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CENTRAL INTELLIGENCE AGENCY

INTELLIGENCE MEMORANDUM NO. 185

17 June 1949

SUBJECT: The Abrasive Industry of Eastern Europe and the USSR.

Abrasives are of critical importance in a state's war potential, and represent one of the most sensitive points at which an industrial economy can be controlled. Artificial abrasives and industrial diamonds, necessary to advanced industrial technics, are among the items in which the Soviet-controlled economies stand in great need. Although both the USSR and Czechoslovakia have sizeable abrasives industries, their combined production is not sufficient for their own requirements, to say nothing of those of the entire Soviet orbit. The USSR's most critical lack is in precision grinding wheels, which Soviet industry cannot yet manufacture, and without which Soviet machine tool production is quantitatively and qualititively handicapped. With all its abundant resources, the USSR is dependent upon imports for such essentials in the abrasives industry as graphite electrodes, silk bolting cloth, natural rubber, and shellac.

Shipments of abrasive raw materials and finished abrasives are helping to alleviate this shortage to some extent. In view of the limited information available on abrasives production and requirements, it is extremely difficult to relate western shipments to the normal requirements of Eastern Europe. It is estimated, however, that actual shipments have not been in excess of current requirements, and that therefore stockpiling of abrasives has not been possible. Western exports of abrasives to Eastern Europe would have been larger had it not been for the initial inability of American and British suppliers after the war to fill the large orders from Eastern Europe, and the more recent refusal of American manufacturers to accept Soviet or Satellite orders.

A detailed report on the abrasives situation in Eastern Europe and the movement of abrasives to that area is attached as Enclosure "A".

Attention is drawn to earlier information on this subject presented in IM-82 and IM-150. Further information will be provided as it becomes available. A comprehensive study of the abrasives situation in the world as a whole is under preparation.

Note: This memorandum has not been coordinated with the Intelligence Organizations of the Departments of State, Army, Navy, and Air.

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An edition which has been modified to protect certain CIA sources has been prepared for more general distribution. Document No. 001

ENCLOSURE A

THE ABRASIVE INDUSTRY OF EASTERN EUROPE AND THE USSR

1. Introduction.

Abrasives are of the greatest importance to any industrial economy. The process of grinding, involving the use of abrasives, enters into every phase of precision production in the metal working and optical industries, as well as being a major standard production method in all types of light and heavy industry.

Abrasives found in the natural state, with the exception of diamonds and the better grades of corundum, are too soft for most industrial uses. This report will therefore be concerned with artificial abrasives with brief mention being given to industrial diamonds.

The artificial abrasive industry is of American origin and began in the latter part of the 19th century when the American scientist, Dr. E. G. Acheson, discovered the electrode method of producing artificial abrasives. Dr. Acheson subsequently founded the Carborundum Company to exploit this process, and that company now has several subsidiaries in Europe. The United Carborundum Company in Czechoslovakia was formed as the result of the purchase by Czech industrialists of Dr. Acheson's patents. The technical know-how for manufacturing artificial abrasives is available or in practice in most of the industrial countries of the world including the USSR. The United States has always been the leading producer, consumer, and exporter of artificial abrasives.

Artificial abrasive products employ the use of either of two basic commodities, aluminum oxide or silicon carbide. Both of these are produced in electric furnaces. The crystals that result from this electrolytic process are crushed and then sifted into grain sizes. It is these grains which go into

the production of coated abrasives, such as sandpaper and garnet cloth, and into the bonded products-- grinding wheels, sticks, and hones.

Approximately 60 percent of the output of crude silicon carbide is used for abrasive grain; the remainder is used for refractories. All except a small fraction of the fused aluminum oxide production goes into abrasive grain.

Approximately 15 percent of abrasive grain is used in the manufacture of coated abrasives; 25 percent is employed as grain in a wide variety of uses such as sandblasting; the bevelling and polishing of glass, granite, marble and stone; lithographing; and in refractories. The remaining 60 percent is used in bonded abrasives - wheels, sticks, and hones.

The production of abrasive crude is dependent upon an adequate supply of raw materials--bauxite in the case of fused aluminum oxide, and silica and high-grade coke for silicon carbide (petroleum coke is required for the better grades of silicon carbide). A large quantity of cheap electric power is required to run the electric furnaces, while a certain degree of ceramic know-how is basic to the whole operation.

Abrasive wheels consist of the abrasive grain (aluminum oxide or silicon carbide), bonded together with some other material such as kaolin feldspar, china clay, natural rubber, or shellac. Vitrified wheels, containing one of the clay products mentioned above, constitute approximately 50 percent of the output of abrasive grinding wheels. The manufacture of grinding wheels requires a higher degree of technical know-how than the production of abrasive grains. Advanced technical knowledge is of particular importance in the manufacture of precision grinding wheels.

The field of coated abrasives is considered to be of less importance than that of bonded abrasives and is therefore omitted from this survey.

2. Abrasive Situation in Eastern Europe and the USSR.

The study of the abrasive industry in eastern Europe and the USSR is hampered by the paucity of prewar and postwar information on requirements, production, and to a lesser extent, on imports. Scattered bits of information must be pieced together and the resultant gaps must be filled by intelligent estimates.

Only the USSR and Czechoslovakia possess a significant abrasive industry. Both countries produce abrasive grain and grinding wheels, although Czechoslovakia produces no silicon carbide. Hungary manufactures enough grinding wheels for its own use but has to import all of its abrasive grain requirements. Poland, Rumania, and Yugoslavia produce no abrasive grain and only small quantities of grinding wheels. They are therefore dependent upon outside sources for the major part of their abrasive requirements. Albania and Bulgaria are so little industrialized that their abrasive requirements are of minor significance.

The following country by country analysis is divided into two parts, the first dealing with abrasive grains and the second with grinding wheels.

3. Specific Abrasives.

a. Abrasive Grains.

(1). USSR.

(a). Requirements and Production.

Soviet requirements for abrasive grains are estimated to be around 30,000 tons annually. Estimates of Soviet production[1/], based upon an

1/ This production estimate does not take into account production in the Soviet Zone of Germany, which in 1943 amounted to 20,000 tons of aluminum oxide and 7,000 tons of silicon carbide. If the Soviet Zone plants were now in full production and their output were at the disposal of the Soviets, the USSR should have no worries about its abrasive grain requirements. Two Soviet Zone abrasive

(Cont'd on page 4)

Analysis of individual plant production, approximate 15,000 tons of fused aluminum oxide and 10,000 tons of silicon carbide yearly. Silicon carbide grain is believed to be in shorter supply than aluminum oxide.

Further expansion of Soviet abrasive grain production to the point where it can supply the entire domestic requirement is favored by:

(1) An adequate supply of electric power.

(2) Adequate manpower;

(3) Sufficient ceramic know-how;

(4) A plentiful supply of silica for the production of silicon carbide.

Limiting factors include (1) a probable shortage of petroleum coke for the production of the better grades of silicon carbide; (2) an inadequate supply of high-grade bauxite (low in both iron and silica content) for the production of white aluminum oxide; (3) the need to import silk bolting cloth for sizing the fine grain; and (4) a shortage of graphite electrodes for electric furnaces.

Of these limiting factors, the most critical bottlenecks are probably petroleum coke and graphite electrodes. Silk bolting cloth is manufactured only in Switzerland but the Soviets are presumably able to import this material from Swiss suppliers.

The USSR might be able to overcome all of these limitations by imports. Should these materials be denied to the Soviets, however, their abrasive industry

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Footnote: (Cont'd)
plants have reportedly been dismantled and shipped to the USSR. If, as also reported, these plants were cannibalized by the Soviets some time before their removal, Soviet technicians may have had some difficulty putting them into operation on Russian soil. The SovZone abrasive picture is at present so clouded by conflicting information that it seems best, for purposes of this study, to exclude it from the computation of total USSR abrasive production.

would be severely hampered, at least until new sources could be developed within the Soviet orbit.

(b). Imports.

During the war the U.S. shipped large quantities of abrasive crude and grain to the USSR under the Lend-Lease program. (See Appendix A). These shipments reached a peak of 5,035 tons for the calendar year 1945. It is quite likely that the Soviet abrasive industry was unable to utilize all of the abrasive grain it received under lend-lease and was therefore able to stockpile a portion of the grain for later use.

U.S. shipments were reduced to a trickle after lend-lease was cut off and amounted to only 48 tons during 1948. This amount would undoubtedly have been much larger had not U.S. manufacturers turned down most of the orders emanating from the Soviet orbit.

So far as is known the only other significant source of Soviet abrasive imports is Norway, which during 1948 shipped 420 tons of silicon carbide to the USSR.

(c). Inquiries.

Few Soviet inquiries (or suspected Soviet inquiries) for abrasive grains have been received by U.S. abrasive manufacturers. The last large-scale Soviet order to circulate in the U.S. was placed in 1946 and called for 3520 tons of abrasive grain, of which 2575 tons were for aluminum oxide and 945 tons for silicon carbide. To the best of our knowledge this order was never filled.

The only recent Soviet inquiry for abrasive grains was an order for 520 tons of green silicon carbide received by several U.S. companies in March 1949.

One U.S. manufacturer received identical orders from five different agents and identified them as being similar in quantity, specifications, and terminology with an inquiry placed by Teccno Import in Moscow. Green silicon carbide is important because of its use in the manufacture of wheels used for grinding tungsten carbide tools. No known production of this material exists within the Soviet orbit probably because it requires the use of petroleum coke in its manufacture. To the best of our knowledge no U.S. firms have quoted on this order. The quantity is not considered to be in excess of current Soviet requirements for silicon carbide.

(2) Czechoslovakia.

(a) Requirements and Production.

Czech requirements of abrasive grains are estimated at 8,000 tons of aluminum oxide and 3,000 tons of silicon carbide annually. United Carborundum is the only producer of abrasive grains in Czechoslovakia and has a reported annual capacity of 8,000 tons of aluminum oxide. Official Czech statistics, however, report that 1948 production of this commodity was only 6,121 tons. United Carborundum has apparently failed to restore its silicon c rbide furnaces since the war, and Dr. Novak, the Company's director, has made persistent efforts to obtain this product in the United States.

(b) Imports.

The Czechs have indicated that they were purchasing 1,000 tons of silicon carbide a year from Norway and that they desired to purchase another 2,000 tons in the United States. In 1948, however, the Czechs purchased only 420 tons of silicon carbide from Norway and 813 tons from the United States. They have apparently had no need to import any of their aluminum oxide require-

ments and have demurred to the offers of U.S. manufacturers to substitute aluminum oxide for Czech silicon carbide orders.

(c) Inquiries.

During the last three years the Czechs have tried repeatedly, and for the most part unsuccessfully, to secure large quantities of silicon carbide from the U.S., but the quantities requested have not been in excess of Czech requirements. The following inquiries have been reported during 1949, on all of which the American companies have refused to quote:

(i) 1,000 tons of silicon carbide for the manufacture of refractories. Inquiry received 11 February 1949 from U.S. agent for Pancosma Ltd., Geneva, Switzerland.

(ii) 6.5 tons of silicon carbide. Inquiry received 11 February 1949 from Siegel Chemical Co., Inc., Brooklyn, N.Y.

(iii) 2,000 tons of silicon carbide. Inquiry received 1 April 1949 from Overseas Marketing Services, London.

In each of the above cases the agents involved stated the inquiries had come from Czechoslovakia.

(3) Hungary.

(a) Production and Requirements.

Hungary has no known production of abrasive grains. Hungarian abrasive grain requirements, largely for her grinding wheel industry, are estimated at 400 tons of aluminum oxide and 150 tons of silicon carbide annually.

(b) Imports.

In 1948 Hungary imported 48 tons of abrasive grains from the United States, none from Norwegian, British, or Italian manufacturers.

(c) Inquiries.

The Central Board of the Hungarian Ceramic Industry has made numerous attempts to procure abrasive grains from U.S., British, and Canadian suppliers. In a few cases these inquiries have been placed directly by the Board. In most instances, however, the orders have been placed with American, British, and Dutch agents. The following is a list of the inquiries which have been received:

Date of Inquiry	Agent	Material	Amount	Action
A. By a U.S. Manufacturer of Abrasives:				
1. 10/8/48	Hungarian Ceramic Ind.	Aluminum Oxide	409 tons	No quote
2. 10/8/48	B. Rupke, Utrecht	Aluminum Oxide Silicon Carbide	840 tons 150 tons	No quote No quote
3. 11/12/48	M. Denes, Budapest	Aluminum Oxide	400 tons	No quote
4. 11/17/48	Block Int. Corp., N.Y.	Aluminum Oxide regular & white	several hundred thousand pounds of each	No quote
5. 12/14/48	New World Suppliers, N.Y.	Aluminum Oxide	-not stated-	No quote
B. By a U.S. machine tool and abrasive Co.:				
1. 12/6/48	Corregidor Ltd., London	Abrasive Grains	440 tons	No quote
2. 12/7/48	Hungarian Ceramic Ind.	Identical order as above,		No quote
3. 12/1/48	U.S. export agent	Aluminum Oxide	374 tons	No quote
B-1. By Same Company's UK subsidiary:				
1. 12/-/48	Corregidor Ltd., London	Abrasive Grains	100 tons	No quote
C. U.S. Exporter:				
1. 3/-/49	Hungarian Govt.	Aluminum Oxide	100 tons	export license applied for

Added together, these inquiries would represent amounts far in excess of Hungary's requirements. The similarity of many of the orders indicates, however, that the same order was probably placed with a number of agents in the hope that at least one of them would materialize.

(4) Poland.

(a) Production and Requirements.

Poland produces no abrasive grains. Requirements for such grains probably range from 200 to 300 tons a year.

(b) Imports.

During 1948 Poland imported 174 tons of silicon carbide from Norway. The U.S., Britain, and Italy exported no abrasive grains to Poland in 1948.

(c) Inquiries.

(1) 100 tons of aluminum oxide. Placed by the Polish American Supply Corporation, New York, with an American manufacturer in December 1948. Latter advised customer to obtain an export license and has heard nothing further regarding the order.

(5) Rumania.

(a) Production and Requirements.

Rumania produces no abrasive grains. Rumanian requirements are estimated at 200 to 300 tons a year.

(b) Imports.

So far as is known, there have been no shipments of abrasive grains from the U.S. and western Europe to Rumania since 1946. The USSR has reportedly shipped some abrasive grain to Rumania from Germany.

(c) Inquiries.

(i) 200 to 300 tons of abrasives, including silicon carbide and aluminum oxide. Received during 1948 by an American exporter. So far as is known, this exporter did not accept the order.

(6) Yugoslavia.

(a) Production and Requirements.

Yugoslavia produces no abrasive grains. Requirements are estimated at 300 to 500 tons annually.

(b) Imports.

During 1948 Yugoslavia imported 109 tons of abrasive grains from Italy, 45 tons from Norway and none from the United States. Imports during 1947 included 110 tons of silicon carbide from Norway and 217 tons of aluminum oxide from the United States.

In addition to the above, three trade treaties signed by Yugoslavia in 1948 called for the shipment of abrasive materials to that country. The treaty with Czechoslovakia signed 24 May called for the shipment of 3,000,000 Korunas worth of abrasives to Yugoslavia. A trade agreement with the SovZone of Germany signed on 15 November 1948, effective until 31 May 1949, provided for shipment of aluminum oxide to Yugoslavia. A trade treaty with Austria signed on 31 August 1948 provides for the shipment to Yugoslavia of abrasive materials to the value of $50,000. (Grinding wheels may be included in the category of "abrasive materials" in some of these treaties). There is no confirmation of actual shipments under any of these agreements. It does not appear that the quantities in the aggregate would go any further than the supplying of Yugoslavia's current requirements.

(c) Inquiries.

(i) 1,500 tons raw abrasives. Inquiry received 21 December 1948 by U.S. exporter from Pav Impex, New York City, a firm with Yugoslav connections. In April 1949 Pav Impex informed the U.S. exporter that the order had been filled in Europe. It is doubtful whether any single European manufacturer could fill such a large order which is certainly in excess of Yugoslav requirements.

(ii) Numerous additional inquiries of Yugoslav origin were received by U.S. firms during 1948. The total quantity exceeded 16,000 tons, two-thirds of it aluminum oxide and the other third silicon carbide. To the best of our knowledge, none of these inquiries was filled. It is believed that the Yugoslav Government hoped by placing these orders to fill its import requirements in their entirety even though only a fraction of the quantities requested were actually shipped. The desire to stockpile may also have been the motive behind these large orders, although even for stockpiling requirements, the quantities requested were excessive.