

REPLY BY DR. BUTEFISCH

Introduction

The questions set out in the document of the 4th January by the Ministry of Fuel and Power are concerned mainly with a comparison of the Fischer process with the hydrogenation process, and involve the consideration of a range of various manufacturing possibilities. The exact evaluation of these figures in a form capable of withstanding any criticism would require information on each single operation in the processes, with all the specific consumption figures and detailed cost calculations. These figures are not at my disposal here, and I have no notes or documents on the matter. The copious documentary material was, when last heard of, at Leuna.

For comparing processes and for the technical and scientific consideration of both projected and existing plants, I developed and built up at Leuna in 1926 the Abteilung für Wirtschaftlichkeitsprüfung (Department for the Examination of Economics), which thereafter worked on many I.G. projects.

This establishment had as its object the examination of scientifically investigated reactions and processes which had been worked out on a semi-technical scale, with a view to determining their economic practicability before they were employed on an industrial scale. Such examination can only be undertaken by personnel who, as a result of the best scientific training and several years practical experience in various processes, have powers of observation and critical examination, and further, know how the products prepared in the processes should be examined and judged from the commercial standpoint (market analysis).

This Department had therefore to undertake the following main task:

- (1) Testing the scientific and technical bases of the processes.
- (2) Preliminary calculation of the cost of production of the products, in accordance with the generally valid rules of experience.
- (3) Market analysis of the products.
- (4) Comparative calculation of the existing manufacturing processes with the same or similar end products.

(1) The theoretical bases of the process under consideration were worked out (thermodynamic conditions, theoretical yield, heat consumption etc.) The technical details were then discussed (e.g.

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questions of plant, corrosion, temperature, pressure, other conditions etc.)

(2) After the questions under (1) were thoroughly clarified and after the quantities of raw materials consumed were determined, a preliminary calculation of the production cost of the product is made. The following data are determined according to the generally valid rules of experience, bearing in mind any special conditions, such as may arise, for example, from the situation of the plant:-

- (i) The price of the raw materials to be used including transport costs.
- (ii) Power costs for steam and electricity according to the various prices for coals and the various possibilities for current generation. (High or extremely high pressure steam, condensation or counter-pressure, price of water, facilities for the utilization of gas and the general price configuration).
- (iii) Costs of necessary chemicals.
- (iv) Wages (wages/man/hour) for working the process.
- (v) Wages for repair work. These are calculated according to special rules from other comparable chemical industries (e.g. fitter-hours for low-pressure or high-pressure plant - water-gas production or salt works - inclusive of materials consumed - etc.)
- (vi) Necessary bonuses on wages.
- (vii) Conditions of employment of skilled and unskilled workers (from experience with related processes).
- (viii) Determination of the capital charges - the overall value of the plant according to the data from the constructional engineer's office (necessary for making comparison) - calculation of the necessary amortisation (life of the plant) and calculation of the necessary interest payments - taxation questions.

(3) The market analysis is carried out in collaboration with the commercial departments (purchase and sales). It includes an examination of the prices of like or related products already on the market, import and export questions, customs duties and special payments, questions of demand and comparisons of quality, and of the development of markets.

4. If like or similar manufacturing possibilities exist, a
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comparison of the cost of production of these products is drawn up considering the various cost factors separately. At the same time, other processes in course of development are compared with the process under investigation in so far as the same or similar end-products are in question.

The calculations as a whole give a general picture of the possibilities of utilising a process, and, on more prolonged observation, a constant comparison with other like or similar processes already in existence. They allow analyses of the individual stages of a process to be made, and the fixed and variable costs to be separated. In this way, the examination of the economic practicability gives constant stimulation and direction in seeking possibilities for the improvement and development of the process. For drawing up the cost calculations for a process the data mentioned above are necessary, together with the material on which they are based, and this applies particularly for the comparison of processes.