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12, 1944

COMMENTS ON BRITISH A.O. (44) 41

THE OIL POSITION IN AXIS EUROPE FIRST SIX MONTHS OF 1944

Commentary by the Enemy Oil Committee

1. We agree with the Hartley Committee that the oil supplies of the European Axis are currently below requirements, which latter have already been reduced to extremely low levels.
2. The time lag between the loss of significant sources of oil and reduction in German military operations would in our belief be short. We cannot specify the duration of such time interval with precision because it is determined by the amount of time deficit which must be made good from stocks, by the size of available stocks and by the supplies which may yet be diverted from civilian and non-operational military use.
3. The curtailment of military supplies would be felt at the front whereas further deep cuts in non-military consumption, even though ultimately fatal, will not immediately affect front line activity. An enemy determined to fight to a finish will choose the latter course, and thus further delay military collapse.
4. We completely endorse the conclusion inherent in the Hartley Report that oil can be made outstandingly limiting factor on the scope and duration of the German war effort by the continued destruction of the synthetic plants and refineries.

20 July 1944

1. It is the purpose of this report to present a summary of the work done during the period from 1 July 1944 to 31 July 1944. The work was done in the laboratory of the Department of Chemistry, University of California, Berkeley, California. The work was done under the direction of Professor R. M. Barrer and the assistance of Mr. J. H. Duerksen and Mr. J. H. Duerksen.

2. The first part of the report describes the work done during the period from 1 July 1944 to 31 July 1944. The work was done in the laboratory of the Department of Chemistry, University of California, Berkeley, California. The work was done under the direction of Professor R. M. Barrer and the assistance of Mr. J. H. Duerksen and Mr. J. H. Duerksen.

3. The second part of the report describes the work done during the period from 1 July 1944 to 31 July 1944. The work was done in the laboratory of the Department of Chemistry, University of California, Berkeley, California. The work was done under the direction of Professor R. M. Barrer and the assistance of Mr. J. H. Duerksen and Mr. J. H. Duerksen.

4. The third part of the report describes the work done during the period from 1 July 1944 to 31 July 1944. The work was done in the laboratory of the Department of Chemistry, University of California, Berkeley, California. The work was done under the direction of Professor R. M. Barrer and the assistance of Mr. J. H. Duerksen and Mr. J. H. Duerksen.

1. The production ratio to the first quarter of 1944, as reflected in Table 1, does not accurately portray the total damage to the German oil economy resulting from aerial attacks. To evaluate the full effect of bombing on the German strategic oil position, it is necessary to review the development of the present situation.

2. The crude oil production of the Reich is estimated to be capable of a rate of 5,500,000 tons/year on 1 July 1944, as shown in Table 1. However, at present it is the amount of operable

refining capacity which determines the quantity of crude oil produced. The production of oil is therefore dependent on the amount of refining capacity available.

3. The works of refineries began in the first half of 1944. The present working refinery capacity of 5,500,000 tons/year was reduced over the period April through June to approximately 2,800,000 tons/year. The reasons for this are stated as follows: (1) the reduction in the number of refineries operating; (2) the reduction in the amount of crude oil available; and (3) the reduction in the amount of refining capacity available. The reduction in the amount of refining capacity available is due to the fact that the refineries are operating at a lower capacity than they were previously.

4. The German refining capacity has been reduced to a level of about 2,800,000 tons/year (8,000,000 tons/year potential), which is a significant reduction. The German authorities have attempted to meet the situation through three basic measures: (1) the shut-in of the production of oil; (2) the storage of oil; and (3) the use of oil in the fields and refineries, to be used when refining capacity is available. The German authorities have also attempted to meet the situation by increasing the production of oil in the fields and refineries, to be used when refining capacity is available. The German authorities have also attempted to meet the situation by increasing the production of oil in the fields and refineries, to be used when refining capacity is available.

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and Romania in Europe for treatment in the unused refinery capacity of those areas.

20. The plan to refine Romanian oil in other areas of Europe was blocked by the extension of aerial attacks during May and June to include the majority of the refineries of Austria, Hungary, Germany, Yugoslavia and Italy. Refineries in France, Czechoslovakia and Poland were also attacked, but the total refining capacity of these latter countries had only been moderately reduced by 1 July 1944. Thus, far from being able to treat displaced Romanian crude oil, the operating refineries of other Axis countries have been so damaged as to be unable to handle all of the indigenous crude oil of Austria, Hungary and Germany. The Germans are, therefore, currently forced to store or shut in crude oil in these countries as well as in Romania. There still remain ^{operational} ~~refineries~~ ^{refineries} in Holland, France and Belgium with a total capacity of ~~tons~~ ^{tons}/year. These plants might be put into operation within an average period of about a month, unless they have been ~~completely~~ ^{partially} ~~destroyed~~ ^{damaged}. Aerial reconnaissance in early ^{July} ~~June~~ indicated that the Germans had to that date ~~not~~ ^{not} attempted to use these refineries. The loss of production resulting from attacks on European refineries, and the estimated recovery rates for the damaged plants is indicated in Annex II. The figures there shown are subject to the considerations of paragraph 18 below.

21. Aerial attacks on synthetic plants began in May and by 1 July all but two of the great hydrogenation complexes (the Fischer-Tropsch plants) had been more or less severely damaged. The Fischer-Tropsch plants have been less frequently the object of attack, as they are of

lesser importance owing to their generally smaller output and lack of proper refining capacity. That is, the primary oil production of Fischer-Tropsch plants must in large part be sent to outside refineries for finishing, and as these refineries are now so reduced in capacity as to be unable to treat all the crude oil available, they are likewise unable to handle the Fischer-Tropsch oil. The loss of production and rates of estimated recovery for the hydrogenation and Fischer-Tropsch plants is shown in Annex III, which is subject to the considerations of paragraph 15.

12. The German production position on 1 July is shown by Table II below, and affords a fair appraisal of the effects of the damage to refineries and synthetic plants as summarized in paragraphs 9-11.

~~ESTIMATED PRODUCTION OF LIQUID FUELS FROM CRUDE OIL~~
~~IN THE UNITED STATES - 1944 - 1945~~

(In thousands of metric tons)

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13. ~~has~~ has been indicated in paragraph 6, the rate of production is now subject to rapid variation. Our estimates of the rates at which currently damaged plants can be repaired (Annex II, III) have considered each plant individually, and have assumed that the plant will not be subject to further attacks during the repair period. To 1 July some 55 plants have been attacked and most of these were simultaneously in need of repair. It is impossible that all these plants could be repaired concurrently at the rates shown in Annex II and III. Actually, the Germans must select a relatively small number of plants for reconstruction at the estimated rates, or work will go forward at a far slower rate than we have indicated.

14. A consideration of the supply position in terms of products indicates that although shortages prevail in all categories, it is in the lighter ends that they are accentuated. We believe that the German supply of aviation gasoline is drawn almost entirely from the hydrogenation plants, and is proportionately curtailed as these are destroyed. The production of motor gasoline is dependent to a considerable extent on the cracking installations of refineries and this cracking equipment has suffered disproportionately large destruction or long term damage. Thus, shortages in aviation and motor gasoline may be expected to develop at a more rapid rate than is indicated by the supply position as a whole. The specialized facilities which produce high grade lubricants have also been heavily damaged, and shortages of this product are already reported.

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15. The minimum level to which Axis oil production can be reduced may be estimated, for all practical purposes, at about 25 per cent of normal production, or some 4,000,000 metric tons. This is a very low level, and results from the fact that synthetic plants and refineries are very large, integrated installations which cannot be dispersed or placed underground. On the other hand, sources of benzol, alcohol, tar oils, and vegetable and regenerated lubricants will not be affected by the bombing of major oil installations; we are allowing some 258,000 metric tons/year as production from "unknown" synthetic oil plants, which cannot be attacked unless they are located; the law of diminishing returns will probably make it unprofitable to bomb known installations beyond very low rates of production. Crude oil, in ultimate emergency, could be used as fuel oil after allowing it to weather in the open for a period. A weighted allowance for all these factors suggests that it would be neither feasible nor profitable to attempt to reduce German oil supplies below a level of about 4,000,000 tons/year. The operation of the Western Axis military economy at this rate of supply would in any case be impossible.

16. Total European Axis consumption of liquid fuels and lubricants in the first six months of 1944 was at the annual rate of 14,444,000 metric tons, or an average monthly rate of 1,200,000 tons. The breakdown of the total by products and uses is shown in Table III:

TABLE III

AXIS MONTHLY CONSUMPTION OF PETROLEUM PRODUCTS, JAN.-JULY 1944 - ANNUAL RATE

(In thousands of metric tons)

	1943 1944	AIR FUEL	MILITARY FUEL	CIVILIAN	TOTAL
Aviation Gas	-	1,684	14	33	1,686
Motor Fuel	3,880	284	44	1,650	5,444
Kerosene	-	-	-	606	606
Lubricants	102	70	35	750	1,079
Signal Oil	1,684	62	448	922	3,240
Fuel Oil	-	-	1,384	1,321	2,720
TOTAL	5,106	2,036	1,730	3,520	12,444

1/ Including requirements of Axis organization.

17. The monthly rate of civilian consumption declined steadily during the semester to a low of about 550,000 tons/month as of 1 July in consequence of large cuts in allocations throughout all of Axis Europe, and the loss of large areas in Russia.

18. Military consumption increased sharply in June over the preceding quiescent period, but the rate of consumption by 1 July is estimated at only about 650,000 tons, or slightly below the average rate of the first six months. The explanation lies fundamentally in the fact that

the attacks on oil production facilities, fuel dumps and transportation have forced the adoption of severe measures of economy. In addition, the Axis military strength appears also to be rapidly deteriorating. The tremendous losses in manpower and equipment suffered in June can be only partially replaced, so that consumption of liquid fuels and lubricants would also decline from this cause. On the other hand, the Axis armies now have shorter and better lines of communication, especially in the East, and this factor is only partly offset by the attacks on rail transportation in the West and in Italy, which have compelled the enemy to rely largely on road transport in those areas.

19. All the foregoing factors are evaluated in Table IV below which estimates the annual rate of consumption on 1 July.

TABLE IV

AXIS EUROPEAN CONSUMPTION OF LIQUID

PETROLEUM PRODUCTS, RATE AS OF JULY 1, 1944^{1/} (in metric tons)
(000's missing)

	<u>GROUND FORCES</u>	<u>AIR FORCES</u>	<u>NAVAL FORCES</u>	<u>CIVILIAN</u>	<u>TOTAL</u>
Aviation Gas	-	1,980	12	24	1,996
Motor Fuel	2,940	512	36	1,140	4,428
Kerosene	-	-	-	440	440
Lubricants	144	72	36	620	872
Diesel Oil	1,118	96	420	680	2,314
Fuel Oil	-	-	1,176	1,296	2,472
TOTAL	4,200	2,400	1,630	4,200	12,430

^{1/} Excluding extraordinary cases.

^{2/} Including requirements of Todt organization.

20. The total stocks available for making good the deficit between supply and demand we estimate, on admittedly inadequate data, as being 1,500,000 tons on 1 July 1944. It has been necessary for the Germans to distribute the larger part of these stocks over the whole area of Axis Europe, to accord with their strategic planning and their possible commitments. Thus only a relatively small fraction can be available in central depots to meet the unforeseen requirements of Axis Europe wherever these might arise.

21. It is in our belief unlikely that the Germans will continue to withdraw from stocks for any considerable time to make good deficits at the rate of 300,000 tons/month as calculated for 1 July. It is probable that they will choose to adapt consumption to current production, regardless of the shortages of military and essential civilian supplies such may entail.