8,053.77	0.24	0.23
<u>Total Costs (III + IV)</u>	760,738.20	22.94	22.99
Amortization (10% of the capital value of the plant:- RM. 1,491,530.)	12,180.00	0.37	0.35
<u>Final Total Cost</u>	772,918.20	23.31	23.34

Table 31.

Catalyst Wax

Production of 130,920 kg.

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
I. <u>Input</u> Raw Materials	28,867.86	22.05	22.26
II. <u>Working Costs</u> Wages	873.15	0.67	0.62
Stores Materials	-	-	0.01
General	591.51	0.45	0.50
Total	1,464.66	1.12	1.13
<u>Production Costs (I + II)</u>	30,332.52	23.17	23.39
Despatch	-	-	0.08
III. <u>Total Production Costs</u>	30,332.52	23.17	23.47

Table 31 (Continued)

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
IV. <u>Charges</u>			
Administration	255.64	0.19	0.23
Taxes	604.04	0.46	0.45
Interest (calculated)	37.80	0.03	0.03
Total	897.48	0.68	0.71
<u>Total Costs (III + IV)</u>	31,230.---	23.85	24.18
Amortization (10% of the capital value of the plant: - RM. 13,040.)	107.---	0.09	0.09
<u>Final Total Cost</u>	31,337.---	23.94	24.27

Table 32.

Power Gas (G₂ and G₃ Gases)

Production 969,813 kg.

	Costs for April 1944		Costs per 100 kg. products for the business year RM
	Total RM	per 100 kg. products RM	
I. <u>Input</u>			
Crude Gas from Synthesis (Active Carbon Plant)	150,236.57	15.49	15.15
Crude Gas from Stabilization	67,241.89	6.93	7.43
Total	217,478.46	22.42	22.58
II. <u>Working Costs</u>			
Wages	1,249.09	0.13	0.11
Salaries (technical)	209.28	0.02	0.02
Stores Materials	361.23	0.04	0.02
Replacements	287.50	0.03	0.01
Auxiliary Working Costs	66.16	-	-
Laboratory Costs	1,451.96	0.15	0.14
General	449.84	0.05	0.06
Total	4,075.06	0.42	0.36
<u>Production Costs (I + II)</u>	221,553.52	22.84	22.94

Table 32 continued

	Costs for April 1944		Costs per 100 kg. products for the business year RM.
	Total RM	per 100 kg. products RM	
In addition:			
Despatch	240.66	0.03	0.03
Bottling	4,724.67	0.49	0.51
Cylinder Maintenance	-	-	0.07
<u>III. Total Production Costs</u>	226,518.85	23.36	23.55
Less Credit for Service of Cylinders	15,392.11	1.59	1.52
	211,126.74	21.77	22.03
<u>IV. Charges</u>			
Administration	225.80	0.02	0.02
Taxes	176.56	0.02	0.02
Interest (calculated)	1,078.35	0.11	0.11
Total	1,480.71	0.15	0.15
<u>Total Costs (III + IV)</u>	212,607.45	21.92	22.18
Amortization (10% of the capital value of the plant; - RM. 374,900)	3,061.--	0.32	0.33
<u>Final Total Cost</u>	215,668.45	22.24	22.51

Hoesch-Benzin.

As far as capital costs are concerned, Hoesch stated that the estimates given by Dr. Bütetisch of I.G. Farben for Fischer-Tropsch plants were definitely wrong. He estimated RM. 800 - 900/t. products produced per year, whereas the actual figure for Hoesch-Benzin was RM. 500 /t. even using 1941 figures.

The parent Hoesch company was a steel works and they built the Hoesch-Benzin plant, so that the capital costs were a minimum figure. Thus most of the other firms had to obtain their plant from outside contractors through Mineralölbau, so that not only were the actual prices higher but there was a percentage (about RM. 500,000) to be paid to Mineralölbau.

As an example of the detailed production costs, the Hoesch figures for January 1942 are given in Tables 35 and 36. The production for this month and the previous month is shown in Table 33, and the cost of the raw materials used as the basis for the production cost calculations are given in Table 34.

Table 33.Production. Hoesch-Benzin.

	January 1942 t.	December 1941 t.
Liquid and Solid Primary Products	3,894.120	3,674.620
Primary Power Gas	378.531	361.450
Total	4,272.651	4,036.070

Table 34.Prices of Raw Materials

Coke	RM. 17.79
Steam, 18 atm.	2.82/t.
Steam, 9 "	2.38/t.
Steam, 2.5 "	1.88/t.
Electric Power	17.60/1,000 kwh.
Water	64.02/1,000 cu. m.

Table 35
Production Costs for Primary Products (including working up), Hoesch-Benzin
January, 1942.

	Total Cost RM	Cost per tonne products	
		January 1942 RM	December 1941 RM
I. <u>Input</u>			
Coke 18,731.6 t. as delivered			
18,453.1 t. dry	333,178.10	77.98	80.01
II. <u>Working Costs</u>			
<u>Wages, etc.</u>			
Salaries	9,414.05	2.20	4.37
Social Charges connected with salaries	485.32	0.11	0.17
Wages	38,094.15	8.92	11.21
Social Charges connected with wages	3,164.32	0.74	1.03
Total	51,157.84	11.97	16.78
III. <u>Fuel</u>			
Coke-oven gas	1,935.15	0.45	0.52
Residual gas	14,049.08	3.29	3.88
Total	15,984.23	3.74	4.40

Table 35 (cont.)

	Total Cost RM	Cost per tonne products	
		January 1942 RM	December 1941 RM
Power			
Steam	160,097.10	37.47	37.-
Electricity	40,733.06	9.53	8.95
Compressed Air	514.22	0.12	0.05
Water	11,130.17	2.61	2.35
Total, power and water	212,474.55	49.73	48.35
Maintenance and Repairs	68,362.-	16.-	16.-
Working Materials			
Catalyst	81,180.-	19.-	18.-
Active Carbon	6,409.-	1.50	0.50
Gas Purification Material	17,091.-	4.-	4.-
Alkali	5,123.35	1.20	1.06
Chemicals	1,170.90	0.28	0.44
Stores Materials	8,140.87	1.90	2.10
General	11,031.-	2.58	1.75
Total	150,146.12	30.46	27.85
Other Working Costs			
Transport	4,180.74	0.98	0.88
Workshop Costs	12,083.19	2.83	3.32
Total	16,263.93	3.81	4.20
Total Working Costs	494,388.67		
Total Working Costs per tonne products		115.71	117.58

Table 35 (continued)

	Total Cost RM	Cost per tonne products	
		January 1942 RM	December 1941 RM
<u>III. General Costs</u>			
General Costing Costs	19,759.60	4.63	6.29
General Works Costs	21,250.-	4.97	5.01
Voluntary Social Service Payments	3,425.62	0.80	1.15
Administration	23,804.60	5.57	6.93
Total	62,239.82	15.97	19.38
<u>IV. Credits</u>			
Steam	113,788.-	26.63	28.58
Residual Gas	34,849.81	8.16	8.54
Total	148,637.81	34.79	37.12
Production Costs (I + II + III - IV)	747,168.78	174.87	179.85
<u>V. "Werksumlage" *</u>			
Preliminary Stage			
Direct	45,000.-	10.53	11.15
Auxiliary	289,000.-	67.64	71.60
Total	21,000.-	4.92	5.20
Total Production Costs	355,000.-	83.09	87.85
Additional Cost for working up of pure hard wax	1,102,168.78	257.96	267.80
Final Total Production Costs	32,820.24	7.68	11.37
	1,134,989.02	255.64	279.17

* The precise nature of these costs is obscure, but the total sum is very similar to that quoted elsewhere (B.I.O.S. 805) as the capital charges (Depreciation and interest on loans).