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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF MINES
COAL TO OIL DEMONSTRATION STATION
LOUISIANA, MISSOURI

ECONOMY OF BITUMINOUS COAL HYDROGENATION

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High Pressure Experiments
Ludwigshafen I.

May 11, 1944, Koh/Le.

REPORT OF BITUMINOUS COAL HYDROGENATION

The effects of certain factors on the production cost of gasoline + middle oil were computed on the strength of the hydrogenation balance of the Funing coal to gasoline and middle oil, March 9, 1944, and the itemized cost estimate, April 4, 1944.

The computations are based on the working costs of RM. 0.- /to gasoline + m.o.

		per to gas. + m.o.
+1% gasification/to gasoline + m.o. + gasification I lowers the production costs of gasoline + m.o. by		M.3.30
+1% utilization, to ash coal	"	" 2.70
" 0.01 to/cbm/hour space-time yield[1]	"	" 0.60
+1% increase in throughput[2] per to I gasoline	"	" 0.95
+1% coal concentration in the paste[3] per to gasoline + m.o.	"	" 1.05
+1% low temp. carb. (l.t.c.) yield	"	" 0.40

Calculated to 1 to a-gasoline + m.o., these values affect the H2 consumption, hydrogenation gas formed and the production factor:

	% gasif.	% utilis.	space/time yield	to/cbm/h paste throughput	% ash coal	% l.t.c. yield
1	18.5	98	0.33	1.64	39	32.5
2	20.5	"	"	"	"	"
3	19.5	95	"	"	"	"
4	"	96	0.34	"	"	"
5	"	"	0.374	1.474	2	"
6	"	"	0.35	1.54	40	"
7	"	"	"	"	39	31.5

	to coal	M	m^3 H_2	M	$10^3 m^3/y$ gas	M credit	costs	working costs	differ.
1	1.75	33.20	1040	73.00	3.16	18.90	99.80	187.90	
2		33.67	+60	76.13	+0.2	20.25	101.00	191.18	3.2
3		33.73	+ 3	73.87		18.80	101.00	190.60	2.7
4	1.75	33.20		33.20		18.90	100.40	188.50	0.6
5		33.20		73.80		18.80	101.00	188.40	0.5
6		33.20		73.80		18.90	100.85	188.95	1.0
7		33.28	+ 3	73.94		18.95	100.04	188.30	0.40

Footnotes to the table above:

1) [illegible] which will require an additional 4-converter stall

2) No change in gasification and utilization, therefore proportional to the increase in the space/time yield. The increased thruput must be taken care of by the reserve unit.

3) With the amount of paste not changed

4) Compare the cost estimate of 3/30/44 for the individual costs and changes.

Investigation of the influence of the nature of the coal shows that, e.g., the C-richest coal (type of Castellengo) produces a deviation in the effect of gasification upon the working costs by only 1.5% when compared with the Janina coal, so that the above values may well be considered as guides for all kinds of bituminous coal.

These computations permit drawing the following conclusions:

A maximum concentration of coal in the paste is desirable.

One may assume a 2% reduction in the utilization with a 10% increase in the thruput, as long as no changes in the l.t.c. yield take place by changing the distribution in the oil production[1]. If the gasification drops simultaneously, larger l.t.c. losses could become equalized.

This picture would naturally be changed if the deciding feature was the production of gas, instead of the working costs, or if the H_2 production formed the bottle neck.

/s/ V.Hochstetter

1) With an increasing excess of heavy oil the asphalt level will rise; in Pölitz this increase will be by an additional amount, because the present deficiency is covered by asphalt-free oils.