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HISTORY OF THE SYNTHETIC OIL INDUSTRY IN JAPAN

by

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I. GENERAL DESCRIPTION

The Japanese Government began consideration of a liquid fuel policy in 1923, but little was done until 1933 when a practical liquid fuel program was established. With regard to synthetic oil in this program, it was decided to aid and develop the low-temperature coal carbonization industry, and to increase the production of shale oil at FUSHUN in Manchuria.

In 1934, the Government established subsidies for low-temperature carbonization of coal, but this industry still did not become active. In July, 1936, the government established a new program, to be made effective in 1937. In this policy they included the following items concerning synthetic oil, intended to assist the petroleum substitutes fuel industry:

1. Institution of laws and regulations to encourage the petroleum substitutes industry.

2. Institution of payments for losses in coal-liquefaction, Fischer-Tropsch synthesis, and low-temperature carbonization of coal industries.

3. Carrying into effect any other measures to aid security and promotion of this industry.

A seven-year synthetic oil plan was drafted to incorporate these items and the Synthetic Oil Production Industry Law and Imperial Fuel Development Company Law were instituted in August, 1937 to accomplish this plan. The Synthetic Oil Production Industry Law was enforced from January, 1938 and the Imperial Fuel Development Company Law from September, 1937.

II. SEVEN-YEAR PLAN FOR SYNTHETIC OIL

This plan was drafted to produce annually 1,000,000 kiloliters each of gasoline and fuel oil from synthetic oil by 1943 in Japan and Manchuria. The quantities produced were expected to supply half of the civilian demands in 1943, and, of this amount, 500,000 kiloliters were expected to be produced in Manchuria. Manufacturing processes were, (1) direct coal liquefaction, (2) Fischer-Tropsch Synthesis and (3) low-temperature carbonization of coal. Raw materials were coal, lignite, and natural gas. The program of plant erection was as follows: 10 units for hydrogenation of coal (capacity of each unit, 100,000 kiloliters per year), 11 Fischer-Tropsch units (capacity of each unit, 500,000 kiloliters per year), and 66 low-temperature carbonization units (capacity of each unit, 100,000 tons of coal per year). The total requirement of funds was expected to be 750,000,000 yen, distributed as follows: 360,000,000 yen for hydrogenation, 121,000,000 yen for Fischer-Tropsch 115,500,000 yen for low-temperature carbonization, and for the expense of coal field developments, 15 yen per ton of output. 50,000,000 yen of the 750,000,000 had already been invested in plants of this type.

III. SYNTHETIC OIL PRODUCTION INDUSTRY LAW

This law was enforced since January, 1938, in Japan proper, Korea, Sakhalin and Formosa. The main object of this law was to protect and help the synthetic oil industry to become firmly established as quickly as possible.

At first, the plants to which this law was applied were as follows: (1) Hydrogenation plants, whose raw materials were coal, lignite, and tar, and whose producing capacities were over 10,000 kiloliters per year. (2) Petroleum synthesis (Fischer-Tropsch) plants, whose producing capacities were over 10,000 kiloliters per year.

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(3) Low-temperature carbonization plants, processing either coal or lignite, and which processed more than 100,000 tons of coal per year. In 1941 the government abolished this limit for raw materials and products and amended its policy so as to include any plant which produced fuel oil, lubricants or any crude oil whose main components were hydrocarbons, from any raw materials except natural petroleum. All plants were included which had a capacity of more than 1,000 kiloliters per year production of aviation gasoline blending stock and lubricants. For any other oil products the minimum capacity remained at 10,000 kiloliters per year.

These companies were to be exempted from income tax, profit tax, local tax, and import duty for necessary machines or appliances. The privilege of applying the land expropriation law for plant erection was given to these companies. At first, this law provided that the government would deliver a bonus for synthetic oil produced, but in 1942 this practice was abolished. From that time onward, the government substituted the policy of establishing prices which insured manufacturers of synthetic products a fair profit only.

IV. IMPERIAL FUEL DEVELOPMENT COMPANY LAW

This law was passed in August, 1937, and went into effect in September. It was revised in 1940, 1941, and 1942. The Imperial Fuel Development Company, Ltd. was established in January, 1938 to administer this law, some of whose provisions were as follows:

Art. 1. The Imperial Fuel Development Company shall make it their object to transact all business which will promote synthetic oil production.

Art. 2. The Imperial Fuel Development Company shall have a capitalization of 100,000,000 yen, half of which is supplied by the government. The company can increase the capitalization when approved by the government. (Capitalization was increased to 250,000,000 yen by the end of the war.)

Art. 10. The president and vice-president shall be appointed by the government and their term of office shall be five years.

Art. 12. The Imperial Fuel Development Company shall finance synthetic oil enterprises. They may manufacture or sell synthetic oils, etc., or manage other business necessary for promoting synthetic oil production, when permitted by the government.

Art. 13. The Imperial Fuel Development Company can issue debentures up to an amount equal to five times their paid-up capital.

Art. 15. The government guarantees the return of the face value of shares and the payment of interest.

Art. 20. The Government supervises the business of the Imperial Fuel Development Company.

Art. 30. The Imperial Fuel Development Company shall not be obliged to pay dividends on shares held by the government unless the amount of their annual profit reaches six per cent of the value of paid-up shares not held by the government. Should the annual profit of the Imperial Fuel Development Company fail to reach four per cent of the value of paid-up shares (excluding government holdings) in the first three years of their existence, and six per cent in the following seven years, the government shall subsidize the difference so that

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dividends may reach the above-mentioned percentage.

Art. 32. The Imperial Fuel Development Company shall be exempted from corporation and business taxation in the first year of their existence and in the following ten years.

V. GOVERNMENT SUBSIDIES

In Table I(I), the column headed "Estimated Subsidy" refers to the amount of money the government estimated would be paid out in subsidies if the proposed synthetic fuel program produced in accordance with expectations. The column headed "Actual Amount Paid" is self-explanatory. Ten yen per ton of tar was paid in Japan proper, and two yen per ton of coal processed in Sakhalin. This agreement continued in effect until 1937.

At the end of each year, after the Synthetic Oil Production Law went into effect in 1938, the government determined the amount paid out in subsidies to synthetic oil manufacturers in Japan proper. In Table II(I), all synthetic oil produced has been divided into 2 categories (1) gasoline and (2) all other synthetic products combined. The unit of production to which the subsidy applies is not specified.

The practice of subsidizing production was abolished in 1942 when the government initiated the policy or fixing the prices of synthetic oil products. At these fixed prices (which included suitable profit), the Sekiyu Kyohan Company, Ltd. bought the products from synthetic oil companies and pooled them with natural petroleum products bought from refining companies. The purchase price was based on production cost. The production cost of synthetic oil and the price at which the pooled material was distributed is presented in Table III(I).

The annual Government subsidies paid through the Imperial Fuel Development Company were as follows (yen):

1937	148,094
1938	878,387
1939	1,938,000
1940	2,625,057
1941	4,086,052
1942	4,050,650
1943	7,497,335
1944	8,519,288

VI. CONSTRUCTION AND PRODUCTION

In 1937, when the government began the seven year synthetic oil plan, there were five plants in operation, one on shale oil, and four on low-temperature carbonization. Three plants were under construction in Japan and Manchuria, two of these being for coal hydrogenation, and one for the Fischer-Tropsch synthesis. The next year, 1938, six additional plants were placed under construction, and in 1939, six more. The seven-year plan for synthetic oil did not progress successfully, however. At the end of 1940, the government planned to limit the synthetic oil expansion program to plants already established. However, after 1941, progress in erection was very slow because of material shortages and therefore production of synthetic oil could not meet the government objective. In 1942, Japan obtained petroleum from the East Indies, but the government declared that the synthetic oil industry should be continued under the same policy and completed as rapidly as possible. Actually, erection of plants was very slow and production was very small. Thus, the Japanese synthetic oil production was not successful at the end of the

war. Almost no aviation gasoline was produced from synthetic oil. Production since 1937 was as follows (Kl - lubricant from rubber is not included):

1937	4,950	excludes Korea & Manchuria
1938	7,400	excludes Korea & Manchuria
1939	17,934	excludes Korea & Manchuria
1940	33,254	excludes Manchuria
1941	52,056	excludes Manchuria
1942	75,984	excludes Manchuria
1943	106,146	excludes Manchuria
1944	113,166	excludes Manchuria
1945	29,351	excludes Manchuria

In 1945, seven synthetic oil plants in Japan were bombed, three of which received heavy damage. All seven plants ceased production and had not been able to resume operation by the end of the war. After the war, production of synthetic oil was limited by coal shortages.

In December, 1945, the government abolished the synthetic oil production industry law and declared that they would not help such an expensive industry in the future. The government decided that the Ube Works and Takikawa Works would in the future produce sulfate of ammonia with synthetic oil produced as a by-product. Two plants, the Miike Works and the Wakamatsu Works, would produce synthetic oil only. The present oil capacity of these plants is as shown in Table IV(I).

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Table I(I)
GOVERNMENT SUBSIDIES (YEN)

	Estimated Subsidy	Actual Amount Paid
1934	449,500	
1935	505,300	165,556
1936	552,000	287,092
1937	517,300	455,102

Table II(I)
SYNTHETIC OIL PRODUCED (YEN)

	Process	Gasoline	Other Oil
1938	Hydrogenation Fischer-Tropsch Low-Temp. Carbonization	43.88	17.20
1939	Hydrogenation Fischer-Tropsch Low-Temp. Carbonization	77.00 66.00 47.00	34.00 47.00 18.00
1940	Hydrogenation Fischer-Tropsch Low-Temp. Carbonization	72.00 60.00 39.00	24.00 50.00 13.00
1941	Hydrogenation Fischer-Tropsch Low-Temp. Carbonization	72.00 60.00 39.00	24.00 50.00 13.00

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Table III(I)
PRODUCTION COSTS & RETAIL PRICE OF SYNTHETIC OIL

Type of Product	Process	Production Cost of Synthetic Oil (Yen/kl)	Official Retail Prices (Yen/kl)
Aviation Gasoline	Hydro.	600	444
Motor Gasoline		400	307
Gas Oil A - 1	Hydro & L.T.C.	230	152
Gas Oil A - 2		220	141
Gas Oil B - 1	Fischer-Tropsch	340	177
Gas Oil B - 2		330	167
Gas Oil B - 3		320	157
Semi-diesel Oil	L.T.C.	180	88
Bunker Fuel Oil		100	84

Table IV(I)
SYNTHETIC OIL CAPACITIES

Name of Works	Name of Company	Process	Capacity kg/year
Miike	Nippon Jinzo Sekiyu	Fischer-Tropsch	13,000
Wakamatsu	Nissan Kkitai Nenryo	L.T.C.	21,000
Takikawa	Nippon Jinzo Sekiyu	Fischer-Tropsch	14,000*
Chisso	Ube Kosan	L.T.C.	10,000
Wanishi	Nippon Seitetsu	L.T.C.	1,500
Ube	Teikoku Nenryo Kogyo	L.T.C.	0**
	Total		59,500

* Capacity will decrease to 6,000 kl/year when sulphate of ammonia is produced.

** After one year, plants shall be restablished and shall have capacity 15,000 kiloliters per year.