

INTERROGATION ON 9th JANUARY, 1946

The interrogation of Dr. Bütetfisch was conducted by:-

Sir Harold Hartley  
Mr. O.F. Thompson

Dr. W.A. Macfarlane  
Mr. A.R.M. Murray

Dr. F.A. Williams

In the first place Dr. Bütetfisch was asked to give an account of his activities in connection with the oil programme in Germany. Dr. Bütetfisch related how in 1920 he had been in charge of all new technical processes at Leuna. He later became a Director of the I.G. Farbenindustrie. He was a Founder-member of the Wirtschaftsguppe Kraftstoffe, which was formed in 1926/27 by Industry although its leader was a Government nominee. In the course of the war Dr. Bütetfisch had succeeded Dr. E.R. Fischer as head of this organisation. Dr. Bütetfisch mentioned that he was also a Director of Brabag and was also interested in the Poelitz plant and other organisations.

Hydrogenation had been started at Leuna in 1927 and the output which in 1930/31 had been about 100,000 tons per annum had soon been pushed up to 300,000 without any increase in plant. The final maximum obtained at Leuna was 600,000 tons per annum. In 1935/36 the Vierjahresplan was prepared and the Brabag Organisation set up with capital which was not provided by the Government. Other plants were subsequently erected in which, however, there was Government assistance, for example, the Heydebreck and Auschwitz plants were I.G. Farben enterprises financed with Government money. Both these plants were projected after the commencement of the war. The I.G. Farben did not have an interest in the Blechammer plant which was set up by a syndicate of Silesian coal owners with, however, Government money. The reason for I.G. non-participation was that the I.G. felt that they had gone as far as they wished to go in investments in synthetic oil plants. Bütetfisch claimed that he had no knowledge of the projected synthetic oil plants at Gladbeck and Frankenthal and therefore he did not think they could be I.G. Farben projects.

The I.G. had several interests in the possibilities of developing fuels and chemicals from petroleum. It had a plant at Moosbierbaum.

In addition to hydro-forming there was at Moosbierbaum a D.H.D. plant. The subsequent addition of crude oil distillation plant was an emergency measure to provide additional refining capacity undertaken at the direction of the Reichamt under Dr. Krauch.

Dr. Bütetisch said that he personally thought the war was not going to be won by Germany after Stalingrad, but it was not possible for the realisation of this by I.G. to make any change in their policy.

#### Effect of Air Attacks.

Dr. Bütetisch was unable to say when the shortage of oil was really felt because the position regarding stocks in Germany was always kept a close secret. He was, however, aware of the severe decline in production as soon as the May 1944 bombing of the synthetic oil works started. Up till then there had been no anxiety felt about oil supplies.

According to Bütetisch the damage to communications did not seriously interfere with oil production except in the case of the Ruhr plants where rail dislocation hampered production at Scholven and Gelsenberg. In general, the effect of the bombing of communications had only a secondary effect on oil production. The actual bombing of the plants was far more important. Bütetisch stated that he was astonished at the rapidity with which bomb damage to railway tracks was repaired. At one time a shortage of rail tank wagons became imminent but this was unexpectedly relieved by the shortening of communications due to the retreat in Russia, and from then on there was an abundant supply of tank wagons.

The damage to communications did not, in general, prove a serious factor in the repair of plants. He felt that any delays in the completion of repairs were due more to lack of materials caused by the muddled priorities of the Geilenberg programme than to difficulties in transporting materials.

#### Aviation Fuels.

At the start of the war aviation fuel consisted of normal gasoline plus iso-Octane prepared from isobutanol. Some 6/7,000 tons per annum of iso-Octane was manufactured. Benzole was also used to bring up the octane rating of the fuel together with up to 0.7 c.c. per litre of Lead Tetra-Ethyl. Aromatised spirit of O.N.78 prepared from spirit of O.N.68 by hydrogenation treatment using Tungsten Disulphide was also employed to be followed later by D.H.D. spirit.

Prior to the war it was intended to use butane for the manufacture of synthetic rubber. The planning of the use of butane for alkylate

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production was left too late in the war since the plants were not finished. Only the plants at Leuna and Poelitz were completed. The curve for the production of iso-Octane rose very slowly and the maximum reached was only 50,000 to 60,000 tons per annum. Plans were laid for a maximum production of 150,000 tons per annum. In 1944 there was talk of alkylate not being required since spirit of O.N. 74/75 plus 0.12 c.c's per litre of lead with the addition of aniline or mono methyl aniline gave a satisfactory fuel with no attendant corrosion problems.

Dr. Bütetfisch was concerned only with the subject of base petrol and D.H.D. petrol. Special blends were prepared by the Forces for particular uses, e.g. motor transport, bombers, fighters, and the blends employed were secret.

The D.H.D. process was really equivalent to the hydro-forming process except that it was worked at some 50 atmospheres pressure instead of 25 atmospheres pressure. It gave a spirit of C.N. 78/82 but with a loss of some 15/20%. Attempts have been made to pass Fischer Tropsch spirit through the D.H.D. process but have met with difficulties.

#### Lubricating Oils.

Dr. Bütetfisch said that there was no shortage of lubricating oils. The bulk of the lubricants came from the German and Austrian petroleum which contained a large proportion. There was, however, insufficient de-waxing equipment available because of the large proportion of wax in the crudes.

Special lubricants for aero-engines were made from the polymerisation of ethylene, the source of the ethylene was usually by-product ethane obtained through hydrogenation. These synthetic lube oils possessed very good qualities and were used in blends with natural oils. Ester lubricating oils were also made synthetically from the ester of adipic acid and isobutanol. Synthetic lubricants amounted to only 10% of the total lubricants.

#### Fischer Tropsch Process.

Dr. Bütetfisch said that the I.G. were very interested in syntheses starting from carbon monoxide and hydrogen mixtures in order to make alcohols, pure hydrocarbons, etc., but not as a means of making fuel. All Fischer Tropsch plants had worked to their maximum capacity but not by any means did the whole of the product go to fuel uses. Much use had been made of fractions by the Chemical Industry, for example, the use for soap had amounted to 70,000 tons per annum. He mentioned that at Schaffgotsche trouble had been experienced with medium pressure operation. At Schwarzheide there had been troubles with the gasification of brown coal as well as difficulties with the synthesis. The Lutzkendorf plant had always been in difficulties with gasification and  
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gas purification and had actually produced little oil during the whole war.

The cost of the Fischer Tropsch process was stated to be some 20% higher than that of the hydrogenation of coal for the production of spirit. It was possible by the Fischer Tropsch process to produce a highly unsaturated product but the unsaturated hydrocarbon had the double bond in the centre of the carbon chains whereas it was preferable to have it near the end of the chain. He regarded the C8 to C20 hydrocarbons as the most important range for the production of chemicals for use in textiles, solvents, washing materials, lacquers.

#### Cracking.

At Poelitz paraffin wax from the Fischer Tropsch process and from T.T.H. and M.T.H. processes at Zeitz were cracked and used for the manufacture of lubricating oils. It had been intended to erect a Catalytic Cracking Plant at Niedersachswerfen since the process gives a good aviation spirit from petroleum.

#### QUESTIONNAIRE TO DR. BÜTEFISCH

Arising out of the earlier of the above interrogations Dr. Bütefisch was asked to supply written information on a number of points. These points were subsequently incorporated in a questionnaire. In the ensuing section the questionnaire and Dr. Bütefisch's reply are given in full.

Ministry of Fuel & Power,  
7, Millbank,  
L O N D O N, S.W.1.

#### QUESTIONNAIRE

4th January, 1946.

Dr. Bütefisch,

At the meeting last Wednesday, it was arranged that you would provide this Ministry with information on the following points:-

- (1) The relevant costs of production from black coal per ton of motor fuel by the Fischer Tropsch and hydrogenation processes.
- (2) The relevant quantities of coal required to produce a ton of motor fuel by the two processes.
- (3) An account of the manufacture, properties and use of the Ester synthetic lubricating oils.

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(4) Oil production figures for Germany during the war period.

It is now desired that you should elaborate upon the above points, so as to include the following additional information. Any explanation required to make the figures precise and to avoid misinterpretation should be included.

(A)(i) Under (1) above the cost figures quoted should be those actually achieved under good running conditions. A similar set of figures of estimated cost in the case of a new specially designed plant should also be included if they differ from the realised figures.

(ii) Fischer Tropsch Process.

The figures for the costs should be given for both one metric ton of primary product and for one ton of motor fuel, using as raw materials brown coal or coke from black coal. The proportion represented by operating costs should be shown and details given of the capital and other costs.

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(iii) Hydrogenation.

Figures should be given per metric ton of motor fuel which apply to the use of each of the following raw materials:-

Black coal, black coal tar, pitch, producer tar, brown coal and brown coal tar.

The prices taken for each of these raw materials should be shown and operating costs and capital costs etc. should be differentiated.

(B)(i) Item (2) above should be extended in the following manner:-

(ii) Fischer Tropsch Process.

The quantity of coal required to give one metric ton of primary product and one ton of motor fuel from both brown and black coal should be given. Details should be shown separately of the amounts of coal required to produce the necessary synthesis gas, and of the energy and power requirements.

(iii) Hydrogenation.

The figures should show separately the coal requirements for actual conversion to oil, and in addition the coal requirements for the necessary hydrogen and lastly the coal equivalent of the energy and power requirements. Figures should be given for the hydrogenation of both black and brown coal. Finally figures should be quoted for the amounts of brown coal tar, black coal tar, pitch, producer tar and petroleum residues required to give one ton of motor fuel and likewise the coal (expressed in terms of black and brown coal) required

to produce the necessary hydrogen should be shown, and in addition the coal required for energy and power.

(C)(i) Item (4) above should show the overall production from the various sources for each of the war years 1939 - 1945 for the following products:-

Motor spirit, aviation base inclusive of D.H.D., diesel oil, fuel oil, lubricating oil, treib gas, alkylate and octane, kerosene, miscellaneous.

(ii) The year by year production of each of these products from the various processes, Fischer Tropsch, hydrogenation, brown coal tar distillation, bituminous coal tar distillation, petroleum, benzol etc., should be given. Finally the production of each plant of these various products should be given.

(iii) Details should also be given of the extent to which it was proposed to extend the capacity for the above products at each of the above plants, and of the dispersed plants proposed under the Geilenberg plan.

Information is also required on the following points:-

(D) In the hydrogenation process was there any preference for any particular raw material in order to produce a specific product, or was the choice merely one of the most appropriate operating conditions.

(E) The I.G. carried out experimental work on four hydrocarbon synthesis processes using iron catalysts.

- (i) Which of these is regarded as the most promising?
- (ii) Was any one of the processes developed sufficiently for full scale production?
- (iii) Was there any intention to carry out full scale development?
- (iv) What were the estimated costs for the fixed bed high recycle process?
- (v) Did the processes of (iv) give a spirit of octane number as high as 80, and if so was this due to isohydrocarbons?
- (vi) Who in the I.G. organisation is the best authority on the Fischer Tropsch work carried out by the I.G.

/Reply