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GUTEHOFFNUNGSHÜTTE A.G.

STERKRADE

Hall; C. C

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COMBINED INTELLIGENCE OBJECTIVES SUB-COMMITTEE

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The Offices of Gutehoffnungshütte A.G. (G.H.H.), Sterkrade, Ruhr.

Reported by

Capt. C.C. Hall

on behalf of

British Ministry of Fuel and Power
and
United States Technical Industrial Intelligence Committee

CIOS Black List Item
C-30/11.12

[1945]

COMBINED INTELLIGENCE OBJECTIVES SUB-COMMITTEE

G-2 Division, SHAEF (Rear) APO 413

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Personnel of Team

Dr. A.R. Powell, U.S. Petroleum Administration for War
Lt.Col. A. Parker, Br. Ministry of Fuel and Power
Lt.Col. R.N. Quirk, ...
Lt.Col. H. Hollings, ...
Capt. R.A.A. Taylor, . CAFT.
Capt. C.C. Hall, .. Ministry of Fuel and Power

Target visited on April 9 and 10, 1945.

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Target 30/11.10

Offices of Gutehoffungshütte A.G., Sterkrade

Object of visit:

To obtain information and engineering drawings appertaining to reaction vessels for the Fischer-Tropsch Synthesis.

Personnel Interrogated:

Herr Mühl,	Director of the Offices.
Dr. Otto Zechetmayer,	Chief Chemist.
Herr Weiss,	Manager of the Boiler-making Dept.

General

Herr Mühl explained that the Company has a mining section with 500,000 tons/year coal output with collieries at Sterkrade, Hugo, Oberhausen, Osterfeld and Jacobi, the last two including coke-oven plants. They operated iron works at Oberhausen with blast furnaces, rolling mills etc., wire-mills at Gelsenkirchen, and factories making rivets, screws, blades etc., at Schwerte, general machinery at Düsseldorf and Sterkrade, steel structures, bridges, mining machinery, boilers, compressors etc., at Sterkrade. Reaction vessels (catalyst ovens) for the Fischer-Tropsch process were made only in the boiler section at Sterkrade.

Fischer-Tropsch Catalyst Ovens

Dr. Zechetmayer stated that the manufacture of Fischer-Tropsch ovens was in the control of a "ring" of firms, Mannesmanne Rohrwerke, Krupps and G.H.H. Mannesmanne were the leaders of this ring and had made the largest number of ovens. He (Z) knew of only three types of oven, (1) The normal "Lammellenofen" for use at atmospheric pressure, which had been produced in many different models differing only in minor details, such as the method of interconnection of the water tubes. They were coupled to a common steam drum in blocks of 2, 3 or 4 ovens. It was preferable for each oven to have its own

steam drum. (2) The double-tube oven for medium-pressure, cobalt-catalyst synthesis as seen at the Ruhrchemie plant. (3) The double-tube oven designed for use at 20 atmospheres pressure for the iron-catalyst synthesis. These were of the same dimensions and catalyst capacity as number (2).

Z. identified the single, odd-type oven at Sterkrade as the "Drucklammellenofen" referred to in the S.I.C.S. correspondence. This was a Lurgi idea and was an attempt to adapt the normal-pressure tube-and-plate oven for operation up to 20 atmospheres pressure, by giving the external case greater mechanical strength through the use of curved sections. The oven had been constructed by G.H.H. and they found it expensive, required more steel for the same catalyst capacity and took a month to construct. During such a period, 4 to 6 of the double-tube ovens could be constructed. It had only been tried out with a cobalt catalyst, with (he believed) disappointing results.

The single medium-pressure oven with the annular "bulge" near the top, also seen in the oven house at Sterkrade, was apparently a Mannesmanne idea, the "bulge" being a self-contained steam-drum with the object of allowing individual ovens to be taken off stream. Z. stated that although in the early days forced circulation by pump had been used on the water system of the ovens, circulation in all ovens now depended only on thermal convection.

Herr Weiss then described the construction of the double-tube oven for medium-pressure synthesis. The inner tube was a piece of seamless, mild steel 20/24 m.m. tube on to which two T-shaped end pieces, which had been drilled-out of solid metal, were welded. The completed inner tube was then welded into the outer tube (44/48 mm.) and the assembled 'double-tube' welded into the tube plates. The arrangement is shown in the accompanying sketch.

In order to maintain the inner tube in a central position within the outer tube, solid metal distance-pieces were welded to the outer wall of the inner tube at intervals, longitudinally and circumferentially.

The adaptation of this oven, which was designed for a maximum gas pressure of 15 atmos., for operation up to 25 atmos. gas pressure for iron-catalyst

synthesis had been achieved by Weiss, merely by increasing the strength of the welded joints, thus:-

$$S = \frac{D.p.x.}{200\ k_2 y}$$

where S = thickness of tube wall
D = int. diam. of tube
p = pressure
x = factor of safety
k_2 = strength of material
y = welding factor

For p=15 atms., x = 4.5, y = 0.7
" p=25 " x = 4.0, y = 1.0

Each oven contained 2100 double-tubes.

Engineering drawings of the normal-pressure an medium-pressure ovens were obtained and sent through as Official Documents.

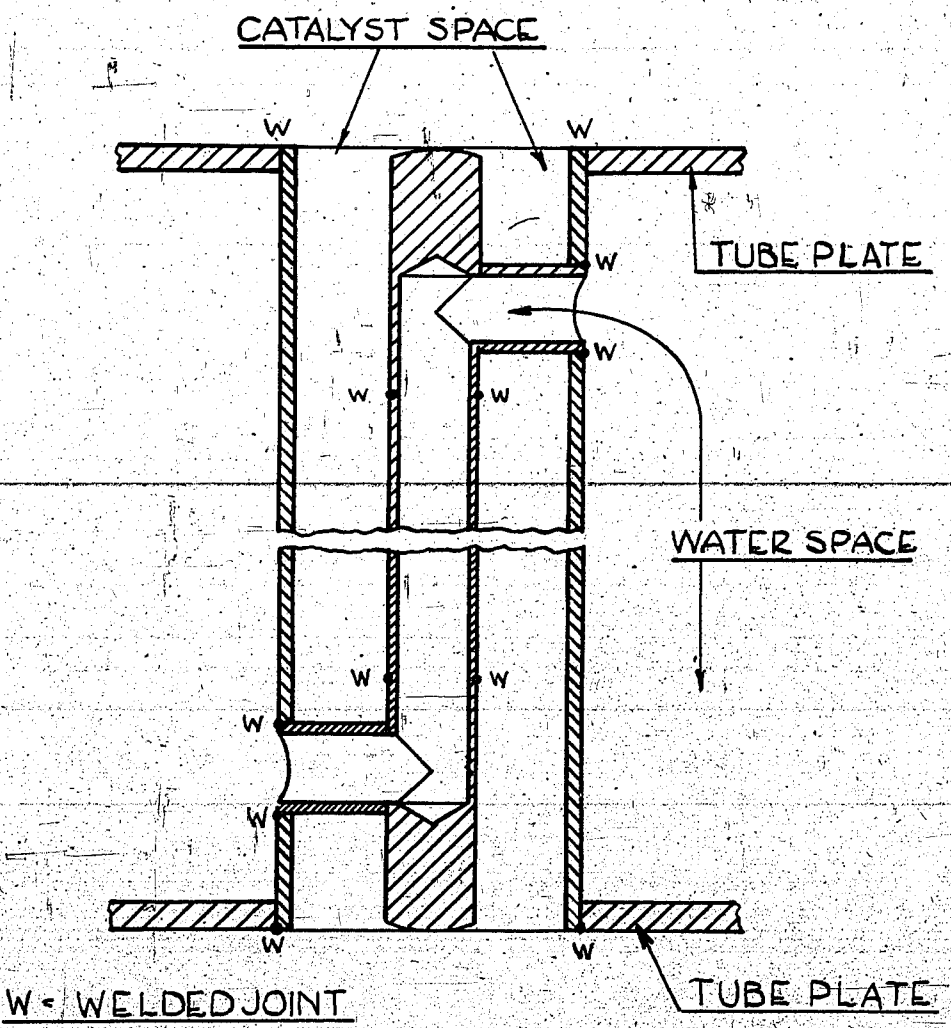
General Information on the Fischer-Tropsch Process.

Zechetmayer stated that no full-scale trial of the iron catalyst had been made in Germany, and if the S.I.C.S. plant had been completed it would have been the first of this type. This had arisen because the German Government had decreed (in 1941 or 1942) against the erection of further Fischer-Tropsch plants. All the existing plants had, in fact, been in operation before the war. All the plants follow the Ruhrchemie model but several of them have experimental units. He instanced Rheinpreussen who had an experimental plant for operating in the liquid phase.

The use of recirculation of residual gas was a Lurgi idea and was being energetically developed both for cobalt and iron catalysts. The Lurgi "diluted Catalyst" however, was merely a "patent racket" and had not been adopted.

If the Feinreinigung step is to be carried out on the compressed gas (as was the case in the S.I.C.S. project) the same contact is used in the same type of vessel strengthened to withstand the operating pressure.

The partly-constructed toluene-from-heptane plant at Sterkrade had been ordered by the Wehrmacht. It was to have produced 10,000 tonnes of toluene per annum and would have cost 40 x 10^6 RM. The catalyst was to operate at 500°C. in the tall-brick-lined towers seen at Sterkrade.



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DOUBLE-TUBE CONSTRUCTION FOR M.P. OVENS.