

*Mr. W. H. Sternberg*

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

Koppers Gas Producer

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DISCUSSIONS IN RUHLAND ON THE GASIFICATION OF POWDERED  
COAL FOR THE PRODUCTION OF INDUSTRIAL GAS AND OF  
SYNTHESIS GAS

Participants in the discussion: For Brabag - Kaden, Pistor, Kannert,  
Seebacher, Weingartner.  
For Ingenieur Technische Zentrale:  
Lackner, Mott, Daniels.  
For Koppers: Daniels and the undersigned.

1. Industrial Gas Production.

Mr. Kaden has stated in connection with the production of industrial gas, i.e. the reconstruction of the Schmalfeldt installation, that a decision has been reached to make no further investments in Schmalfeldt, because a reconstruction of this kind will be no more than a compromise, and new plans will have to be made for powdered coal gas producers. An engineering report will then be made on our proposal for a new installation. The proper authorities have decided that no special authorization will be required for such a report.

A fuel gas of a high heat value is required to heat the Koppers, and efforts will be made to operate the Schmalfeldt installation as originally intended, i.e. to gasify the grude fines with a flushing gas. The gas produced is hoped to have a heating value of about 2000 heat units, and will be used for industrial heating.

The Brabag representatives did not agree with our statements that such an installation will serve no useful purpose, and that the production of such a gas would require:

1. the consumption of much more heat than liberated;
2. only a limited gasification of the carbon.

The experiment will have to be carried out. We are ready however even now to predict the results of this experiment on the strength of our past experience. We will have to prove to them that the method is impossible, using our experimental installation in Rheimpfeussen.

The grounds for these experiments are furnished by the operation of the Schmalfeldt installation in Lützkendorf. In Lützkendorf, however, brown coal is fed to the gasifier, and no solid carbon need at all be attacked, a point left entirely out of consideration. The Schmalfeldt installation is merely a distillation and cracking unit. The solid carbon is practically unattacked, and is carried out to the dump. In Ruhland the powdered coal

is to be replaced with grude fines, i.e. with a product discarded in Mitzkendorf. They could offer no valid objections to this argument, but insisted on having the tests run regardless of the results to be expected, and added that they did not consider the installation a gas producer, but a heating gas converter.

The whole question must accordingly be more fully discussed, but we would much prefer installing a normal aggregate of our system to the rebuilding of the Schmalfeldt installation.

We will accordingly send in a proposal for an installation of this kind.

2. Synthesis gas Production.

Brabag has received a request to prepare a design for a Fischer-Tropsch installation. Its location is going to be in Upper Silesia.

Raw Material: Upper Silesian coal, also l.t.c. coke.  
 Hourly capacity of installation: 160,000 m<sup>3</sup>(CO + H<sub>2</sub>) (8000 year-hours).  
 CO:H<sub>2</sub> 1.65:1

The plans call therefore for an intermediate pressure synthesis with iron catalysts, very probably for the manufacture of crude scale wax. This is a mere assumption, based on the fact, that the construction of this unit is strongly advocated by Mr. Keppler, whose specialty is known to be the production of edible fats.

The gentlemen were fully acquainted with our process from our discussion of the extension in Zeitz, and needed no additional information. We have brought out the fact that no special requirements will be made with respect to coal. It is important to have the coal grind perfectly, i.e. about 70% must pass through 150 mesh. The required proportion of CO : H<sub>2</sub> is such as has been thoroly studied in our experimental installation in Rheinroessen. The gas company has performed additional experiments on condensible hydrocarbons and on the sulfur compounds. We can now, on the strength of these experiments give accurate information which may be used for new designing; the following realizable values have been communicated to us:

Crude coal dust:	water	1.95%
	ash	8.75
	vol. matter	22.3%
	crucible res.	77.7%
	lower heating value	7650 h.u. /kg
Proportion of CO : H <sub>2</sub> in the gas produced:		1.6:1
Analysis of the gas produced:		11.0%
	CO <sub>2</sub>	54.0
	CO	34.0
	H <sub>2</sub>	1.0%
	N <sub>2</sub>	
Concentration of CO + H <sub>2</sub>		88.0%
Lower heating value	per nm <sup>3</sup> syn. gas	2505 Kcal.
Amount of gas	per kg crude powdered coal	2.10 nm <sup>3</sup>
Oxygen consumption:	" " " " "	0.57 "
	" nm <sup>3</sup> syn. gas	0.27 "

	per kg. crude coal				
	H	H	H	H	
CO <sub>2</sub> consumption					0.14 mm <sup>3</sup>
Firing					350 Kcal.
Steam prod., 16 atm. 350°					0.71 kg.
Steam consumed 3 atm. sat. steam.					0.40 "

We select our normal construction method. For such a gas composition the heater installation is too large, and we arrange two gasifiers with the boilers and coolers in series with them to one heater installation. Such a unit would produce 20,000 m<sup>3</sup> of the above gas.

The number of aggregates to be ordered provoked much discussion. We agreed on having 6 aggregates built, one of which is to be kept in reserve, or else in repairs. The price per aggregate quoted was 2.7 million Reichsmark. For 6 aggregates this will amount to 16.2 million Reichsmark. The cost of gas given is 1.7 pfg/m<sup>3</sup>, on the strength of the following component costs (our proposal to Rheinpreussen of July 29, 1942).

1) 1 te ground coal at the pulverized coal bin	RM.	14.00
2) 1 mm <sup>3</sup> 95% oxygen		0.025
3) 1 eight hour labor shift		10.00
4) 1 kwh electric power		0.02
5) 1 m <sup>3</sup> clarified and cooled circulation water		0.025
6) 1 m <sup>3</sup> make-up water		0.025
7) 1 m <sup>3</sup> boiler feed water		0.25
8) 1 x 10 <sup>6</sup> Kcal fuel gas		4.75
9) 1 te steam at 16 atm.		3.00
10) 1 te steam at 3 atm.		1.50
11) Amortization and interest		12.0%
12) Maintenance and repairs		2.%

The I.Z. is in position to start on the above proposal with the preliminary work. We have been requested to make the written proposal in much detail, and to supplement if possible with information on the coal preparation and water treatment (on the basis of figures to be communicated by Mr. Lackner). We must also furnish information on the sulfur content and the composition of the sulfur compounds in the gas. The information will be based on data obtained in the Rheinpreussen tests.

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