The Oil Industry in Nazi Germany, 1936–1945

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¶ *The oil industry in Nazi Germany provides an excellent focus for studying the interplay between economics, politics, and government policy in the Third Reich. In this article, Mr. Stokes brings to this subject a comparative approach, making comparisons both within the oil industry and with the industry's major industrial counterparts. He concludes that a variety of factors—including the degree of shared interest between individual firms and the government, the size and concentration of a firm's production facilities, and the political position of key firm personnel—explain the success as well as the eventual collapse of a given industrial sector.*

With the oil crises of 1973–74 and 1979, Americans have become very much aware of the importance of a national energy policy. Among the many issues discussed in this context are energy self-sufficiency, the role of energy in national security, synthetic fuels development, and the extent to which government and industry should cooperate in energy matters. All these issues were discussed and acted upon during the National Socialist period in Germany. Thus it may be instructive to examine that regime's disposition of these issues.[1]

In terms of energy consumption patterns, the world of 1936–45 was a very different place from today's. European nations as a whole depended on coal for over three-fourths of their energy needs in 1938, for instance, while oil is by far the preferred fuel today. The German economy relied on coal for 90 percent of its energy in 1938, using oil for only 3 percent of its needs.[2] Nonetheless, it is clear that petroleum products played a special and irreplaceable role in the German economy. No other fuel source was suitable for motorized vehicles, whose

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[1] Aside from the obvious political differences between the Nazi regime and that in the United States, there have been great changes in economic structure since 1945. The two cases differ in capital structure and in the amount of labor available; moreover, the German economy of 1945 depended largely on coal rather than oil. One set of figures puts this difference into clear perspective. Total world production of petroleum in 1945 was just over seven million barrels a day. In contrast, the United States alone, imported close to eight million barrels of oil a day until the oil shock of 1979, a figure that closely approximated daily gasoline consumption in the United States.

[2] Figures are drawn from Ferdinand Friedensburg, *Die Rohstoffe und Energiequellen im neuen Europa* (Oldenburg/Berlin, 1943), 299. German figures exclude Austria. Synthetic fuel production figures are not included; they would increase oil's share to about 5 percent of total energy consumption.

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economic importance was increasing throughout Europe. The significance of petroleum products was further enhanced by the fact that such vehicles, as well as air power, played a crucial role in preparations for and the conduct of the war that began in 1939. Production of liquid fuels was thus a vital component of Germany's economic and national security policies from at least the early 1930s.

In the short run, the National Socialist petroleum policy achieved a marked success. In 1936, the fourth year of Nazi rule, Germany imported nearly 70 percent of its liquid fuel requirements of approximately five million tons. By the first four months of 1944, the country was producing domestically 72.3 percent of its total annual liquid fuel requirements—close to eight million metric tons on an annual basis. Of this indigenous production, over 60 percent was produced synthetically from Germany's abundant coal resources.[3] The dramatic changeover was achieved largely through collaboration between government and industry. Both in the relatively small, but still significant, German crude oil industry and in the larger German synthetic oil industry, government aided business through subsidies for exploration and construction, through high tariffs on imported crude or finished oil products, and, particularly in the synthetic industry, through help in the rapid application of relatively new technology. In addition, government and the industry as a whole cooperated through Kontinentale Oel, AG, in the exploitation of the oil reserves of countries occupied by Germany. The nature of the cooperation and the benefits it provided differed between the crude and synthetic sectors of the oil industry, and within the synthetic sector.

Because the development of the German oil industry was closely related to Nazi notions of territorial expansionism, its history highlights the interplay between government policy goals, politics, and economics in the Hitler period. Moreover, the petroleum industry provides an excellent case study of the factors necessary for business success in Nazi Germany. Some of those same factors also contributed to the collapse of the industry in 1944 and 1945.

A major concern of this article is to identify the reasons for the oil industry's comparative success in expanding relative to other parts of German industry, and to explain the expansion of the synthetic sector relative to the crude oil sector, and of one synthetic process—Bergius

[3] U.S. Strategic Bombing Survey (USSBS) (European War), USSBS Report 109, *Oil Division Final Report* (2d ed., Jan. 1947), fig. 1 (hereafter cited as *Oil Division Final Report*). Percentages are calculated on the basis of statistics from this figure. All USSBS figures are reported in metric tons, rather than in barrels, the more common measure today. Multiplying the USSBS figures by 7.3 will give an approximation of the number of barrels. See Ulf Lantzke, "Expanding Use of Coal," *Foreign Affairs* 58 (winter 1979–80), 354n. Duane Skidmore of the Ohio State University's department of chemical engineering helped me understand the conversion factor and advised me on other technical questions.

hydrogenation—relative to the other major synthetic oil process, Fischer-Tropsch. Other aspects of the industry will receive relatively little attention—storage and distribution of petroleum, German production of synthetic fuel by other, less important processes, German oil firms and oil policy outside of Germany, and the use of imported petroleum.[4]

AUTARKY AND THE OIL INDUSTRY

Close cooperation between industry and government during the early years of the Nazi period was based on two interrelated policies. The first was the policy of rearmament, the second a commitment to the development of a domestic base in certain key raw materials, most notably iron ore, rubber, and petroleum. The latter policy is often referred to as autarky. Agreement with government policies led some industrialists to support the Nazi's initial seizure of power and a much larger cross-section of the business community to support the regime in its early years. But by 1936 differences in the assumptions underlying those policies had led to a rift, not only between the National Socialist government and large segments of industry, but also within industry.

Some segments of the German business community in the late 1920s and early 1930s sympathized with rearmament in principle as a means to establish German political equality with the other great powers. The policy became attractive to a much larger segment of German business with the onset of the world economic crisis in 1929, which provided an additional and more pressing reason for supporting rearmament.[5] State spending on arms, and on nonarmaments items for the military, would stimulate the stagnated economy, especially in the heavy industrial sector (coal, iron, and steel). This predominantly economic moti-

[4] There is no recent study of the storage and distribution of petroleum in Germany, although the *Oil Division Final Report* includes a good overview. Arnold Krammer, "Fueling the Third Reich," *Technology and Culture* 19 (July 1978), although almost exclusively concerned with the major synthetic oil producers in Nazi Germany, includes material on other synthetic or substitute fuels (such as alcohol, *Benzöl*, and *Treibgas*); see 414. Krammer also deals briefly with imports of oil from Eastern Europe (408–9). As for the foreign activities of the German oil industry, Helmut Mejcher has begun a projected multivolume study on politics and oil in the Middle East before World War II with the very good *Die Politik und das Öl im Nahen Osten*, vol. 1, *Der Kampf der Mächte und Konzerne vor dem Zweiten Weltkrieg* (Stuttgart, 1980).

[5] Ernst Nolte, "Big Business and German Politics: A Comment," *American Historical Review* 75 (Oct. 1969): 75; Alan Milward, *War, Economy and Society 1939–1945* (Berkeley, Calif., and Los Angeles, 1977), 10–14. The precise nature of the relationship between German business and Nazis both before and after the seizure of power is a subject of considerable historiographical controversy. An excellent summary of the debate and the literature relevant to it is in Reinhard Neebe, *Großindustrie, Staat und NSDAP 1930–1933: Paul Silverberg und der Reichsverband der deutschen Industrie in der Krise der Weimarer Republik* (Göttingen, 1981), 9–18, esp. 15–18. For Neebe's own well-reasoned and well-documented analysis of these relations to 1933, see 117–26, 200–203.

vation provided a reason for big business to support the policy of autarky as well, especially immediately after the Nazi seizure of power. Hjalmar Schacht, a banker who represented the interests of big business in the Nazi government as minister of economics from 1934 to 1938, believed that the synthetic oil and rubber industries should be supported and encouraged by the state. However, he thought that synthetics should be developed only on a small scale and as a stopgap measure to save desperately needed foreign exchange until the world trade system began to function satisfactorily once again. It was to this end that Schacht forced brown-coal producers to form Braunkohle-Benzin, AG (BRABAG) in 1934 to produce synthetic oil from brown coal.[6]

In contrast, the Nazis supported rearmament and autarky not on economic but on political and military grounds. One of their major policy goals was territorial expansion to the east, which would necessarily involve either war or the recognized potential to wage it—thus the dedication to rearmament. In addition, believing that the German defeat in 1918 had been due in large part to the country's dependence on imported raw materials, the Nazis logically favored the development of as much self-sufficiency as possible. In this, they were heavily supported by the army.[7]

Despite their differing assumptions, the government and industry were able, albeit with some difficulty, to cooperate until mid-1936. A severe trade crisis then ensued. Rearmament had necessitated the large-scale importation of raw materials without producing corresponding exports, a situation that resulted in a RM 500 million balance-of-trade deficit by the end of 1936. In addition, the high level of employment (achieved through rearmament and other government programs) produced a high level of purchasing power, which resulted in an increased demand for imported foodstuffs.[8] Minister of Economics Schacht, supported by certain elements of heavy industry (most

[6] Dieter Petzina, *Autarkiepolitik im dritten Reich: Der national-sozialistische Vierjahresplan* (Stuttgart, 1968), 36, 43; William Carr, *Arms, Autarky and Aggression* (New York, 1972), 52; T. W. Mason, "The Primacy of Politics—Politics and Economics in National Socialist Germany," in *The Nature of Fascism*, ed. S. J. Woolf (New York, 1968), 179. For a more nuanced view of the chemical industry in particular, see Helmuth Tammen, *Die I. G. Farbenindustrie A.G. (1925–1933). Ein Chemiekonzern in der Weimarer Republik* (Berlin, 1978), esp. 143–44.

[7] For Nazi goals and reasoning, see the summary of Hitler's memorandum of mid-August 1936 in Petzina, *Autarkiepolitik*, 48–52; Norman Rich, *Hitler's War Aims: Ideology, the State and the Course of Expansion* 1 (New York, 1973): 3–10; and Ludolf Herbst, *Der totale Krieg und die Neuordnung der Wirtschaft* (Stuttgart, 1982), 36-42, 142-44. For the role of the Nazi reading of the causes of the German defeat in 1918 in their development of policy, see Milward, *War, Economy and Society*, 26–28. For support of the army, see Petzina, op. cit., 36–38, and Carr, *Arms*, 52–53. More recent research indicates that the Nazis and others were mistaken in attributing to raw materials shortages a key role in the German defeat in 1918. Gerd Hardach gives much more emphasis to the factors of transportation outages, coal shortage, and insufficient labor. See Hardach, *The First World War* (Berkeley, 1977), 30–34.

[8] Mason, "Primacy of Politics," 178; Petzina, *Autarkiepolitik*, 45–46.

notably the large iron and steel interests), therefore supported a cutback in arms and autarky expenditures to cool down the overheated economy.[9]

Cutbacks in rearmament and in autarky expenditures were, however, not possible for the Nazis, given their political goals. Hermann Göring, supported by the army, thus proposed in mid-1936 to increase arms expenditures and to hasten the development of German synthetic industries, saying that "all measures would be considered from the standpoint of securing the conduct of war."[10] The outcome of the struggle between Schacht and Göring was to be expected, given Hitler's own beliefs and his role as supreme arbiter in the German government. On the basis of a Führer directive of 4 April 1936, Göring formed the Raw Materials and Foreign Exchange Staff, the first step towards the four-year plan that was formulated in September. The result was that Göring shortly thereafter became the central figure in German economic policy, superseding Schacht.[11]

The new development had twofold significance. It constituted a formal recognition of the rift that had developed between big business and government regarding autarky and rearmament. With the organization of the four-year plan, Nazi political aims took precedence over the predominantly economic aims of German business.[12] Moreover, German industry was now divided into two camps: those industries that stood to gain substantially from the renewed commitment to rearmament and autarky—specifically building, chemicals, and engineering—and those that did not—coal and agriculture, for instance.[13] Within the German petroleum industry, both the crude and the synthetic sectors stood to gain from the newly reaffirmed policies.

Petroleum planning and investment in fact were the focal point of both the Raw Materials and Foreign Exchange Staff and the later four-year plan. The plans of the earlier organization called for stockpiling fourteen different raw materials, for which RM 600 million in foreign exchange per year was to be appropriated. Of this total, RM 250 million, the largest single expenditure category, was to be used to build up petroleum stocks. In addition, of about RM 3 billion per year to be used to develop a domestic raw materials base, no less than RM 2 billion was to be used for petroleum development. The figures were

[9] Mason, "Primacy of Politics," 179.

[10] Quoted in Petzina, *Autarkiepolitik*, 43.

[11] Ibid., 40; Rich, *Hitler's War Aims*, 68–69.

[12] Arthur Schweitzer, *Big Business in the Third Reich* (Bloomington, Ind., 1964), 537–47; Carr, *Arms*, 62.

[13] Mason, "Primacy of Politics," 180. Wages remained low in the German coal industry even though coal production was essential to German war production because the coal industry had little political power and did not deliver directly to the armed forces.

later altered in the four-year plan, but give some indication of the extent of the government commitment to the development of the German petroleum industry.[14] In addition, the four-year plan aided research in the industry. On the orders of Göring's Four-Year Plan Office, the Reich Institute for Petroleum Research, attached to the Technische Hochschule at Hannover, was created. Over one hundred employees researched technical improvements for the industry.[15]

Both the crude and the synthetic sectors of the German oil industry gained from these and similar favorable developments during the Nazi period much more than did other German industries. The two sectors, however, did not gain to the same degree or in the same way. To understand the differences between the two sectors, and the reasons for those differences, it will be necessary to consider each sector separately and in some detail.

THE GERMAN CRUDE OIL INDUSTRY

German crude oil refineries, mostly located in northwest Germany, were supplied during the 1930s with both imported and domestic crude oil. In general, over the course of the Nazi period there was some change in the refineries' source of supply. They moved from using imported crude almost exclusively to using much larger amounts of crude produced indigenously. The source of imported crude and other petroleum products also shifted—from overseas to eastern Europe–and imports continued to play a large role in refinery supply until nearly the end of the war. The expansion of the domestic crude industry was accompanied by ever-stricter state control. During the same period, the capacity of the refineries themselves remained about the same as in 1930—that is, about five million metric tons per year.[16]

The German crude oil industry was dominated throughout the 1930s and 1940s by six major companies, which together controlled 96 percent of all production in Germany. These companies were Deutsche Erdöl, Elwerath, Wintershall, Preussag, Deutsche Vacuum, and Brigitta (Shell). Unlike other industries in Germany, the crude industry

[14] Petzina, *Autarkiepolitik*, 45.

[15] Combined Intelligence Objectives Subcommittee (CIOS) Final Report 10 xxxii-94, "German Petroleum Industry, Hamburg District," 12–27 May 1945; E. H. Bower, report 13, "Reichsinstitut für Erdölforschung der Technische Hochschule Hannover," 1, in box 11/27-1, Office of Military Government for Germany (U.S.), Headquarters, Legal Division, Decartelization Branch, RG 260, Washington National Records Center, Suitlands, Md. (hereafter WNRC).

[16] U.S. Strategic Bombing Survey (European War), USSBS Report 113, *The German Oil Industry, Ministerial Report Team 78*, sec. 1.05, 14–15, and sec. 1.08, 30, in Records of the U.S. Strategic Bombing Survey (European War), RG 243, National Archives, Washington, D.C. (hereafter NA). (This report is cited hereafter as *German Oil Industry*.) See Krammer, "Fueling," 408–9, for imports from eastern Europe and German exploitation of oil from that area.

never formed cartels. It was not until the Nazi period that industry-wide organizations were formed, and these were formed only for government to monitor industry.[17] In fact, though the state monopolized marketing, corporate leaders remained in charge of most aspects of the industry, including the management of technology, throughout the Nazi period.

The world economic crisis of 1929 spurred the expansion of the German crude industry. To conserve foreign exchange, the government encouraged the expansion of domestic crude production in part by subsidizing exploration. Increased tariffs on imported petroleum products similarly encouraged expansion. The duty on imported gasoline, for instance, rose from 8.6 cents per U.S. gallon to 14.3 cents per gallon in April 1930. A year later, the government raised the duty per gallon still further to 24.4 cents. As a further measure to slow the drain of foreign exchange, the government encouraged the importation of less expensive, unfinished petroleum products, and thus stimulated domestic refining.[18]

These government efforts increased domestic crude production slightly, from 174,000 metric tons in 1930 to 230,000 tons in 1932. The most dramatic expansion in domestic production occurred during the National Socialist period, as the Nazi government expanded on policies begun earlier. Exploratory drilling, for instance, more than tripled from 1933 to 1937, although no major new fields were found in Germany. In addition, the Nazi government increased the duty on imported oil by about 20 percent. The tax on imported gasoline rose to more than 30 cents a gallon in December 1936.[19]

The National Socialists also continued, at least initially, to encourage imports of unfinished petroleum. Hitler supported the plan of Gottfried Feder and other prominent Nazis to build refineries to process imported crude oil in order to save foreign exchange and to give jobs to the heavy engineering industry.[20] The Nazis also encouraged the expansion of the industry through the National Geological Survey, under the auspices of the four-year plan.[21] Finally, after the Anschluss in 1938 the Nazi government turned over control of Austrian oil companies involved in the Austrian crude industry to their German counterparts: "Most of the important importing firms [in Austria] were taken

[17] British Intelligence Objectives Subcommittee, BIOS Final Report 1017, Oil Fields Investigation, pt. 4, sec. 2, *The War Structure of the German Crude Oil Industry 1934–1945, Private Industry* (London, n.d.), by A. E. Gunther, 2–3a (hereafter cited as BIOS 1017, *War Structure*).

[18] USSBS 113, *German Oil Industry*, sec. 1.07, 19.

[19] Ibid., sec. 1.07, 20; USSBS 109, *Oil Division Final Report*, 14.

[20] Thomas Parke Hughes, "Technological Momentum in History: Hydrogenation in Germany 1898–1933," *Past and Present* 44 (Aug. 1969), 127.

[21] BIOS 1017, *War Structure*, 3c.

over by German firms, while the large concerns like Shell Floridsdorfer and Austrian Vacuum Oil Company were amalgamated with their corresponding undertakings in Germany [Brigitta and Deutsche Vacuum respectively]."[22] This development was particularly significant because crude production in old Germany peaked in 1940 and began to decline thereafter—but sharp increases in Austrian crude production allowed total "Greater German" production to continue to rise.[23]

The results of the Nazi policies and industry efforts were quite striking. By 1940, annual crude oil production in the old Reich had reached one million metric tons, up from only 230,000 metric tons in 1932. In 1944, close to two million tons of crude oil were produced annually in Greater Germany (i.e., including Austria).[24] This figure represented fully one-fourth of total German use of oil products that year. Although Germany's waxy crude could not be used for airplane fuel, it was particularly suitable for lubricating oils, for which synthetic petroleum was in general unsuited. Thus German crude oil played a crucial, if unspectacular, role in the nation's war economy. Indeed, the German supply of lubricating oils was entirely adequate until the Allied bombing of oil refineries began in late 1944.[25]

Despite these impressive results, and despite the importance of German crude oil production in the war effort, Nazi attitudes toward the industry were ambivalent. The regime's support for the industry's growth was half-hearted. Despite government assistance, crude oil marketing was nationalized in 1934 and government, not industry, controlled its development. Furthermore, Feder's refinery-building program, which would have expanded the industry considerably, was abandoned late in 1933 in favor of a commitment to a synthetic fuels program. While the increase in tariffs on imported petroleum products in late 1936 undoubtedly encouraged domestic crude production, it was enacted primarily to make synthetic production profitable. It is no coincidence that this increase occurred at the same time the four-year plan called for expanded synthetic oil production.

Nazi planners were pessimistic about the industry's growth possibilities. As late as 1937, the final approved version of Göring's four-year plan projected that liquid fuel and lubricants from indigenous crude production would remain static from 1936 to 1940 at less than 500,000 metric tons a year. In contrast, annual synthetic production of liquid

[22] "Oil Investments and Holdings of Oil Companies," 1, in OMGUS Headquarters, Economics Division, Decartelization Branch, Box 17/235-3, RG 260, WNRC.

[23] USSBS 113, *German Oil Industry*, sec. 2.07, 47–48; USSBS 109, *Oil Division Final Report*, 21.

[24] Ibid.

[25] FIAT Final Report 403, "Report on the German Economic Situation, 1943/44," trans., prep., and ed. by H. R. Habicht and Walter Jessel, 8, in (Army Staff) Intelligence (G-2) Library "P-file," 1946–51, entry 82, box 499, RG 319, WNRC; USSBS 113, 48; USSBS 109, appendix B, 21.

fuels was projected to increase from 630,000 tons to about 3.5 million tons during the same period.[26] These projections reflect the perception that the domestic crude industry was relatively unimportant. Given the broad role of the Four-Year Plan Office in formulating economic policy in the Third Reich, they also indicate a much smaller commitment to the crude industry.

Why was so little importance attached to the German crude industry? To some extent, the perceptions of government planners were justified. Despite increased exploratory drilling during the 1930s, no major new crude fields were discovered. The enormous production increases between 1932 and 1940 were thus in a sense artificial: the result of forced exploitation of existing fields. For this reason, production in the old Reich declined noticeably after 1940, to 711,385 metric tons in 1944. A British technical team investigating the North German oil fields in May and June 1945 noted that "any relaxation of this [exploitation] program, once production is resumed, will result in a steepening of the decline curve." Their conclusion was that "the proving-up of new reserves by exploration drilling is thus essential if the production of the German oil industry is to be maintained at anything like the 1944 level."[27]

A second reason for the Nazi planners' deemphasis of the German crude industry had to do with the type of product for which German domestic crude was suited. The Air Force Ministry—powerful in Reich economic affairs because the head of the four-year plan, Göring, was also air force minister—attached more importance to the hydrogenation synthetic fuel process for supplying airplane fuel needs than to the crude industry, whose products were unsuitable for airplane fuel.[28] Furthermore, although the crude oil industry produced at least 90 percent of Germany's lubricating needs throughout the Nazi period, high-quality airplane lubricants came from the small quantities of lubricating oil produced by the synthetic petroleum industry.[29]

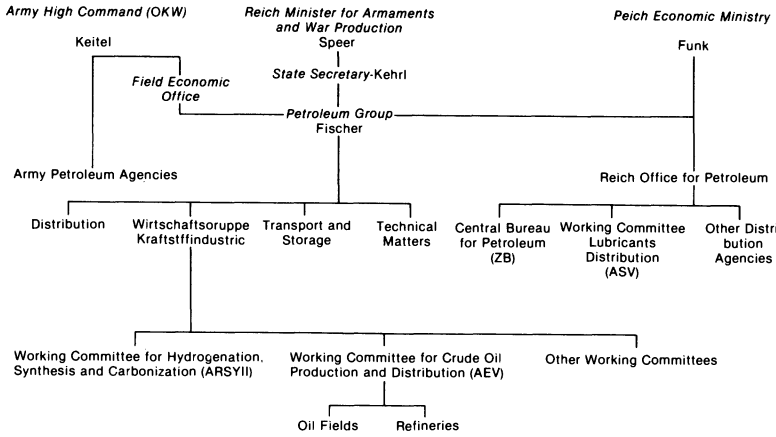
A final factor was the place of crude oil company personnel in the government regulatory hierarchy. Oil producer personnel did participate in the industrywide organizations set up during the Third Reich to coordinate crude production, refining, and distribution of petroleum

[26] BIOS 1017, *War Structure*, 3a; Hughes, "Technological Momentum," 127; USSBS 109, 15; USSBS 113, sec. 1.07, 21, and Table 8.

[27] BIOS 1017, *War Structure*, Appendix 2A, "Report on a Visit to the North German Oil Fields," by R. K. Dickie and A. E. Gunther (21 May 1945), 69–74; ibid., Appendix 2B, "Supplement to 'Report on a Visit to the North German Oil Fields,'" (9 June 1945), 75–78.

[28] Wolfgang Birkenfeld, *Der synthetische Treibstoff 1933–1945* (Göttingen, 1964), chap. 4, esp. 62.

[29] USSBS 113, *German Oil Industry*, sec. 2.04, 44, and sec. 2.07, 48; British Intelligence Objectives Subcommittee, BIOS Final Report 1911, "Major Developments in Synthetic Lubricants and Additives in Germany," by H. L. West (London, n.d.), 75–76, 92–93.



Source: Great Britain, British Intelligence Objectives Subcommittee, BIOS Report 513, "Notes on the Organization of the German Petroleum Industry during the War," by W. H. Thomas and J. G. Withers (1-31 October 1945), 10.

FIGURE 1

General Organization of German Petroleum Production, Distribution and Utilization

products. The function of these organizations, however, was purely consultative and administrative. Ultimate authority for planning and directing the petroleum economy lay with government agencies, as shown in Figure 1. The Working Committee for Crude Oil Production and Distribution (AEV), for instance, stood under the Wirtschaftsgruppe Kraftstoffindustrie (Economic Group of the Fuel Industry), which controlled and coordinated its actions with those of other working committees. This group, headed by Heinrich Bütefisch of I. G. Farben, the major synthetic petroleum producer, in turn stood under the Petroleum Group. The Petroleum Group also was headed by an I. G. employee, E. R. Fischer. Ultimate control of production lay in the hands of Hans Kehrl, who held this responsibility both in the four-year plan organization and in the Speer ministry. Two other important producers' organizations, the Central Bureau for Petroleum (ZB) and the Working Committee for Lubricants Distribution (ASV), were originally controlled by the Reich Economics Ministry, although they too later came under the control of the Speer Ministry. In any case, all

three of the crude oil industry organizations were under the control of government officials or synthetic oil industry personnel.[30]

To sum up, the crude oil industry in Nazi Germany was permitted to share in the financial bonanza brought on by the regime. It received government subsidies for exploration, was encouraged to produce by high tariffs on imported goods, and was allowed to profit by expanding into occupied territories (especially Austria). For the most part, these incentives rewarded the industry's technical and production success. The industry nonetheless remained secondary in the minds of Nazi planners, and received less financial and political support than did its synthetic counterpart. Regulation and ultimate control of the industry's expansion remained in the hands of the government, primarily because of physical limitations on the industry's expansion, its inability to provide airplane fuel and lubricants, and the fact that it lacked political power.

THE SYNTHETIC PETROLEUM INDUSTRY IN GERMANY

If the expansion of the German crude oil industry was impressive, the growth of synthetic petroleum was awesome. Leuna, the first synthetic oil plant, opened in 1927, producing annually about 90,000 metric tons. Just twelve years later, at the outbreak of the war, annual synthetic capacity was about 1.5 million metric tons. By 1944, the annual rate of production (based on the first four months of the year) was almost 4.3 million tons, while total annual synthetic capacity stood at close to 5 million tons.[31] Just as the German oil industry as a whole expanded more rapidly than other industries during the Nazi period, so its synthetic sector expanded more rapidly than its crude sector.

Expansion in the synthetic oil sector was not uniform. One of the two major synthetic processes was allowed to develop much faster and to a much greater extent than the other. This discrepancy cannot be attributed to physical limitations on the expansion of the facilities for production of either process. Nor, it seems, can the preference of one process over the other be explained on purely economic grounds. While economic structures have undoubtedly changed since World

[30] Quoted in British Intelligence Objectives Subcommittee, BIOS Final Report 513, "Notes on the Organization of the German Petroleum Industry during the War," by W. H. Thomas and J. G. Withers (1–31 Oct. 1945), 1–15, (Army Staff) Intelligence (G-2) Library "P-file," 1946–51, RG 319, WNRC; Office of Strategic Services, Research and Analysis Branch, R&A Report 1917, "Draft of Section for German CAD Guide on Oil" (18 May 1944), 2–3, Records of the Office of Strategic Services RG 59, NA. See also organizational chart in USSBS envelope 110.d.108, "Government Control Instruments of the German Oil, Chemical, and Rubber Industries," Records of the U.S. Strategic Bombing Survey (European War), RG 243, NA.

[31] Hughes, "Technological Momentum," 120; USSBS 113, *German Oil Industry*, sec. 1.08, Table 15, 31, and sec. 2.04, 43–44.

War II, it is still significant that a version of the process that was neglected under the Nazi regime is today used commercially to a much greater degree than the process the Nazis favored.[32] The explanation of the regime's preference lies primarily in three other factors: differences in the raw materials used in each process; differences in the final products and in the usefulness of each process given the technology of the day; and crucial differences in political power. The key figures in the two firms involved in synthetic production held very different places in the Nazi regime.

The two major synthetic fuel processes used in Nazi Germany—the Fischer-Tropsch process and the Bergius hydrogenation process—were similar in some respects. Both were pioneered in Germany by German scientists. The patent rights to both were owned by German companies, and both used the same basic raw materials: coal, water, and air.

The processes differed considerably in other ways, however. The Fischer-Tropsch process was first developed around 1930 by Franz Fischer and other scientists working at the Kaiser Wilhelm Institute for Coal Research at Mülheim. The process involved the combination of carbon dioxide and hydrogen, derived from coal and steam, by means of a catalyst at fairly low temperatures (around 200° C) and pressures (up to 20 atmospheres). Coke, which was in oversupply in Germany when the process was developed, was the preferred raw material for Fischer-Tropsch synthesis, although both hard coal and lignite were also used. Among the final products of the process was a low-grade crude oil, which, while it could not be used to produce aviation fuel, was further refined to produce gasoline, diesel fuel, and waxes. The process could also be used to produce several nonfuel chemicals, such as alcohols and resins. The rights to the process were purchased by Ruhrchemie, a German chemical concern, which built the first commercial Fischer-Tropsch plant on the grounds of its synthetic ammonia plant at Holten in 1934.[33]

In contrast to the Fischer-Tropsch process, the Bergius hydrogenation process was performed at high temperatures (400–600° C) and pressures (200–700 atmospheres). Although this process could employ any carbonaceous material, brown coal, abundant in Germany, was most often used. The coal, or other carbon-based material, was combined with hydrogen in the presence of a catalyst to form synthetic petroleum products. Bergius hydrogenation further differed from the Fischer-Tropsch process in that the final product was high-grade gas-

[32] A modified version of the Fischer-Tropsch process is used in the synthetic oil plants of South Africa, the country with the largest synthetic fuel production in the world today.

[33] USSBS 113, *German Oil Industry*, sec. 1.03, 10–11.

oline or aviation fuel that was directly useable. In practice, however, aviation fuel was rarely produced directly since the yield was low. Rather, the high-grade gasoline was refined further through other hydrogenation processes. The result was a "high grade aviation base stock with a high aromatic base."[34]

Pioneering work in the hydrogenation process for making synthetic fuels started much earlier than did work on the Fischer-Tropsch process. Friedrich Bergius performed initial research on the development of the process before and during World War I. The rights to the process were then bought by Badische Anilin- und Sodafabrik (BASF), a German chemical firm. After the war, BASF had to find a use for both the hydrogenation facilities developed during the war for the production of synthetic ammonia and a staff of engineers experienced in the technology. The company was lured by the prospect of enormous profits because the booming auto industry had increased consumption of gasoline while a shortage in world petroleum supplies was projected. An additional spur toward development was the support for the project—moral at first, but soon financial—offered by Standard Oil of New Jersey. On this basis, BASF's Carl Bosch pushed first the firm, and then the enormous chemical combine I. G. Farbenindustrie, AG (formed in 1925 with BASF as a leading member), to develop the Bergius process for industrial application. The first large-scale Bergius plant opened at Leuna in 1927.[35]

The Nazi seizure of power in 1933 proved a boon for I. G. Farben and its Bergius process. The discovery of large petroleum reserves in Texas and Oklahoma, combined with the world economic crisis of 1929, had sent oil prices spiraling downward and threatened I. G. with disaster. Even the influx of capital from Standard Oil of New Jersey after 1928 did not help much. The Nazi policy of continuing, and eventually increasing, tariffs on imported petroleum products made materials produced by the Bergius process profitable. Huge allocations to support construction of plants under the four-year plan and forced contributions from other industries toward financing this construction made enormous expansion possible. By the outbreak of the war in 1939, hydrogenation plants with a completed annual capacity of well over one million metric tons were in operation. By the start of the

[34] Ibid., 9–10.

[35] Ibid.; Hughes, "Technological Momentum," 108–20. Gottfried Plumpe, in a recent article, takes issue with Hughes and stresses business strategic factors rather than technological momentum in explaining the I.G. decision to develop synthetic rubber. Plumpe's article actually complements rather than disproves Hughes's argument, however. See Plumpe, "Industrie, technischer Fortschritt und Staat: Die Kautschuksynthese in Deutschland 1906–1944/45," *Geschichte und Gesellschaft* 9 (1983): 564–97, esp. 572–73. For the role of Standard Oil of New Jersey, see Joseph Borkin's engaged but well-documented book, *The Crime and Punishment of I. G. Farben* (New York, 1978; Pocket Books ed., 1979), 60–61, 64–65; see also Tammen, *I. G. Farbenindustrie*, 102–3.

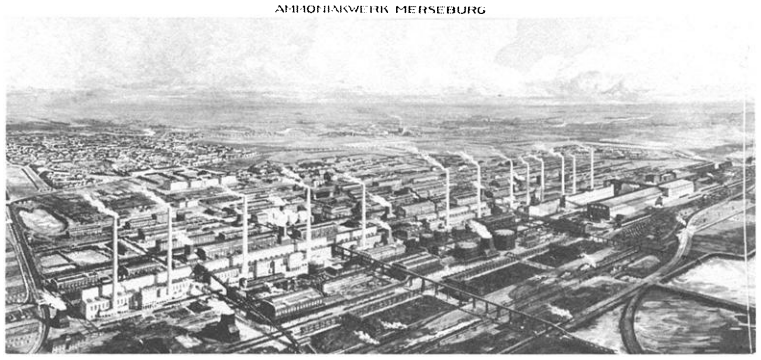
Allied attack on the German oil industry in mid-1944, Germany's annual domestic hydrogenation capacity, most of which was directly controlled or licensed by I. G., exceeded four million tons. In addition, hydrogenation plants with a projected annual capacity of well over one million tons were under construction in Silesia and the Sudetenland when the war ended.[36]

In contrast, Germany's domestic Fischer-Tropsch capacity in operation when the war broke out was a mere 240,000 tons. This capacity was expanded considerably by May 1940, when plants that could produce 414,000 tons a year were in operation. No new Fischer-Tropsch plants were constructed after 1940, however; thus, the ultimate Fischer-Tropsch annual capacity of 587,000 tons simply reflected the completion of plants designed and started before the war.[37] The difference is substantial and must be explained. Why was the hydrogenation process preferred to the Fischer-Tropsch process?

The question was put directly to Heinrich Bütefisch in a series of interrogations by British technical investigators in January 1946. Bütefisch, a director of I.G. Farben and chief of the I.G. Leuna works, which contained the first and one of the largest Bergius operations, stressed interrelated technical and economic factors in his replies. On the technical side, he noted that the Fischer-Tropsch process used more raw material than did the hydrogenation process. Moreover, the preferred basic raw material was scarcer than that generally used in the Bergius operation. Coke, required for optimum production in the Fischer-Tropsch process, was in short supply in wartime Germany because of increased steel production, while Bergius production used more plentiful brown coal, or lignite, and other brown-coal products, such as coal tars. Finally, the petroleum products of the Fischer-Tropsch process were inferior in quality to those produced by the Bergius process. Fischer-Tropsch yielded a synthetic crude that could be processed into low-octane motor fuel (40–45 octane), for instance, while hydrogenation yielded much higher-grade products.[38]

The economic factors cited by Bütefisch are tied to the technical factors. Partly because of the relative scarcity of coke, and the need for larger amounts of raw material, the Fischer-Tropsch process was considerably more expensive than hydrogenation. According to Bütefisch's rough calculations, summarized in Table 1, the cost of producing one metric ton of liquid products through the Fischer-Tropsch process was RM 320–360. In contrast, the cost of producing one metric ton of mo-

[36] Hughes, 120ff; USSBS 113, *German Oil Industry*, sec. 2.04, 43, and sec. 1.08, Table 15, 31.
[37] USSBS 113, sec. 108, Table 15, 31, and sec. 2.07, 48.
[38] British Intelligence Objectives Subcommittee, BIOS Report 1697, *Synthetic Oil Production in Germany: Interrogation of Dr. Bütefisch* (London, n.d.), 2.



I.G.FARBENS LEUNA WORKS (c. 1930)

It was here that the I.G. opened the world's first large-scale production plant for synthetic fuels in 1927. The plant remained the largest single producer of synthetic fuels in Germany until heavy bombing took its toll in late 1944. (Photograph courtesy of Bundesarchiv Koblenz, Bildsammlung.)

tor fuel through hydrogenation was RM 260–310. The fact that Fischer-Tropsch products had to be refined still further to produce motor fuel made the ultimate price differential even greater.[39]

The factors noted by Bütefisch go far toward explaining why the hydrogenation sector of the synthetic oil industry expanded more than the Fischer-Tropsch sector. A preference for the more efficient (i.e., less expensive) of the two processes is understandable. Furthermore, given the place of Göring in the economic decision-making hierarchy of the Third Reich, and his concern for the needs of the air force, the fact that hydrogenation could supply aviation fuel and lubricants on a large scale made it the preferable process. In fact, 95 percent of all base aviation fuel was made through hydrogenation during the later years of the war.[40]

Bütefisch's analysis, however, neglects two important factors. First, the price differential between products produced by the two processes was certainly due in part to economies of scale. Large quantities of

[39] Ibid., Table 1, 14, and explanation of Table 1, 15.
[40] USSBS 113, *German Oil Industry*, sec. 2.07, 48.

hydrogen gas are needed for any of the major chemical synthesis processes, including synthesis of ammonia, methanol, nitric acid, rubber, and fuel. The hydrogen gas is generally produced by passing steam through electric current. In addition, carbon monoxide is needed, especially for the Fischer-Tropsch process, and is produced by burning coal or coke. Thus the cost of producing hydrogen or the synthesis gas (a mixture of hydrogen and carbon monoxide)—closely related to the cost of coal and coke for both energy and raw materials—is a key element in determining the final cost of synthetic fuel production.[41]

As Table 1 shows, the two processes differed in the amounts of coal input required. The major difference arose in the amounts needed for the production of synthesis gas or hydrogen. Because higher-quality (and thus more expensive) coal or coke was needed in hydrogen/synthesis gas production than in other operations, this discrepancy had a significant influence on the difference between the two processes in total production cost. It is also important to look more closely at Bütefisch's figures on plant costs. Along this dimension the Fischer-Tropsch process cost less per ton than hydrogenation. For the Fischer-Tropsch process, Bütefisch observed, at least half of total plant costs were related to the construction and maintenance of a large synthesis gas plant for the production of hydrogen and carbon monoxide. The major costs in a hydrogenation plant, in contrast, were related to the construction and maintenance of high-pressure reactors that could withstand the extreme temperatures and pressures of the hydrogenation reaction; facilities for the production of hydrogen were less important in the determination of plant costs.[42]

Bütefisch's rough calculations allow no precise comparison of the cost of hydrogen or synthetic gas for the two major fuel synthesis processes. Nonetheless, Table 1 reveals that coal costs were much higher for the Fischer-Tropsch process than for hydrogenation. Furthermore, the facilities necessary for the production of synthetic gas in a Fischer-Tropsch plant were a much larger factor in plant costs than those for the production of hydrogen in a Bergius plant. The end result of these differences was a cost differential of about 20 percent between the two, with the products of the hydrogenation process by far the cheaper.

The overall cost difference between the two fuel synthesis processes cannot be explained fully by differences in the size of the respective operations. Bütefisch's examples are both drawn from large-scale

[41] "Synthesegas aus Braunkohle," *Chemische Industrie* 59 (May 1936), 106; Tammen, *I. G. Farbenindustrie*, 37.

[42] BIOS 1697, *Synthetic Oil Production*, 15.

TABLE 1

Relative Costs of the Fischer-Tropsch Process and Bergius Hydrogenation (per metric ton of product)

	FISCHER PROCESS[a]	BERGIUS HYDROGENATION[b]
Coal input (tons) for:		
Synthesis gas or hydrogen[c]	5.2–7.0	1.7–2.3
Hydrogenation[d]		1.2–1.6
Power	1.9[e]	3.8
TOTAL	7.1–8.9	6.7–7.7
Capital charges		
Cost of plant[f]	RM 860	RM 970
Amortization (at 8%)	RM 70.8	RM 77.6
Cost of production	RM 320–360	RM 260–310

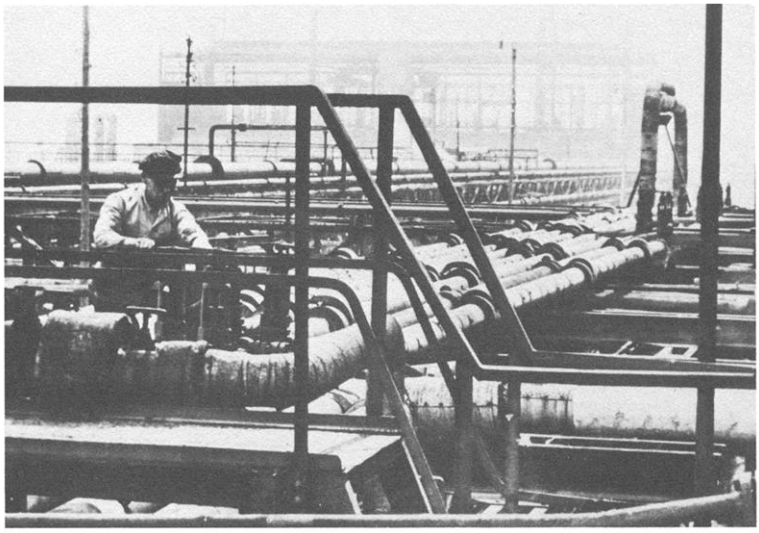
Source: British Intelligence Objectives Subcommittee, BIOS Report 1697, "Synthetic Oil Production in Germany. Interrogation of Dr. Bütefisch," 14.

[a]Per ton of liquid product.
[b]Per ton of spirit.
[c]Coke is calculated back to bituminous coal (carbon content of the coal was very variable).
[d]Calculated as bituminous coal.
[e]Refers to atmospheric pressure synthesis.
[f]Estimated prices for normal conditions.

plants (Fischer-Tropsch at 100,000 tons per year; Bergius at 150,000 tons per year). Rather, the difference was probably due in large part to the fact that hydrogenation was generally part of large plants producing synthetic ammonia, synthetic methanol, nitric acid, and synthetic rubber, as well as synthetic petroleum. Fischer-Tropsch operations were connected only to plants producing synthetic ammonia.[43] The I. G. Bergius operations were likely to be attached to larger hydrogen synthesis operations already in place, and thus used lower-priced hydrogen. More importantly, these plants, more diverse in their operations, were better able to realize economies of operation by keeping hydrogen synthesis in use at all times. This line of reasoning does not, of course, take into account the superior quality of the petroleum product produced through hydrogenation, but it does undermine Bütefisch's economic argument. The lower production costs of hydrogenation thus may have been a result, rather than a cause, of its preferred position.

Another factor not mentioned by Bütefisch also contributed to the faster growth of hydrogenation capacity in Nazi Germany. The com-

[43] Ibid.; USSBS 113, *German Oil Industry*, sec. 1.06, 16.



PIPE NETWORK AT AN I.G. FARBEN HYDROGENATION PLANT

A worker on the pipe system connected the various production facilities at the I.G. Farben Leuna plant. The plant made efficient use of the technological interdependence to produce a number of items necessary to the German war effort, including synthetic fuels. (Photograph courtesy of Bundesarchiv Koblenz, Bildsammlung.)

panies that controlled the two fuel synthesis processes occupied quite different political places in the Nazi regime. I. G. Farben personnel played a critical role in the control of the synthetic petroleum industry, and indeed of the entire German war economy. The personnel of Ruhrchemie were less highly placed.

Two prominent examples of the role of I. G. personnel will suffice. Heinrich Bütefisch himself became, in the course of the war, the chief of the Wirtschaftsgruppe Kraftstoffindustrie, which had some importance in the Speer ministry in the control and coordination of the four oil industry working committees. In this capacity, he served under E. R. Fischer, who was both head of the Mineralöl Gruppe and an I.G. executive. Bütefisch also headed the Working Committee for Hydrogenation, Synthesis, and Carbonization (ARSYN), which advised the government regulatory hierarchy with regard to the synthetic oil industry and coordinated government direction and industry production. Throughout this period, Bütefisch continued as a director of I. G. and head of the Leuna works.[44]

[44] BIOS 1697, 5; BIOS 513, *Notes*, Chart A; organizational chart, in envelope 110.d.108, RG 243, NA.

Beginning in May 1936, another I. G. executive, Karl Krauch, was in charge of research and development for the entire chemical industry, of which synthetic oil was a part. Krauch served in this capacity first under the Raw Materials and Foreign Exchange Staff and later in the Four-Year Plan Office. In 1938, he became commissioner-general for problems of the chemical industry. He and his staff "studied and advised on all problems relating to expansion, planning, production bottlenecks, and new projects of [the] chem[icals] industry. Though *not an executive* agency, [Krauch's staff] exerted controlling influence." Krauch also retained his posts as chairman of the I. G. managing board and as chief of the high-pressure chemistry division of the chemical company.[45]

Krauch used his government positions to influence synthetic oil policy. As head of the research and development division of the Raw Materials and Foreign Exchange Staff, he was largely responsible for that organization's preliminary four-year plan. That plan projected that 90 percent of proposed government investment would be allocated to the development of the chemical industry. Of this sum I. G. was to receive over 70 percent, much of which was to be invested in synthetic oil plant expansion.[46] In 1938, Krauch was largely responsible for the Karin Hall Plan—a revision of the four-year plan which placed still more emphasis on the expansion of hydrogenation plants.[47]

THE DOWNFALL OF THE GERMAN OIL INDUSTRY

In May 1944, concentrated aerial attacks on German industry began. By June, U.S. General Carl A. Spaatz directed that the "primary strategic aim of U.S. Strategic Air Forces is now to deny oil to enemy air forces."[48] The oil industry was designated as the primary target of Allied attacks, and the resulting production losses were exacerbated by losses of occupied territories. From May 1944 to the end of the war in Europe in April and May 1945, the industries (or subsectors) that had expanded most rapidly and most extensively in production contracted in the same way, and for some of the same reasons.

In a modern industrial state the various sectors of the economy are so interconnected that it is nearly impossible to say that the downfall of any one industry was decisive in the decline of the economy as a

[45] Quotation taken from organizational chart in envelope 110.d.108, RG 243, NA; Borkin, *Crime and Punishment*, 84.

[46] Petzina, *Autarkiepolitik*, 44; Borkin, 90.

[47] Borkin, 92–94; USSBS 109, *Oil Division Final Report*, 22; Alan Milward, *The German Economy at War* (London, 1965), 20.

[48] USSBS 109, 1; see also Birkenfeld, *Treibstoff*, 191.

whole. However, the downfall of the oil industry was undoubtedly a crucial factor in the German defeat, especially since the industry declined in the months following June 1944 much more precipitously than did the rest of the German economy. The decline of the German economy as a whole proceeded surprisingly slowly. The final report of the Overall Economic Effects Division of the U.S. Strategic Bombing Survey observed:

> The "Kriegseilbericht" [War Express Report] . . . gives a final picture of the developments in the last months of 1944 and again in January 1945. The most striking result of this emergency industrial survey is its indication of well maintained production almost to the end of 1944, in the face of the accumulated stresses of a long war and intensive efforts at aerial destruction of the German industrial machine. The Kriegseilbericht shows that industrial activity in November stood at approximately 95 percent of its second quarter level, and by December had lost another 10 percent of its April-June rate. Only in January 1945 did the further loss of industrial areas and the mounting effects of aerial attack cause a pronounced recession of output, foreshadowing the almost complete breakdown of the next months.[49]

The German oil industry was collapsing far more rapidly. In December 1944, while total industrial production stood at 85 percent of its second-quarter level, production of petroleum products was less than 40 percent of the level achieved during the first four months of the year. By March 1945, petroleum production in Germany, both synthetic and crude, had decreased to about 12 percent of its level during the first four months of 1944.[50] A major factor in this decline was the effect of Allied bombing on the German transportation system, since with transportation outages coal could not be brought to the synthetic plants and finished products could not be distributed. Allied bombing also crippled production directly in the German oil industry, as Figure 2 shows.[51]

The synthetic oil sector of the German oil industry declined much more rapidly than did the crude sector. In December 1944, total synthetic production was proceeding at only 16 percent of its prebombing

[49] U.S. Strategic Bombing Survey, USSBS Final Report 134, *Overall Economic Effects Division Final Report*, 17, Records of the U.S. Strategic Bombing Survey, (European War), RG 243, NA.

[50] Percentages calculated from figures in USSBS 109, *Oil Division Final Report*, 23.

[51] For transportation systems outages, see U.S. Strategic Bombing Survey (European War), USSBS Report 2 (30 Sept. 1945), 64, and Milward, *German Economy*, 173. Arnold Krammer contends that "the bombing raids destroyed the German fuel network not by crippling production but by causing a complete breakdown of transportation" (see Krammer, "Fueling," 418). It is more accurate to say that both effects of the bombing—crippled production combined with transportation breakdown—contributed to the downfall of the industry. Krammer himself admits, for instance, that high-octane fuel production fell because of production losses brought on by the bombing, and Bütefisch claimed that "the actual bombing of the [synthetic oil] plants was far more important" than transporation outages. (See BIOS 1697, *Synthetic Oil Production*, 6.) American technicians in Germany after the war estimated that it would take at least a year (until June 1946) to restore synthetic production, because of damage to the plants. See D. M. S. Langworthy to members of the Army-Navy Petroleum Board, 24 May 1945. Records of the War Department General and Special Staffs, CAD 463 (6-1-43), sec. 2, RG 165, NA.

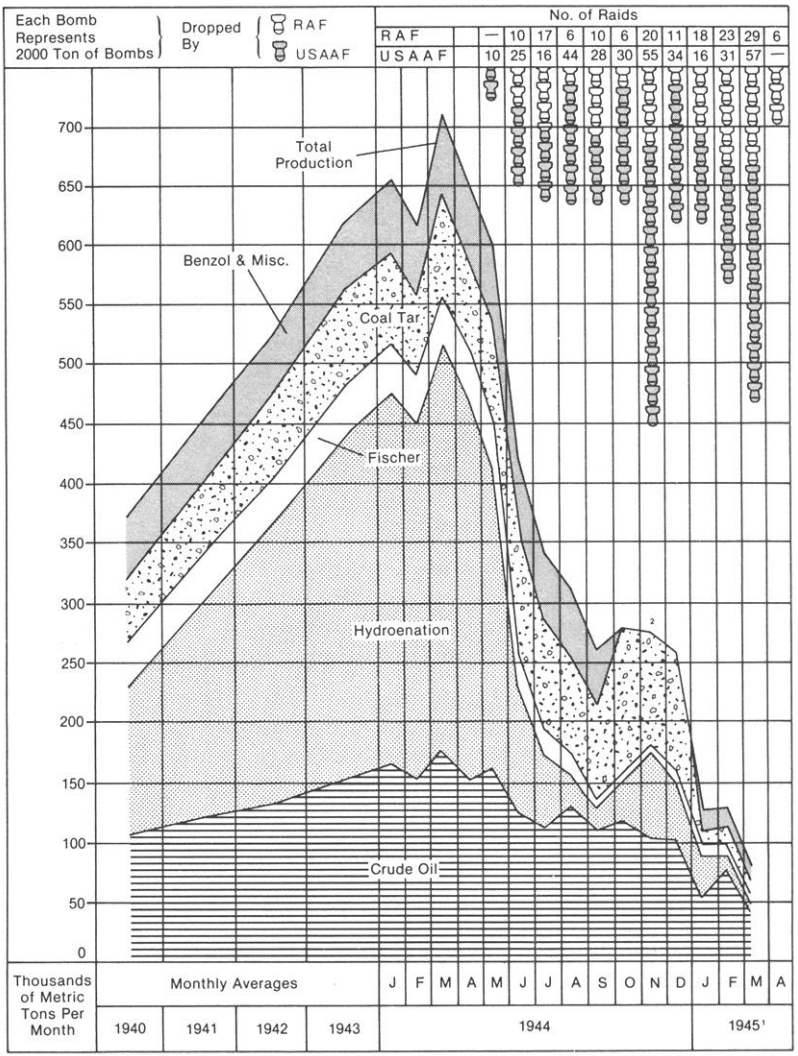


FIGURE 2
German Production of Petroleum Products by Process

Source: U.S. Strategic Bombing Survey (European War), USSBS Report 109, *Oil Division Final Report* (2d. ed., Jan. 1947), figure 15.

[1]Includes aviation gasoline, motor gasoline, diesel oil and liquified gas only.

[2]Included with coal tar, October-December, 1944.

rate, and by March 1945 that statistic had dropped to 3 percent. From an average monthly rate of 359,000 metric tons of petroleum before the bombing, production had dropped to only about 11,000 metric tons.[52] It is not surprising that the Allied bombers concentrated on the synthetic sector, given its relative importance to the German economy. However, one of the very factors that had led to the sector's rapid rise—efficient use of technological interdependence—speeded its downfall. Hitler himself expressed this problem well at a meeting on 9 May 1944 at Obersalzburg with the most important economic policymakers in the Third Reich: Keitel, Göring, Milch, Krauch, Pleiger, Bütefisch, E. R. Fischer, Kehrl, and Speer. "In my view," he said, "the fuel, Buna rubber, and nitrogen plants represent a particularly sensitive point for the conduct of the war, since vital materials for armaments are being manufactured in a small number of plants."[53] Air strikes on synthetic petroleum plants yielded unexpected dividends, reducing the production not only of oil but also of synthetic alcohol, synthetic rubber, and synthetic nitrates, which in turn hastened the decline of the economy.

Within the synthetic sector of the German oil industry, hydrogenation plants suffered more from the Allied onslaught than did Fischer-Tropsch plants. Bergius facilities represented nearly half of all German petroleum production capacity, and received a corresponding percentage of the tonnage of bombs dropped by the Allies. But production losses in the hydrogenation plants constituted over 65 percent of total German petroleum production losses due to the Allied bombing. Overall, 36 metric tons of production were lost for every short ton of bombs dropped on the Bergius plants. In contrast, Fischer-Tropsch plants, with 6.5 percent of total installed petroleum production capacity, were responsible for 7.5 percent of the production loss. For every short ton of bombs dropped on Fischer-Tropsch facilities, only 10 metric tons of production were lost. The Allies, like the Nazis, attached great importance to hydrogenation plants, recognizing their crucial role in the German war economy.[54]

In general, the crude oil sector of the German oil industry fared much better than the synthetic sector. In December 1944, six months after the start of the Allied offensive, crude refining was still proceeding at more than 60 percent of the rate achieved before the start of the bombing. In March 1945, this proportion dropped to 24 percent—still much higher than the 3 percent figure for synthetic production. In

[52] USSBS 109, *Oil Division Final Report*, 23.
[53] Albert Speer, *Inside the Third Reich* (New York, 1970; Avon books edition, 1971), 446–47.
[54] USSBS 109, *Oil Division Final Report*, Table 11, 24.

I.G. FARBEN OFFICIALS AT THE NÜREMBERG TRIALS, AUGUST 1947

I.G. Farben's role in providing the Nazi regime with the synthetic fuels was one piece of evidence used to substantiate the prosecution's charge that its officials had conspired to plan and carry out an aggressive war of expansion. Company officials were also charged with spoliation, slavery, and mass murder. Carl Krauch (far left, front row) and Heinrich Bütefisch (far right, front) were both sentenced to six years imprisonment. (Photograph courtesy Bundesarchiv Koblenz, Bildsammlung.)

absolute terms, German crude production stood at 40,000 metric tons in March 1945, compared with 11,000 metric tons of synthetics. Crude production suffered less both because spare capacity existed in German crude refineries and because the Allies, like the Germans themselves, considered the industry of secondary importance. The German oil fields were relatively unscathed by the Allied bombing.[55]

CONCLUSION

Before its dramatic collapse, the German petroleum industry, especially its synthetic petroleum sector, had achieved remarkable growth. Even now, almost forty years after the end of World War II, no one country's synthetic production of petroleum comes close to German production at its peak.[56] The study of the German oil industry clarifies to some extent the degree to which Nazi political aims, and

[55] Ibid., 23.

[56] South Africa's synthetic production is about 2.2 million metric tons a year, whereas Germany was producing synthetic petroleum in 1944 at an annual rate of about 4.3 million metric tons (estimated on the basis of production in the first four months of that year).

especially the policy of autarky, were related to economic policy. The economic needs of I. G. Farben, and to a lesser degree those of the entire German oil industry, coincided very well with the Nazi policies of autarky and rearmament. That was one good reason for the regime's favorable treatment of the industry, and especially the I. G.

But the success of an individual firm reflected more than the mere coincidence of economic needs and political objectives. I. G. Farben was more successful than others in the liquid fuel business for two additional reasons. First, it was already well advanced and concentrated in technologies related to that of synthetic fuels, including synthetic ammonia, synthetic rubber, and nitric acid. This technological expertise and high concentration made it possible to produce the synthetic fuels so crucial to Nazi policy at low costs. Secondly, the firm owed its success in part to the fact that key managers occupied important Nazi policymaking positions. At the same time, technological success and its implementation, because it entailed still further concentration, made synthetic producers more vulnerable to bombing attacks from the Allies. Destruction to plant and transportation facilities in the synthetic oil industry, and especially to I.G. Farben's factories, was an important factor in Germany's final defeat.

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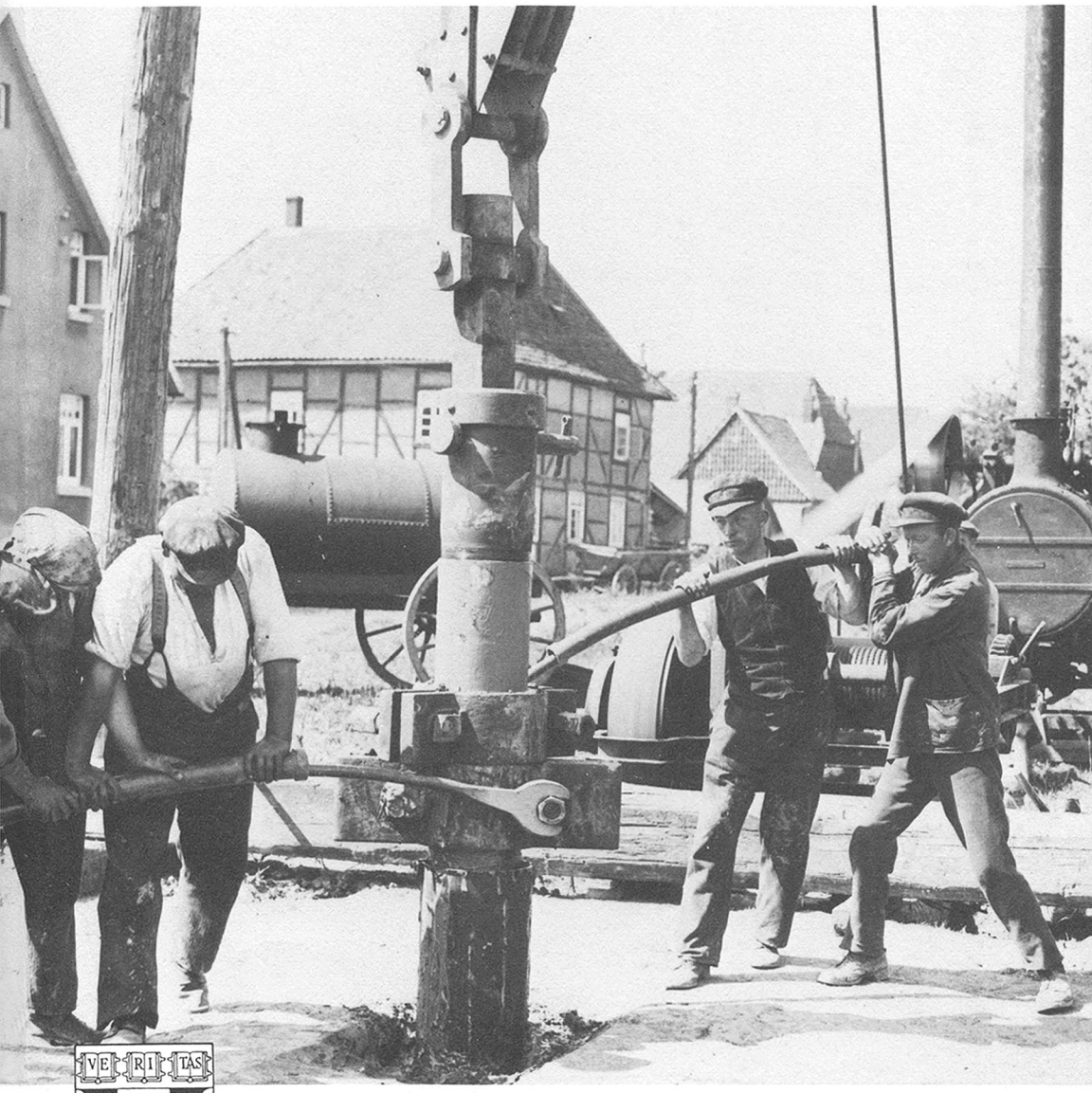

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COVER: WORKERS IN A NAZI OIL FIELD. Despite the Nazis' need for large supplies of fuel, the German petroleum industry remained small and politically weak throughout the Hitler era. In this photograph, workers are drilling an oil bore-hole pump in Oberg. (Photograph courtesy of Bundesarchiv Koblenz, Bildsammlung, Bild 122/Transoceon Nr. 128.) For an article on the oil industry in Nazi Germany, see pp. 254-77.