CONFIDENTIAL

GERMAN PETROLEUM INDUSTRY

HAMBURG DISTRICT

REPORT No.7

DEUTSCHE ERDOLWERKE A/G

HEMMINGSTEDT - Nr. HEIDE

SCHLESWIG-HOLSTEIN

Reported By

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MR. D. MORTEN - " " " " " "

on behalf of the

BRITISH MINISTRY OF FUEL & POWER

AND THE

U.S. TECHNICAL INDUSTRIAL INTELLIGENCE COMMITTEE

JUNE, 1945

C.I.O.S. Target No.30

FUELS AND LUBRICANTS

COMBINED INTELLIGENCE OBJECTIVES SUB-COMMITTEE

G-2 Division, S.H.A.E.F. (Rear) APO.413

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I N T R O D U C T I O N

Deutsche Erdölwerke A/G.

This company controls the following activies in the HEIDE area:-

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2. The "Oil Chalk" Mine

3. The Plant for Recovery of Oil from the "Oil Chalk"

4. The Refinery

5. Sand-Lime Brickwork

Though this target had been noted in the C.A.F.T. Assessment Report as of little intelligence value, it was visited on 19th May, 1945 to obtain further technical information on the retorting process used for recovering oil from a form of oil chalk which is mined in the refinery area.

Personnel Interrogated

Bergrat Günther Sievers, Managing Director of the Oil Field, Mines and Refinery.

SECTION 1. Oil Field

The Oil Field at Heide was not visited by this Team as it did not fall within the scope of its investigation, and it is understood that it has already been reported on separately by the Fields Group.

No further report is therefore included here.

SECTION 2. The "Oil Chalk" Mine

This does not properly come within the scope of this Team's investigations, but the following very brief description is included here to complete the picture of the Deutsche Erdölwerke's activities.

The "Oil Chalk" locally known as "Kreide", consists of a marl of somewhat greasy constituency containing 15/18% of oil.

The mines, of which there are two are situated in the Refinery Area. The "Oil Chalk" is mined by hand at 80 and 140 metres depth, and brought to the surface in skips, containing about two-tons each, in the usual manner.

The spent "Oil Chalk", after recovery of the oil is returned to the Mine as back filling.

SECTION 3. Oil Recovery Plant

The recovery of oil from shale and sand has been practised with some commercial success for many years in different parts of the world, but the process to be described used an oil chalk of a type which it is not thought has been processed anywhere else. This material contains about 15/18% of oil, and has the 'feel' and appearance of a stiff filled grease.

The very elaborate plant to be described should be regarded as an engineering curiosity only, rather than of important technical significance. The plant, which was built by Lurgi and only completed in January 1944, was an elaborate design of the type used for processing Esthonian shale. But, in spite of these elaborations, it was evident to the operating staff that the design basis was fundamentally wrong, and a more promising type of plant, to be described later, had been designed by them and was in process of erection.

The essential feature of the process was one or more large kilns, about 7 ft. in diameter and 150 ft. long. Car loads of the clay passed through these, and the oil was vaporised off by indirect heating. The kiln was divided into sections by large hydraulically operated gate valves, each pair of which constituted a gas lock. About 20 car loads of chalk would be in the kiln at one time, each able to hold about 4 tons of material. The cars had a tapered bottom, reducing to a flanged opening about 2 ft. by 1 ft., the chalk resting on a heavy perforated sheet iron bottom at the top of the tapered section. The cars were progressively moved through the kiln by hydraulically controlled rams, and each time came to rest over a flanged pipe matching the flange on the bottom of the car, so that hot flue gas could be circulated through the material in the car. It is obviously important that a very exact location of the car is obtained, else the heating gas would be largely by-passed. But the carefully designed slope on the flanges and the accuracy of the hydraulic rams which located the cars undoubtedly got over any difficulties in this respect.

It is best to follow the progress of an individual car through the kiln. The car was filled at the mine head and transported about 200 yards by telfer till it could be deposited at the kiln entrance. It was

then rolled on to a section of rail which was then hydraulically inclined to run the car into the first gas lock, a quick action swinging cover being swung into position behind it. The car was then moved through the gate valve into the first heating section, where it was gradually heated in five stages to remove the water present. The vapours from these five stages were taken off and condensed separately; the car then passed through another gas lock into the larger portion of the kiln, where its temperature was raised in stages from 200°C. to as high as 600°C, in about another 12 stages, these, together with the cars in the air lock, making up the 20 cars in process at any one time. The spent chalk passed out through a final gas lock where it was given a water quench, and was eventually returned to the mine to fill up the galleries.

All these operations were carried out for the two kilns installed from a centrally located control room. All operations were hydraulic, and the movement of all gates and rams was checked by electrical contact, lighting lamps on the indicator panel.

The indirect heating system was equally elaborate. Water gas, made on the site from imported coke, was burned in a furnace and passed over a series of tubular gas heat exchangers, each of which formed part of the gas circulating system for the individual cars being processed. An independent electrically driven blower drew hot gas from the heat exchanger and discharged it through the car and back again into the heat exchanger. This meant that all the distillation products in the vaporised form were being continually circulated over the high skin temperature tubes in the heat exchanger, the surplus vapours evolved being led into the hot vapour main which finally delivered them to the condensers.

As was to be expected, considerable coking troubles occurred, and a large amount of effort had to be put into cleaning all parts of the equipment. Steam was added to assist the distillation, and the operating pressure was about 3 lbs. per square inch gauge.

The rather optimistic design figures were 400-500 tons/day of oil chalk per kiln, with an oil recovery of 14%, equivalent to 60-70 tons of oil per day. The best working figures obtained during the period

January-June 1944, before the plant was finally bombed out of commission, were an input of 250 tons of oil chalk with a recovery of 10% oil, equivalent to 25 tons per day.

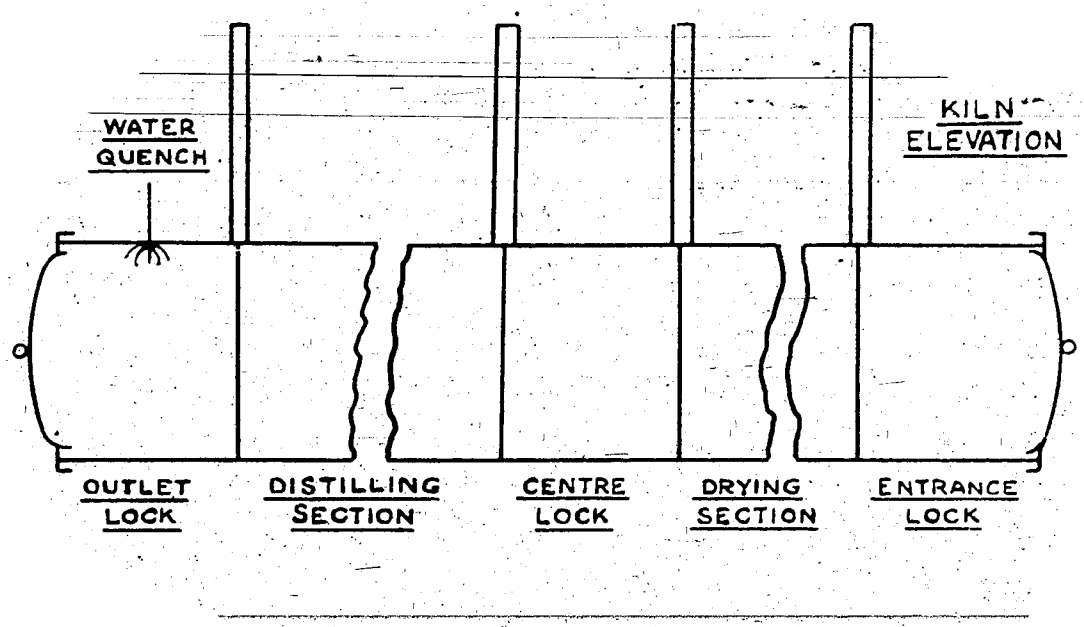
Design figures for operating time were:

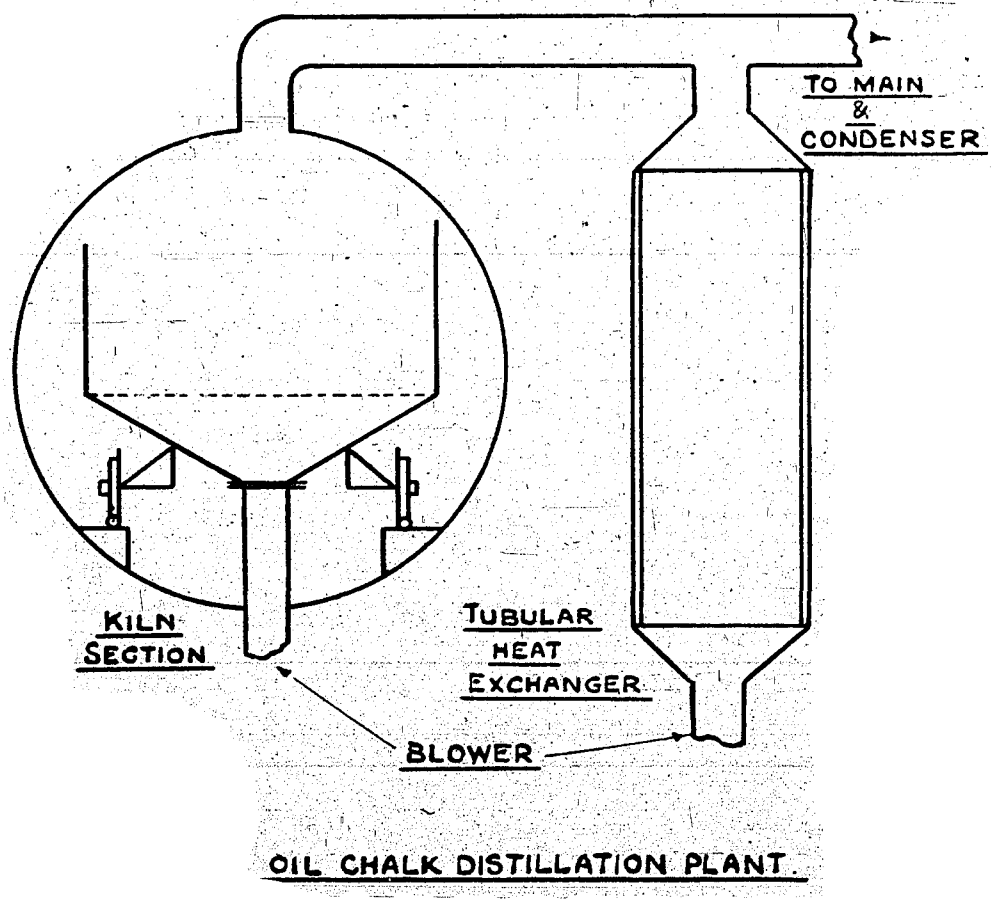
2-3 weeks on stream
Cool - 1½ days
Clean - 2-3 days
Heating to stream - 1½ days,

which may be taken as an on-stream time of 75%. Needless to say these figures were not even approximately realised in practice, but the Manager seemed to consider that they might have been, though not at the design throughput which he felt would never have been attained. It is impossible to believe that Lurgi carried out any serious pilot development on the oil chalk, as the material, from its close-grained nature, does not lend itself to this method of heating.

As mentioned above, a new type of kiln was being built to the Heide design by the Buettnerwerk of Krefeld. This had also been heavily bombed, but sufficient was still left to get some idea of what it was going to be like. This was again a twin unit, and can best be described as a very large bauxite or spent oxide roasting furnace, basically of the Herreshof design. The furnace would have been about 25 ft. in diameter by 40 ft. high. About 20 series of scraper blades were mounted on a 4 ft. diameter central hollow shaft, and these were to rotate at about 10-15 revolutions per hour, causing the oil chalk to proceed downwards through the furnace passing over a series of trays fixed to the casing. Each furnace had a large motor-driven blower, estimated to be of about 200 horse power for circulating the heating gases through the furnace, and there appear to be other high speed fans inside the central shaft to distribute the hot gases over the individual trays. This design appeared to be more suitable for dealing with the oil chalk, but it was thought that carbon deposits might have proved extremely difficult and tedious to remove.

An interesting point was that the cost of all this work was borne by the German Navy, a sum of the order of R.M. 20 million, for a possible output of little over 15,000 tons per annum, commencing in 1944.





OIL CHALK DISTILLATION PLANT.

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SECTION 4. The Refinery

The Refinery which deals with the Crude from both the Field and the Mine is the conventional type, and presents no features of interest. It comprises two pipe stills and fractionating columns, and the usual ancillary equipment. A separate fractionating column to deal with the vapours from the "Oil Chalk" plant was in process of being installed but had not been completed.

SECTION 5. Sand-lime Brickwork.

This forms no part of the Refinery, but being operated under the same management, is included here to complete the picture of the Company's activities.

So far as could be ascertained from a brief inspection the plant is of the usual type, the raw material being excavated close to the Refinery area.

Date of Visit & Party

19th May, 1945.

Mr. P. de.H. Hall (Brit.)
Mr. D. Morten (Brit.)
Mr. C.A. Harrison (Brit.)

(Sgd.) D. MORTEN.