An Overview of Fischer-Tropsch Synthesis at the U.S. Bureau of Mines

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In 1925, almost 70% of the world's petroleum was produced by the U.S. However, during the 1940s there was a fear that the US was running out of petroleum and a program to develop a coal-based supply of transportation fuels was undertaken late in 1943. This work involved both direct and indirect processes and was under the direction of H. H. Storch. Bureau personnel were involved in reviewing and translating documents retrieved from Germany following WW II as well as being members of several of the teams that surveyed the German plants and interviewed personnel who worked in the plants. Storch, together with Golumbic and Anderson, published a book that provided comprehensive coverage of work on Fischer-Tropsch and related synthesis; this book was the "standard reference" for many years and is a valuable reference source today. During the late 1940s period, the Bureau was provided funding to construct two pilot plants, one devoted to direct liquefaction and one to indirect liquefaction using the Fischer-Tropsch synthesis. Each plant was allocated five million dollars for construction of the plants at Louisiana, Missouri; in current dollars this would be 50 to 100 million. The indirect liquefaction featured gasification as well as synthesis and product upgrading, although the first two processes were emphasized. Bureau workers concluded that by 1944 most of the basic ideas for the design of FT reactors had been formulated and tested on a pilot-plant scale. Processes were classified on the basis of internal or external cooling. Much of the Bureau work concentrated on synthesis with the catalyst in liquid phase, and most of the emphasis was on the oil recirculation process. Here a combination of gas and oil circulation from bottom to top of the reactor maintained a catalyst suspension. Iron, cobalt and nickel catalysts were utilized in these studies. In addition to pilot-plant work, much effort was expended to understand the composition of the working catalyst, the chemistry involved in catalyst activation and deactivation, and the reaction mechanism. Storch is identified as the driving force behind the "oxygenate mechanism" that became popular during the 1950s. A summary of this work will be provided.