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U. S. BUREAU OF MINES T-407
HYDROGENATION DEMONSTRATION PLANT
LOUISIANA, MISSOURI

TCM Reel 43, Frames 215-218

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August, 1947

Essen, April 13, 1942

POWDERED COAL GASIFICATION BRABAG - SCHWARZHEIDE

Because of the procurement conditions of to-day it is impossible to obtain oxygen generating equipment for Brabag, with which the installation could be converted to a powdered fuel installation for the production of industrial gas and of water or synthesis gas. On the other hand, the production of industrial gas in Schwarzheide from the available coke fines is an urgent need, and the Brabag management is trying to obtain the maximum efficiency from a powdered coal installation on the basis of coke fines of below 5 mm grain size.

The coke is mixed with 40% water for the convenience of transportation. This then is the moisture content of the coke fines as they reach the powdered fuel gasification plant. A paste drying unit of the Roma-Rosin Type is installed in the Schmalfeldt plant, to be used for the drying and grinding of the coke fines. The dryer must bring the moisture content down from 40 to 5% before feeding the coke to the ball mill. 300 te coke are available daily for gasification. We estimate 10% = 30 te of coke are consumed in the drying of the Roma-Rosin installation, and the remaining 270 te are available for gasification.

We estimate a gas yield of 2.6 nm^3 per kg. of dry coke when gasifying with air, producing an industrial gas with a lower heating value of 1250 kg/nm^3. The daily production is then 270,000 x 2.6 = 700,000 nm^3 of industrial gas with 700,000 x 1250 = 675,000,000 Kcal lower heating value.

We had to determine the number of te of coke from bituminous coal replaceable by the gasification of the coke fines.

The coke from Upper Silesia (Gleiwitz) contained a total of 20% ash + water and its heating value was 5850 Kcal/kg. Such coke is gasified in our rotating grate gas producers with an efficiency of 75%. To obtain the 875 million Kcal from the coke,

$$\frac{875 \times 10^6}{5850 \times 0.75} = 184{,}000 \text{ kg.}$$

must be gasified daily.

The gasification of hard coke from brown coal (l.t.c. from briquettes) in the usual rotating grate gas producers, as well as of coke, must be considered. The heating value of the hard coke amounts to 5,800 - 5,900 Kcal/kg, and with a 75% gasification efficiency the 875 million Kcal would require.

$$\frac{875 \times 10^6}{5850 \times 0.75} = 200{,}000 \text{ kg of hard coke.}$$

The cost of production of 1000 Kcal of industrial gas from these three fuels remained to be determined. The cost calculations were based on:

		RM
1.	1 te dry coke fines	2.-
2.	1 te coke	30.-
3.	1 te hard coke from brown coal	20.-
4.	1 kwh power	0.02
5.	1 labor shift	12.
6.	1 te low pressure steam	2.50

Installation Costs

The powdered fuel gasification installation for coke fines including the installation units from Schmalfeldt used RM 6,000,000.-

Rotating grate producer installation for coke gasification (10 producers, 2.6 m diam.) 2,100,000.-

Rotating grate producer installation for the gasification of hard coke from brown coal (12 producers, diam. 2.6 m.) RM 2,400,000.-

The estimated operating costs are, for

A). Gasification of coke fines, per day:

Expenses, per day:

		RM	
1.	300 te dry fines, at RM 2.-	RM	600.-
2.	12,000 kwh power, at RM 0.02		240.-
3.	30 shifts labor, at RM 12.-		360.-
4.	20% of the wages, for supervision		72.-
5.	5% of the installation costs for repairs		860.-
6.	15% amortization and interest costs.		2570.-
	Total expense, per day	RM	4702.-
	Credit, per day		
	510 te low pressure steam, at RM 2.50		1275.-
	Operating costs, per day		3427.-

Operating costs per 1000 Kcal:

$$\frac{342.700 \times 1.000}{875,000,000} = \text{pfg. } 0.39$$

B). Gasification of coke:

Expense per day:

		RM	
1.	184 te coke, at RM. 30.-	RM	5.520
2.	12,000 kwh power, at RM 0.02		240.-
3.	Labor, 24 men at RM 12.-		288.-
4.	20% of wages, for supervision		58.-
5.	5% installation costs, for repairs		286.-
6.	15% amortization and interest		860.-
	Total expense, per day		7,252.-
	Income, per day:		
	74 te low pressure steam, at RM 2.50		184.-
	Operating costs, per day	RM	7,068.-

Operating costs, per 1000 Kcal:

$$\frac{706.800 \times 1000}{875,000,000} = \text{pfg. } 0.81$$

C). Gasification of hard coke from brown coal:

Expenses per day:

1.	200 te coke, at RM 20.-	RM 4,000.-
2.	12,000 kwh power, at RM 0.02	240.-
3.	Labor, 24 men	360.-
4.	20% of wages, for supervision	72.-
5.	5% of installation costs, for repairs	330.-
6.	15% amortization and interest	990.-
	Total expense, per day	5,992.-

Income per day

74 te low pressure steam, at RM 2,50	184.-
Operating costs per day	5,808.-

Operating costs per 1000 Kcal:

$$\frac{580,800 \times 1000}{875,000,000} = \text{Pfg. } 0,66$$

The value on coke fines set in Schwartzheide, where it is obtained as a waste product, is very low, and as a result the operating costs per 1000 Kcal of gas from the fines is 0.27 Pfg. less than when produced by gasification of hard coke and 0.42 Pfg. than gas from coke.

No l.t.c. coke is available for the production of industrial gas, and Schwarzheide is forced to use coke. There will be a loss when using coke as the powdered material for gasification in Schwarzheide, amounting per day to

$$\frac{0.42 \times 875,000,000}{1000 \times 100} = \text{RM } 3,670.- \text{ or, per year:}$$

RM. 1,300,000.-

This is the reason why the Brabag will start with the industrial gas production in Schwarzheide.

Dr. Pistor wished to know whether we were in position to guarantee these costs, and we stated that we intended to erect a large scale unit after the experimental work in Rheinpreussen. We advised that a gasification test with the coke fines be made in Rheinpreussen to permit the Brabag to establish the operating costs for itself. In general, the guarantee is given when the license is paid for, even if Brabag would require a guarantee in the erection of the first large installation.