

THE USSBS REPORTS THAT, THE BOMBING OFFENSIVE AGAINST THE JAPANESE OIL INDUSTRY DID NOT BEGIN UNTIL MAY 1945 ... THE REFINERIES WERE LARGELY INACTIVE FOR LACK OF CRUDE OIL

A REVIEW OF THE DATA ON CRUDE OIL PRODUCTION AND REFINING REVEALS SOME INCONSISTENCIES, AND LEADS TO AN ENTIRELY DIFFERENT CONCLUSION

During World War II, the 315th Bomb Wing, Twentieth Air Force, was assigned the task of destroying the oil refining capacity and oil storage facilities of Japan.¹ After careful analysis and evaluation, the Strategic Intelligence Section of the Air Staff in Washington, D.C. concluded that destroying the Japanese petroleum industry would produce an immediate effect on the tactical situation in the Pacific Area of Operations. The Joint Chiefs of Staff believed that aerial bombardment of Japanese refineries would deprive them of critically needed crude oil and gasoline and would shorten the war. Gen. Carl A. Spaatz, commander of the U.S. Strategic Forces in Europe had seen Germany's ability to wage war severely damaged by the strategic bombing missions against the German oil industry. Later, when he assumed command of the U.S. Army Strategic Forces in the Pacific, Spaatz supported the plan to destroy Japan's petroleum industry, as did Maj. Gen. Curtis E. LeMay, commander of the Twentieth Air Force, and Brig. Gen. Barney Giles, the deputy commander.

Between June 26 and August 14, 1945, the 315th Bomb Wing carried out fifteen bombing missions against Japanese oil refineries and inflicted heavy damage upon the petroleum industry. After reviewing the post-strike photographs of the air attack on one target, the Maruzen Oil Refinery at Shimotsu, General LeMay wrote to the Wing Commander, Gen. Frank Armstrong, "you achieved ninety-five percent destruction, establishing the ability of your crews with the APQ-7 to hit and destroy precision targets, operating at night. This performance is the most successful radar bombing of the Command to date."

The United States Strategic Bombing Survey (USSBS) reports that, "the bombing offensive against the Japanese oil industry did not begin until May 1945. By that time the blockade had achieved its maximum effect and the refineries were largely inactive for lack of crude oil. Many tank farms were completely empty when bombed"² Elsewhere, the Survey states that, "the total amount of oil stocks destroyed between May 1945 and the end of the war amounted to 471,379 barrels (19,797,918 gallons)."³ These figures are very close to the cumulative data obtained for the oil destroyed in bombing missions from May to August 1945, shown in Table 1. These data indicate that 471,341 barrels (19,796,322 gallons) of crude oil, aviation gasoline, motor gasoline, kerosene, gas oil, diesel fuel, fuel oil, aviation lubri-

Table 1: Oil Supplies of Japanese Mainland	by Aerial Refineries
1945	Barrels Gallons
May	203,814 8,560,188
June	103,445 4,344,690
July	103,673 4,354,266
August	60,409 2,537,178
Total	471,341 19,796,322

cating oil, other lubricating oil and miscellaneous oil products were destroyed. In July and August, the last two months of the war, 164,082 barrels (6,891,444 gallons) of oil supplies were destroyed in the bombing campaign.

In Chapter 4 on The Air Attacks and Their Effectiveness, the USSBS reports,

At the Akita refinery of the same company (Nippon Oil Co.) 12,000 100 and 250 pound bombs were released over the target during the last raid of the war. Over 1,200 of them fell into the refinery and oil storage areas. The refinery was in full operation, with furnace fires lighted and equipment filled with oil; a storage area located on a rise of ground adjacent to the refinery contained steel tanks partially filled with oil.... The burning oil from the ruptured tanks in the storage area flowed over the operating section, utterly ruining it.⁴

A review of the data on crude oil production and refining in the U.S. Strategic Bombing Survey reveals some inconsistencies, as the ones cited above, and leads to an entirely different conclusion than was reached by the authors of the Survey with regard to the availability of oil at Japanese refineries during the Twentieth Air Force's bombing offensive in 1945.

It appears that various authors⁵, perhaps relying on the conclusions of the U.S. Strategic Bombing Survey, have also reported that the bombings of the Japanese oil refineries were futile and unnecessary because there was no oil to destroy at these installations. For example, Bradley⁶ reports, "The efforts, however, was criticized by the USSBS. It states that the Japanese were refining virtually nothing by the time the bombing effort started since the blockade had cut off its supply of crude oil from the Netherlands East Indies and the Asian Continent." "Our target selection of the oil industry for the 315th Bomb Wing could be faulted, since it was hitting an already dead industry as a result of the naval

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THE COMBAT CREWS WHO FLEW THE OIL MISSIONS AGAINST THE JAPANESE REFINERIES REPORTED RAGING FIRES AFTER THE BOMBING RUNS

blockade and B-29 mining campaign." Historian Kenneth Werrell wrote,

Despite its great success, Eagle [radar] did not help the war effort. There was no point in destroying Japan's oil plants since their production had peaked between July and September 1943, well before the Boeing B-29 Superforts began their bombing campaign. It was the cutting of the oil imports, not the bombing of the refineries that throttled Japanese fuel.... The bombing destroyed 85 percent of the industry, yet contributed little to ending the war since the facilities were essentially closed down for lack of crude oil.¹

In his book, *Downfall-The end of the Imperial Japanese Empire*, Richard Frank writes, "LeMay assigned the 315th the mission of destroying the Japanese petroleum industry. But ultimately this was the least effective component of the strategic attack upon Japan because the loss of these processing facilities had almost no impact due to the overall lack of crude oil to refine." ⁸ J.B. Smith, in his account of *The Last Mission* flown by the 315th Bomb Wing, reports that "By 1 April [1945] the Allied blockade had effectively shut off all of Japan's foreign oil supply. By the time we began our missions Japan's oil output had been reduced to 3 or 4 percent of its normal refinery yields. Little fuel was being produced domestically, and no supplies were coming from the Southeast. The storage tanks were mostly empty."⁹ Professor Jerome Cohen provides a scholarly review of Japan's economy during the war and reconstruction, with a useful discussion about the role of oil but, he, too, reflects the view set forth in the USSBS, "Seven percent of all U.S. bombs dropped on Japan fell on the oil industry. Every important refinery on Honshu was hit; 85 percent of the total capacity was rendered inoperative but for the most part the bombs fell on inactive plants."¹⁰

While these authors wrote that the Japanese oil refineries and storage facilities did not qualify as strategic targets, because they lacked significant quantities of crude oil and petroleum products the debriefing verbal accounts by the combat crews who flew the oil missions against the Japanese refineries reported raging fires after the bombing runs, fires being fed by the petroleum supplies contained in the refineries. This discrep-

ancy led to a research project whose purpose was to verify or disprove the claim that "there were no strategic oil targets left to destroy in Japan in 1945." Relying on quantitative data obtained from the United States Strategic Bombing Survey, the Nippon Oil Company, the Japan Statistical Yearbook (1950)¹¹, the Geological Survey of Japan¹² and other publications this paper examines these claims about the lack of oil at Japanese refineries and finds them to be unsubstantiated and incorrect.

Nippon Oil Company Data

After more than a year of correspondence and communication with various Japanese organizations (including the Petroleum Association of Japan, the Japan National Oil Corporation, the Petroleum Department of the Ministry of International Trade and Industry, the Japanese embassy in Washington, and the Japan Technical Information Group), quantitative data on crude oil and processed by-products were obtained from the Nippon Oil Company for the period April to September 1945. Table 2 lists the crude oil throughput at nine of the Nippon Oil Company refineries. The original data (in kiloliters), have been converted to U.S. gallons and both sets of data are presented. Of the nine refineries listed, data were furnished for the six refineries located on the Japanese mainland (Kashiwazaki, Niigata, Akita, Yokohama, Kudamatsu and Hokkaido). The data reveal that there were inventories of crude oil at all of these refineries and, in some, significant quantities. (No data were provided for the refineries at Tsurumi and Kansai.) The facility on Taiwan was the only refinery not located on the Japanese mainland.

Total crude oil throughput for each refinery, for the period April-September 1945, is provided as well as the total for each month for all of the refineries. The quantities of the oil at the six mainland refineries are as follows: Kashiwazaki: 15,010.3 kiloliters (3,965,421 gallons), Niigata: 10,881.5 kiloliters (2,874,675 gallons), Akita: 36,867.3 kiloliters (9,739,603 gallons), Yokohama: 3,144.7 kiloliters (830,767 gallons), Kudamatsu: 12,722.2 kiloliters (3,360,951 gallons) and Hokkaido: 4,526.8 kiloliters (1,195,890 gallons). The total crude oil throughput from April-Sep-

Table 2. Crude Throughput at Nippon Oil Refineries* in 1945

Name of Refinery	April Kiloliters-Gallons	May Kiloliters-Gallons	June Kiloliters-Gallons	July Kiloliters-Gallons	August Kiloliters-Gallons	September Kiloliters-Gallons	Total Kiloliters-Gallons
Kashiwazaki	3,129.5-826,751	2,859.1-755,317	2,236.5-590,839	2,747.7-725,887	1,972.0-520,963	2,065.5-545,664	15,010.3-3,965,421
Niigata	1,367.3-361,213	2,121.2-560,379	1,855.0-490,054	1,428.0-377,249	2,994.0-790,955	1,116.0-294,825	10,881.5-2,874,675
Akita* ¹	9,411.0-2,486,198	8,532.3-2,254,063	4,516.8-1,193,248	10,913.5-2,883,128	3,493.7-922,966	0.0-0.0	36,867.3-9,739,603
Yokohama	724.0-191,266	650.6-171-876	79.3-20,949	358.7-94,761	542.7-143,371	789.4-208,544	3,144.7-830,767
Kudamatsu ¹	8,255.2-2,180,859	3,174.9-838,745	1,292.1-341,347	0.0-0.0	0.0-0.0	0.0-0.0	12,722.2-3,360,951
Hokkaido	131.3-34,687	1,084.2-286,424	995.4-262,965	761.9-201,279	852.4-225,187	701.6-185,348	4,526.8-1,195,890
Taiwan	135.0-35,664	153.0-40,420	0.0-0.0	0.0-0.0	0.0-0.0	0.0-0.0	288.0-76,084
Total	23,153.3-6,116,639	18,575.3-4,907,223	10,975.1-2,899,402	16,209.8-4,282,305	9,854.8-2,603,441	4,672.5-1,234,381	83,440.8-22,043,391

* The Nippon Co. did not report data for two of its refineries, Tsurumi and Kansai. *¹ The Akita Refinery was located at the Tsuchizaki Port in Akita Prefecture a Japanese oil refineries bombed by the 315th Bomb Wing, 20th Air Force.

Refinery	Bombing Mission		Crude Oil Reserves, 1945		Percent Reduction
	No.	Date	Kiloliters (Gallons) August	September	
Akita	15	August 14, 1945	3493.7(922,966)	0.0	100%
Kansai (Amagasaki)	8	July 19, 1945	no data available		
	14	August 9, 1945	no data available		
			June	July	
Kudamatsu	2	June 29, 1945	1,292.1 (341,347)	0.0	100%

Name of Refinery	April	May	June	July	August	September	Total
Kashiwazaki	920.5 (243,178)	1,223.8 (323,303)	935.9 (247,246)	719.8 (190,157)	991.6 (261,961)	854.4 (225,715)	5,646.0 (1,491,560)
Niigata							0.0
Akita	607.1 (160,384)	605.0 (159,829)	670.9 (177,238)	773.5 (204,343)	90.0 (23,776)	0.0	2,746.5 (725,570)
Yokohama	-30.5 (-8,057)				41.4 (10,937)		10.9 (2,880)
Kudamatsu	972.8 (256,994)	1,199.6 (316,910)	353.3 (93,335)	411.4 (108,684)	0.0	0.0	2,937.1 (775,923)
Hokkaido	20.0 (5,284)	375.8 (99,279)	325.0 (85,858)		187.0 (49,402)	300.0 (79,254)	1,112.8 (293,980)
Taiwan	59.5 (15,719)	40.8 (10,779)	163.5 (43,193)	0.0	0.0	0.0	263.8 (69,691)
Total	2,549.4 (673,500)	3,445.0 (910,100)	2,448.6 (646,871)	1,809.7 (478,086)	1,310.0 (346,076)	1,154.4 (304,969)	12,717.1 (3,359,604)

Material	Quantity		% of Total
	Kiloliters	Gallons	
Gasoline	12,717.1	3,359,604	15.7
Kerosene	7,286.2	1,924,868	9.0
Gasoil	6,535.2	1,726,469	8.0
Fuel Oil	39,610.9	10,464,408	48.7
Lubricating Oil	15,087.4	3,985,789	18.6
Total	81,236.8	21,461,138	100.0

tember 1945 for these six refineries amounted to 83,152.8 kiloliters (21,967,307 gallons). The grand total for all the refineries was 83,440.8 kiloliters (22,093,391 gallons).

Three of the Nippon Oil Company refineries were struck by the 315th Bomb Wing and this information is given in Table 3. These data demonstrate that at the Akita Refinery, the oil inventories in August 1945 were 3,493.7 kiloliters (922,966 gallons) and after the bombing mission on August 14, 1945 the oil inventories were zero. From April to July 1945 the monthly oil inventories at the Akita Refinery ranged from 4,516 kiloliters (1,193,248 gallons) to 10,913 kiloliters (2,883,128 gallons). The oil inventories at the Kudamatsu refinery in June 1945 were 1292 kiloliters (341,347 gallons) and after the air strike on June 29, 1945 the oil inventories fell to zero (July 1945).

A clue to the origin of the crude oil at the Akita Refinery is contained in the Target Information Sheet for the Akita bombing mission shown in Appendix 1. Section 3 of this document identifies

the Akita refinery as "one of the most important targets in the Japanese Petroleum Industry." And it also, "Processes crude oil from the oil fields around Akita, which are the largest natural petroleum producers in Japan proper." The annual crude oil capacity of these oil fields, in late 1944, was estimated to be 1,320,000 barrels (55,440,000 gallons). The subject of the Japanese oil fields will be discussed later in this paper.

Thus, while the naval blockade and air strikes against Japanese shipping were effective in curtailing or preventing crude oil imports to Japan, domestic oil fields were still capable of supplying shipments of this much needed resource to the refineries.

Table 4 provides data on the quantities of gasoline processed from the crude oil listed in Table 2. Again, in addition to the monthly (April-September 1945) entries for each refinery for which data were available the total quantities in kiloliters and gallons are given for the refineries listed. The total monthly production of gasoline for all the refineries ranged from 1,154.4 kiloliters (304,969 gallons) to 3,445.0 kiloliters (910,100 gallons). The grand total amount of gasoline produced during this period was 12,717.1 kiloliters (3,359,604 gallons).

The Nippon Oil Company also provided useful data on kerosene, gas oil, fuel oil and lubricating oil supplies processed from the crude oil listed in Table 2. This information is summarized in Table 5.

The total quantity of the by-products listed in Table 5 amounts to 81,236.8 kiloliters (21,461,138 gallons). Fuel oil represents 48.7 percent of the total volume of the products, the largest single component, followed by lubricating oil (18.6 percent) and gasoline (15.7 percent).

The data in Table 6 represent the quantities of crude oil at the Nippon Oil Company refineries in 1945 obtained from two independent sources, the U.S. Strategic Bombing Survey (1946) and the Nippon Oil Company in the year 2000. These data are in close agreement, differing by about 9 percent. Both sets of data show that there were between 495,453 and 544,136 barrels (20,809,026 to 22,853,712 gallons) of crude oil at the Nippon Oil Company refineries during the period April to August 1945.

Japan Statistical Yearbook (1950) Data

For the period 1941 to 1945, data on crude oil production in Japan as well as crude oil imports and heavy oil imports have been obtained from the Japan Statistical Yearbook (1950)¹³ and are tabulated in Table 7.

Prior to Japan's entry into World War II crude oil production, for example, in 1940, was 334,834 kiloliters (88.5 million gallons). During the war years crude oil production ranged from 305,720 kiloliters (80.8 million gallons) in 1941 to 245,452 kiloliters (64.8 million gallons) in 1945. It is interesting to note that crude oil production in 1945

Month	Data Source	
	U.S.S.B.S. (1946)	Nippon Oil Co. (2000) *
April	155,564	145,634
May	129,832	116,839
June	88,035	69,033
July	104,408	101,960
August	66,297	61,987
Total	544,136	495,453

* The U.S. Strategic Bombing Survey Data (1946), on p. 47, Table 13, on crude oil was derived from Nippon Oil Refineries at Kashiwazaki, Yokohama, Kansai, Hokkaido, Nagaoka, Kawasaki, Tsurumi, Niigata, Tokyo, Kudamatsu, Akita and Taiwan.

** The data obtained directly from the Nippon Oil Company in the year 2000 reflected crude oil at the following refineries: Kashiwazaki, Yokohama, Hokkaido, Niigata, Kudamatsu, Akita and Taiwan. Three refineries: Nagaoka, Kawasaki and Tokyo were not included. Furthermore Nippon Oil Company did not furnish any data on the Kansai and Tsurumi refineries.

Table 7. Crude Oil and Heavy Oil, 1941-1945

Year	Crude Oil Production		Crude Oil Imports		Heavy Oil Imports		Total		%Imports
	Kiloiliters	Gallons x 10 ⁶	Kiloiliters	Gallons x 10 ⁶	Kiloiliters	Gallons x 10 ⁶	Kiloiliters	Gallons x 10 ⁶	
1941	305,720	80.8	693,812	183.3	465,483	123.0	1,465,015	387.0	79.1
1942	262,605	69.4	559,732	147.9	52,548	13.9	874,855	231.1	70.0
1943	274,524	72.5	980,841	259.1	139,626	36.9	1,394,991	368.5	80.3
1944	254,542	67.2	208,728	55.3			463,270	122.4	45.1
1945	245,452	64.8			6,786	1.8	252,238	66.6	2.7

Table 8. Gasoline, Kiloiliters (Gallons)

Year	Production		Imports		Total		% Imports
	Kiloiliters	Gallons (Mill.)	Kiloiliters	Gallons (Mill.)	Kiloiliters	Gallons (Mill.)	
1941	384,107	101.7	649,202	171.9	1,033,309	273.0	62.8
1942	240,908	63.6	64	.0169	240,972	63.7	0.03
1943	308,244	81.4	5,751	1.519	313,995	82.9	1.8
1944	165,257	43.7			165,257	43.7	0.0
1945	39,450	10.4	77,988	20.60	117,438	31.0	66.4

was only 26.6 percent lower than peacetime production in 1940. Total crude oil throughput at Nippon Oil Company refineries, from April to September 1945, for which data are available, amounted to 83,440.9 kiloiliters (22.0 million gallons), 34 percent of the total crude oil production in Japan as reported in the Japan Statistical Yearbook for 1945. In 1944 the crude oil imports were 208,728 kiloiliters (55.3 million gallons) and represented 45.1 percent of the available crude oil. Crude oil imports in 1945 dropped to zero because of American interdiction tactics while heavy oil imports managed to reach 6,786 kiloiliters (1.8 million gallons), 2.7 percent of available oil. Based on the data published by the Japanese Statistics Bureau in 1950, it is evident that significant amounts of crude oil were being produced domestically in Japan in 1945 (245,452 kiloiliters, 64.8 million gallons). According to Hansell, the Japanese petroleum industry was extremely critical to their war effort and the destruction of their refining and storage facilities would make it much more difficult for them to successfully continue to conduct their war effort.¹⁴

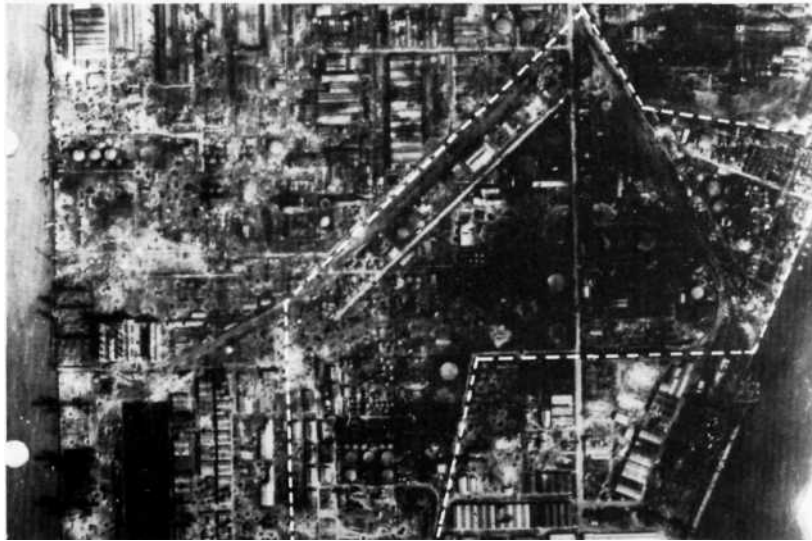
Based on published Japanese data, Table 8 provides useful information on gasoline (kiloiliters and gallons) production, imports, total, and percent imports for the years 1941-1945.¹⁵ One notices that for the year 1944 gasoline imports were zero, but in 1945 imports amounted to 77,988 kiloiliters (20.60 million gallons). This is difficult to explain, except that from September through December, during the Allied occupation of Japan, gasoline may have been imported by the occupying forces.

Japanese publications reveal that domestic gasoline production increased steadily from 1926 to 1937, reaching a maximum of 826,562 kiloiliters (218.4 million gallons) in 1937. In that year imports amounted to 42.7 percent. From that point there was an annual decline in gasoline production and in 1941, 384,107 kiloiliters (101.7 million gallons) of gasoline were produced. By 1944 annual production was reduced even further to 165,257 kiloiliters (43.7 million gallons) and in 1945 it reached a war-time low of 39,450 kiloiliters (10.4 million gallons). This latter figure may be compared to the gasoline produced at the Nippon Oil Company refineries for which data are available. Table 4 indicates that between April-September 1945 12,717.1 kiloiliters (3,359,604 gallons) of gasoline were processed from Nippon crude oil stocks. Therefore, it is estimated that 26,732.9 kiloiliters (7,040,396 gallons) of gasoline was produced at other Japanese refineries for which data were unobtainable.

Synthetic Oil

The production of synthetic oil from coal and its subsequent refining into gasoline should also be factored into the question of whether there were strategic oil targets remaining in Japan in 1945. Of the eleven oil refineries bombed by the 315th Bomb Wing the Ube Coal Liquefaction Company in Ube, Japan was the one that was capable of processing coal into hydrocarbon stock destined for conversion into gasoline and other needed products. Chester Marshall reports that, "the Ube plant was one of the few plants that remained in high production in Japan until we [315th BW] came along. It was not only destroyed on August 5, but also 'sunk' when the surrounding dikes were breached and the area inundated."¹⁶ Figure 1 provides an aerial view of the Ube Coal Liquefaction Company prior to the air strike and Figure 2 shows the destroyed installation after the bombing mission. According to reports on 315th Bomb Wing Operations synthetic oil production dropped 44 percent, representing a loss of 265,000 barrels (11,130,000 gallons). Perhaps, this is why Bradley, in describing the 315th Bomb Wing air attack against the Ube Coal Liquefaction Company states that, "it was probably the most significant of the oil campaign."¹⁷

In 1941, Japan's Inner Zone total annual synthetic oil production was 1,222,000 barrels (51,324,000 gallons). The information in the



(Top) Ube Coal Liquefaction Co. (dashed boundary) before the air strike.

(Above) Ube Coal Liquefaction Co. (dashed boundary) after the air strike.

A 315th Bomb Wing B-29 returns to base at Northwest Field, Guam.

Survey¹⁸ has been converted into Table 9 which lists some of the Japanese oil companies engaged in synthetic oil production, their refineries (works), location and the production actually attained during the war. For the eight oil compa-

nies listed the annual synthetic oil production amounted to 520,125 barrels (21,845,250 gallons). This represents 42.5 percent of the synthetic oil produced in 1941. The Survey¹⁹ also provided information on the synthetic oil production for the early months of 1945 and this has been used to prepare Table 10. For the period April to August 1945, synthetic oil production amounted to 179,929 barrels (7,557,018 gallons), 14.7 percent of the 1941 production.

It is important to include synthetic oil production in the Japanese Home Islands because synthetic oil (which was refined into useful petroleum products) could be produced from domestic coal, coal tar, and oil shale via an industrial chemical process. Thus, while the United States naval blockade and mining operation were very effective in preventing oil shipments from the territories from reaching Japan, it was possible for synthetic oil to be produced on the Home Islands. Each gallon of synthetic oil produced reduced Japan's dependence on oil from other sources by an equivalent amount.

Coal Liquefaction

As coal was one of the essential starting materials for the coal liquefaction plants, the availability of coal in Japan during World War II must be considered. Data on coal production and imports for the period 1941 to 1945 were obtained from the information contained in the Japan Statistical Yearbook (1950)²⁰ and the International Historical Statistics.²¹ These data are listed in Table 11.

In 1945, Japanese coal production amounted to 29,880 kilotons and imports were 312 kilotons or 1.0 percent of the total. This may be compared to the figures for 1941 which indicate 14.4 percent imports, a value close to the prewar (1940) quantity for coal imports that amounted to 14.9 percent. The affect of the American naval blockade, mining operations and air attacks on Japanese shipping is reflected in this marked decrease in imports. In Morgan's review²² of the Japanese war



Table 9. Production of Synthetic Oil at Plants in Japan, Home Islands²³

Name	Location	Production Attained	
		Barrels/Day	Barrels/Year
Nippon Iron Manufacturing Co. (Nippon Seitetsu K.K.) Wanishi Works	Muroran, Hokkaido	50	18,250
Nippon Oil Conversion Industry Co. (Nippon Yuka Kogyo K.K.) Kawasaki Works	Kawasaki, Kanagawa	80	29,200
Nippon Synthetic Oil Co. (Nippon Jinzo Sekiyu K.K.) Omuta Plant Takikawa Works	Omuta.Fukuoka Takikawa, Hokkaido	275	100,375
		110	40,150
Nissan Liquid Fuel Co. (Nissan Ekitai Nenryo K.K.) Wakamatsu Works	Wakamatsu, Fukuoka	350	127,750
Imperial Fuel Industry Co. (Teikoku Nenryo Kogyo K.K.) Ube Works	Ube, Yamaguchi	320	116,800
Toho Chemical Industry Co. (Toho Kagaku Kogyo K.K.) Nagoya Works	Nagoya, Aichi	25	9,125
Tokyo Gas Chemical Industry Co. (Tokyo Gas Kagaku Kogyo K.K.) Yokohama Works	Yokohama, Kanagawa	15	5,475
Ube Industrial Productions Co. (Ube Kosan K.K.)	Ube, Yamaguchi	200	73,000
		1,425	520,125 (21,845,250 gallons/yr)

Table 10. Production of Synthetic Oil (1945)²⁴

Company	Production Barrels	Gallons
1. Imperial Fuel Industry Co. ^a Ube, Naibachi and Naihoro Works	101,456	4,261,152
2. Nippon Synthetic Oil Co. ^b	24,166	1,014,972
3. Nissan Liquid Fuel Oil Co. ^b	36,942	1,551,564
4. Ube Industrial Production Co. ^b	15,787	663,054
5. Nippon Iron Manufacturing Co. ^c	1,578	66,276
6. Toho Chemical Industry Nagoya Works	No Data for	1945
7. Nippon Oil Conversion Industry Co. Kawasaki Works	No Data for	1945
8. Tokyo Gas Chemical Industry Co. Yokohama Works	No Data for	1945
	179,929	7,557,018

SYNTHETIC OIL COULD BE PRODUCED FROM DOMESTIC COAL, COAL TAR, AND OIL SHALE

- a. April-July 1945
- b. April-August 1945
- c. April-June 1945

Table 11. Coal, Kilotons

Year	Production	Imports	Imports From Territory		% Imports
			4,427	Total	
1942	53,540	5,455	3,282	62,277	14.0
1943	55,500	4,068	2,151	61,719	10.1
1944	52,945	2,195	1,129	56,269	5.9
1945	29,880	269	43	30,192	1.0

economy he states that, "of the 6,000,000 tons of merchant ships with which Japan started the war only 2,000,000 tons were left by April 1945." It is also evident that even in peacetime (1940) coal imports represented only a minor percentage of the total available, the bulk coming from domestic

production (mining). In 1941, coal production amounted to 56,472 kilotons, the largest amount of coal produced during the period from 1926 to 1949. This represented 85.6 percent of the available coal. In 1945 the coal production was 29,880 kilotons (99% of available coal), reflecting a 47.1 percent decrease when compared to coal production in 1941. One could conclude that American attacks of the Japanese homeland during 1944 and 1945 contributed to the decline in domestic coal production which incidentally began to increase significantly after the war.

The data in Table 11 demonstrate that even as late in the war as 1945, 29,880 kilotons (29,880,000 tons) of coal were available to the Japanese for war-time use, including utilization at coal liquefaction refineries such as the Ube Coal Liquefaction Refinery. However, it should be mentioned that some of the available coal was of low quality and the high sulfur content often resulted in severe corrosion of the water gas generators in the plants. Also, the shortage of high quality cobalt and thorium catalysts for the conversion of the starting materials to synthetic crude oil led to the use of low activity nickel as a catalyst.

Despite production problems significant quantities of synthetic oil were produced. Returning to Table 9 we see that the synthetic oil production attained in Japan prior to the B-29 air strikes from May to August 1945 was 21,845,250 gallons. The synthetic oil production from April to August 1945, reflected in Table 10, amounted to 7,557,018 gallons.

Japanese Oil Fields

The Japanese oil fields located on Hokkaido and Honshu, contained more than 4,000 oil wells. Table 12, dealing with the quantities of oil produced at these oil fields, has utilized data from the Survey.²⁵

During the first half of 1945, the oil produced at the 4,277 operating oil wells on the mainland of Japan amounted to 739,600 barrels (31,063,200 gallons). This was about 50 percent of the crude oil produced by these wells in 1944, 1,482,500 barrels (66,265,000 gallons). According to other survey data²⁶ during the first seven months of 1945 the total crude oil still amounted to 950,000 barrels (39,900,000 gallons). When equivalent time periods are used for the production in 1945 the difference between the two sets of figures is about 10 percent.

In 1941 the oil storage capacity in Japan was about 60,000,000 barrels, (2,520,000,000 gallons). As a result of the aerial bombing in 1945 85 percent of the storage capacity was destroyed. The remaining 15 percent oil storage capacity amounted to 9,000,000 barrels (378,000,000 gallons).

Table 13 contains 1945 data on crude oil and refined oil from seven Japanese oil companies and two military refineries extracted from the United States Strategic Bombing Survey.²⁷ For each of the

Table 12 Crude Oil Production, Japan (Homeland Islands)

Location	Number of Fields*	Producing Wells	Crude Oil Production, Barrels		Reduced Production, % 1945 vs. 1944
			1944	1945**	
Hokkaido	9	444	36,400	17,600	51.6
Honshu					
1. Akita	15	1,301	812,000	390,600	51.9
2. Yamagata	7	253	278,000	154,700	44.4
3. Niigata	24	2,279	356,100	176,700	50.4
	55	4,277	1,482,500 (66,265,000 gallons)	739,600 (31,063,200 gallons)	

* Crude oil fields in Japan are located along a north-south line from Hokkaido to the West Coast of Honshu.

** First half of 1945.

Table 13. Production of Crude Oil and Refined Oils (1945)²⁸

Oil Company	Crude Oil Charged		Refined Oils	
	Barrels	Gallons	Barrels	Gallons
1. Mitsubishi Oil Co. Kawasaki Refinery	10,002 ^a	420,084	13,876	582,792
2. Maruzen Oil Co. ¹	88,739	3,727,638	81,663	3,429,846
3. Showa Oil Co. ²	145,381 ^b	6,106,002	127,832 ^a	5,368,944
4. Daiko Oil Co. ³	No Data Available for 1945			
5. Koa Oil Co. ⁴	17,184 ^c	721,728	16,184	679,728
6. Nippon Mining Co. ⁵	189,173 ^d	7,945,266	187,459 ^e	7,873,278
7. Toa Fuel Ind., Co. ⁵	75,335 ^e	3,164,070	74,222 ^d	3,117,324
8. Japanese Naval Refineries ⁶	69,190 ^f	2,905,980	132,293 ^g	5,556,306
9. Japanese Army Refineries ⁷	0 ^h	0	27,969	1,174,698
Total	595,004	24,990,168	661,498	27,782,916

1. Includes Yokohama, Osaka, Funamachi, Imafuku, Osaka (Toyo Sekiyu), Matsuyama, and Wakayama refineries

2. Includes Kawasaki, Kainan, Hikoshima, Sekiya, Tokyo, Hirasawa, and Niigata Refineries

3. Includes Niitsu, Niigata, Tokyo and Yokkaichi refineries

4. Includes Yokohama and Marifu refineries

5. Includes Wakayama and Shimizu refineries

6. Includes second, third and sixth naval depots

7. Includes Iwakumi, Shihei and Kinsei refineries

a. April-July 1945

b. April-September 1945

c. April 1945

d. April-September 1945

e. April-June 1945

f. April-May 1945

g. April-August 1945

h. April-June 1945

Note: The total refined products are more than the crude oil charged because semi-finished products were also processed.

oil companies and the military installations their operating refineries and depots are identified. Also, the specific production period (months) during the year 1945 are indicated when such information was provided. In 1945, the Nippon Mining Company produced the largest amounts of crude oil, 189,173 barrels, (7,945,266 gallons) and refined oil, 187,459 barrels (7,873,278 gallons). The total production of crude oil for all these companies and refineries in 1945 was 595,000 barrels (24,990,168 gallons) and the quantity of refined oil amounted to 661,498 barrels (27,782,916 gallons). Because semifinished products were used in addition to the crude oil the quantity of refined oils is greater than the crude oil. Grant²⁹ reports that in 1945 proved oil field reserves at the beginning of the year amounted to 17,977,000 barrels (755,034,000 gallons). Thus, there was a very large

quantity of crude oil potentially available for use by the Japanese oil refineries in 1945 if the facilities had not been destroyed or damaged by the 315th Bomb Wing air raids.

Conclusion

The United States Strategic Bombing Survey and other publications dealing with crude oil and synthetic oil production and refining concluded that by 1945, Japan had so little oil at its refineries and storage facilities, as to make them unworthy targets for bombardment. This conclusion is both unsubstantiated and incorrect. In fact, the data presented in this article refutes the conclusions reached by the Survey and the other publications cited. The data presented here arrives at an altogether different set of conclusions, summarized as follows:

1. Oil production from the 4,277 operating oil wells in Japan during the first six months of 1945 amounted to 739,000 barrels (31,038,000 gallons). Data in the Survey report for the first seven months of 1945 list the oil production as 950,000 barrels (39,900,000 gallons).

2. The Survey reported that during May-August 1945, B-29 air strikes against the Japanese Home Islands petroleum industry destroyed 471,379 barrels (19,797,918 gallons) of oil supplies. Other data in this literature report the oil supplies destroyed in bombing missions as 471,341 barrels (19,796,322 gallons). There is less than 1 percent of difference between these two sets of figures.

3. Data on crude oil supplies for the Nippon Oil company for the period April-August 1945 from two independent sources reveal the following:

	<u>USSBS (1946)</u>	<u>Nippon Oil Co.(2000)</u>
Barrels	544,136	495,453
Gallons	22,853,712	20,809,026

4. Data on crude oil supplies for 1945 from other Japanese oil companies and refineries:

	<u>Crude Oil Charged</u>	<u>Refined Oils</u>
Barrels	595,004	661,498
Gallons	24,990,168	27,782,916

5. Combining the Survey report crude oil figures for the Nippon Oil Company and the other Japanese oil companies and refineries for which data are available:

	<u>Crude Oil</u>	<u>Refined Oils</u>
Barrels	544,136	22,853,712
	595,004	<u>24,990,168</u>
	1.139.140	47.843.880

6. As it has not been possible, thus far, to obtain crude oil and refined oil data on all the Japanese oil companies in operation during 1945, the quantities cited must be considered an underestimate. To support this assumption the data from the



Japan Statistical Yearbook (1950) shows that total crude oil production in Japan in 1944 was 254,542 kiloliters (67, 244,906 gallons) and in 1945 it was 245,452 kiloliters (64,843,509 gallons). The 1945 figures represent 80.3 percent of the total crude oil production for 1941 (305,720 kiloliters, 80,765,110 gallons), the peak year for crude oil production in Japan during World War II. The quantity for crude oil production in 1941 (80,765,110 gallons) derived from the Japan Statistical Yearbook is in good agreement with the

amount noted in the Akita Target Information Sheet for crude oil produced from homeland wells in 1941 (81,522,000 gallons).

7. The goal of this article is to stimulate discussion of this important military historical question. Hopefully, this discussion will lead to additional research on this subject and make it possible to further improve our understanding of the B-29 aerial bombing campaign against the Japanese petroleum industry in 1945. ■

NOTES

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