

INFORMATION DIVISION TRANSLATION T46-45

Memorandum About The Conference in
The Main Administration Building Of
The F. Krupp Co., Essen
December 13, 1940

Ruhrchemie Oberhausen-Holtien

Subject: Hydrocarbon synthesis directly from water gas

Dr. Hagemann reported about experiments in the pilot plant of Ruhrchemie where water gas was converted into hydrocarbons with the aid of cobalt catalyst.

Experimental Conditions

Medium pressure oven; normal cobalt catalyst, cycle 1+3 almost no vapor production occurred in this cycle. The experimental oven was started at 195°C and has now, after 110 days, a temperature of 206°C. The course of the gas is fixed as follows:

The purified water gas was run to the compressor and then to the pressure oven. After leaving the oven, the liquid portions are removed only roughly. After that the circulation flow is branched off from the end gas and is reintroduced into the synthesis between compressor and pressure oven. Only after branching off the circulation stream, the eliminated gas enters the pressure condensation and after release it passes through the activated carbon plant.

After it was mixed with conversion gas the residual gas can be processed as second stage in a normal pressure synthesis. The last part of the normal pressure synthesis has not been considered in the following discussion.

Experimental Results

An average contraction of 53% is reached in the reaction, the (CO plus H₂) conversion amounted to 63%. The degree of liquidation increased from the normal 50-53% to 58-60%. A specific yield of 103 grams per normal cubic meter useful gas was attained. First, the product showed a very strong unsaturated character and much paraffin was formed. But during the first 2-3 weeks these characteristics declined somewhat and then the product appeared in constant quality. Also, the product was somewhat richer in oxygen than those of the ordinary synthesis.

The liquid products are arranged in the following fractions.

Table I

	Yield wt. %	Sp gr	Olefin content vol%	Neutr No	Octane No
Fraction up to 200°C (naphtha)	50-58	0.706	58-60	0.4	44 (or after hot refining 66)
Fraction 200-320°C (diesel oil)	25	-	40	0.2	cetane Nr 81-83
" 320-460°C	17	-	-	-	-
" over-460°C (hard paraffin)	6-8	M.P	about	83°C	-

The 40% olefins of the diesel oil fraction can be used in the oxo synthesis. They are utilized up to 80%. The other 20% can be split catalytically into C₄ and C₅ hydrocarbons which can be put into polymerization.

Dr. Hagemann reported the following analysis.

Table II

	<u>Water gas analysis</u>	<u>Residual Gas Analysis</u>
CO ₂	6.0	14.3
CO	38.5	44.5
H ₂	49.0	23.4
CH ₄	0.5	3.5
N ₂	6.0	14.3

The following possibilities could exist for the motor fuel plant.

Of a total water gas quantity of 58850 cu. meters per hour, 22,000 cu. meters would pass through the pressure synthesis with 66,000 cu. meters rest gas I in the cycle. At a contraction of 53% about 10300 cu. meters rest gas would be combined with the other partial stream of 36850 cu. meters after the latter had been converted to a large extent. Then it was passed into the normal pressure synthesis. It is estimated that 53,000 cu. meters per hour of Sy gas with a (CO+2H₂) - content of 74% would be available for the normal pressure synthesis which was to be run in two stages. The possibilities for utilization of the motor fuel plan are to be calculated carefully by request of Dr. Muller.

/s/ Dr. Mohry

Translated Oct. 15, 1946 - Rochelle H. Bondy

Checked 10/25/46 COA