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CENTRAL INTELLIGENCE AGENCY

# INFORMATION REPORT

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SUBJECT The Ilyich Abrasive Plant, Leningrad, USSR

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THIS IS UNEVALUATED INFORMATION 50X1

1. The Ilyich Plant located on the north bank of the Neva River in the Vyborg District of Leningrad, up until 1932 produced mainly natural abrasive materials. However, after 1932 the production of electrocorundum and silicon carbide (carborundum) was increased until today it makes up the main portion of production of the plant. The reprocessing of natural abrasives has been limited in production to materials for fine polishing and finishing operations (super-finish, polishing, lapping, honing). 50X1

2. The following artificial abrasives are produced at the Ilyich Plant:
   a. Electrocorundum, normal ($Al_2O_3$ - 87 to 97%)
   b. Electrocorundum, white ($Al_2O_3$ - 98 to 99%)

   Note: Black electrocorundum ($Al_2O_3$ - 75 to 85%) as obtained by melting bauxite of a low silicon content without dioxidation agents is not produced for industrial use. White electrocorundum is produced in an amount equal to about 20% of normal electrocorundum.

   c. Black silicon carbide (SiC - 95 to 98%)
   d. Green silicon carbide (SiC - 97 to 99%)

   Note: Green silicon carbide is produced in an amount equal to about 15 to 20% of total production.

   e. Rouge (iron oxide)
   f. Crushed glass

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3. The following natural abrasives are used at the plant for production of abrasives: corundum, emery, granite, pumice. These were used in making the following:
   a. Grinding discs of different sizes, grain, hardness, structure and binding.

   Note: About 80% of the discs produced are made by pressing on a ceramic binding. Molten discs are no longer produced. The remaining 20% are pressed on bakelite and vulcanite bindings. The discs pressed on silicon and magnesian bindings are produced in very small amounts, usually on special order.

   b. Segments for combination discs used for flat polishing.
   c. Grinding bricks for honing-process and super-finish.
   d. Various hand files and plates.
   e. Abrasives with a grain varying from #5 to #500.
   f. Paper and linen abrasives (cemented) of emery and sandpaper.
   g. Various abrasive powders and pastes.

4. The main production of the Ilyich Plant, however, is grinding discs and bricks for machine finishing. Grinding discs are also produced at the Chelyabinsk, Zlatoustov and "Smychka" plants. Various abrasive discs and paper, linen, pastes and powders from natural abrasives are produced by some cooperative organizations and artels as well as in the plants belonging to the "Union Graphite-Corundum Trust", such as the Techinsk and Kyshtym plants.

5. Because there are no diamond deposits in the USSR, all diamond abrasives are imported. (Diamonds found in the Ulal /Ulala/ and Enisseysk /Krasnoyarsk/ districts are a mineralogical rarity.) Because of this fact, wherever possible, diamonds are replaced by durable, hard metals. For example, diamond tools for fine grinding are replaced by T15k6C, T60k6, etc; diamond drills by wolomit[illegible] (94% W /or D/, 4% C, 2% Fe - hardness, 9.8 by Moh's scale). [illegible] carbide /pure corundum/ the hardest material known next to the diamond, did not have any practical significance, since its production and use did not occur beyond the limits of laboratory tests and some factory experiments. Current literature, however, mentions that after World War II the "bar" carbide began to be used in mass production. Its application is still limited to finishing jobs and finishing instruments of hard metal. It is difficult to learn whether "bar" carbide is being produced in one of the above mentioned plants or is being imported from occupied Germany.

6. The machine building department of the Ilyich Plant has a small building section and fairly good mechanical shops. The department produces simple one and two sided polishing headstocks for the hand finishing of tools, universal machines for grinding various instruments and tools and specialized grinding machines for sharpening chucks, spiral drills, etc.

7. The plant occupies a fairly large area (one to 1½ km square). Most of the buildings are of one story; a few are two stories. The buildings housing the electro-furnaces and plant management have four stories. A large area is given over to unloading and stocking of raw materials. The entire plant area is criss-crossed with a transportation system which connects with the Finnish railroad system.

8. The equipment in the mechanical repair shop is very old and in poor condition from neglect. The equipment in the mechanical shops of the machine building department is fairly new and well chosen for the production of grinding machines. The equipment in the shops for reprocessing abrasives is the worst in the plant. It is varied, about one-half being worn out and of old make. Despite this, I would like to point out that the plant receives much attention and in the past, old, worn out equipment was being replaced as quickly as possible. By now the equipment is probably in excellent shape - at the expense of East German industry.

9. The plant has four, low-charge electrode furnaces for melting electrocorundum and one (possibly two) electric furnaces with a heated core for melting silicon carbide. Two electric furnaces for corundum were installed around 1935. They have a moveable base which is placed on a pushcart. Meltings are made "on block" with a closed charge hole. The size of the molten block is about two or 2½ meters in diameter and about the same in height. Melting "on release" is not made at all. Two other electrical furnaces for corundum were installed around 1931. They have stationary bottoms and the size of the block is less than two meters (diameter). The electric furnace used for silicon carbide was installed in 1930 - 1931. It is built on a firebrick base. The side walls can be dismantled after each melting. The full capacity of this furnace is about 60 tons. The maximum amount of carbide obtained from one melting is: black, up to 10 tons; green, up to five tons. The black carborundum is the main production since the melting process of the green carborundum is more expensive, requires greater electric power consumption (for one ton of black carborundum, up to nine thousand kw/hr; for green, up to 12 thousand kw/hr) and three to four tons of cooking salt for each melting. The problem of obtaining salt in the USSR is unsoluble. To accomplish the norms set for production, it is more advantageous to produce the black carborundum since with the same charge, the output of black is almost twice that of green carborundum. Therefore, the plant is trying to limit the production of green carborundum to the 2% which is formed at the core on each black melting.

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10. [redacted] no data on current production. However, before World War II the carborundum output was 18 thousand tons (metric) in blocks (113 thousand tons in grain). This was for both the Ilyich and the Chelyabinsk plants since these were the only two plants in production.

11. The Ilyich Plant uses mainly the Tikhvinsk bauxite, although the quality is lower than the Ural bauxite. According to Soviet standards the coefficient of bauxite (siliceous modulus - $\frac{Al_2O_3}{Si\,O_2}$) must be between seven and 10. The Tikhvinsk bauxite coefficient does not exceed 7.8, but because the Tikhvinsk supply is nearby (and Soviet transportation difficulties are always present) it led to the maximum use of Tikhvinsk bauxite. Attached is a table of the basic components of Tikhvinck and Ural bauxite. (The bauxites are placed according to decreasing siliceous modulus ($\frac{Al_2O_3}{Si\,O_2}$)

12. Quartz and sand are delivered to the plant from the Leningrad area. A better quality (than Leningrad) is also brought from Karelia /Karelo-Finnish Soviet Republic/. Natural corundum is obtained from Semiz-Bugu in the Kazakh area. Corundum is also found in Yakutia /Yakutsk/ along the Chainyga River /sic/ /Chainguja or Khaiyngyya/ but it is too far from Leningrad to be transported efficiently. Emery is obtained from the Priirtysh Mines near Kyshtym in Chelyabinsk. This emery contains from 20 to 60% of corundum. Granite (almandine) is obtained from Karelia (Finnish SSR) and a very good grade comes from the Urals. Pumice is brought from Armenia and the North Caucas region.

13. As a rule the Ilyich Plant processed all raw materials, but in the late thirties crushed corundum began to be produced at the Kyshtym plant of the Union - Graphite - Corundum Trust and crushed emery at the Techinsk plant of the same trust.

14. I do not know the source of power for the Ilyich Plant for sure but believe it is either the Dubrovinsk power plant on the Neva River or the Volhov hydroelectric plant. There are no other possibilities. The electric furnace charges are placed usually during the night-time when the electric power consumption of other enterprises is reduced.

15. The plant worked on three shifts. On the day shift there were about five hundred workers, two hundred on the evening and one hundred to 150 on the night - morning shift. (These figures are exact for the years 1936 - 1937.) Women made up about 15% of all workers, doing mostly plant administration work or cleaning. The administrative section was very large, as is common in the Soviet. (A typical example is the case of the Finnish power plant taken by the Soviets during the Finnish - Soviet War. The Finns operated the plant with eight people. The Soviets replaced them with 42, 30 of them being put in the administrative section.) 50X1

16. [redacted]

17. Up until 1935 the production of the plant was of very low quality. The crystallization of the abrasives was not large enough, was of the wrong isometric form and large amounts of impurities were present. In crushing, the grains came out in swordshape and thin, leaf-like forms. The ceramic bases were very brittle and the discs were not homogeneous. The stamping of discs did not always correspond to their real qualities. However, with the help of the Leningrad Chemistry - Technology Institute and Tsnilash (Central Scientific Research Laboratory of Abrasives and Polishing) these difficulties were overcome, with the result that by 1938 the quality of production was rather good. However, for the important, responsible jobs, particularly in war (defense) plants, the imported discs were preferred. In general, the production of the Ilyich Plant was for internal use and only a small percentage of selected an tested discs were exported, mostly to Turkey and Iran.

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ENCLOSURE (A): Table of Tikhvinsk and Ural Bauxites.

## TABLE OF TIKHVINSK AND URAL BAUXITES

| Origin | Mineralogical Characteristic | Composition of Basic Components in Per Cent | | | | | | $\frac{Al_2O_3}{SiO_2}$ | Temperature - °C. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $Al_2O_3$ | $SiO_3$ | $Fe_2O_3$ | FeO | $TiO_2$ | CaO | | Softening | Melting |
| North Ural | Diasporous | 77.4 | 0.88 | 2.1 | -- | 3.12 | 0.70 | 88.0 | 1860 | 1945 |
| North Ural | Diasporous | 59.9 | 0.85 | 23.8 | 2.21 | 2.60 | 1.03 | 70.0 | 1705 | 1790 |
| North Ural | Diasporous | 55.1 | 1.12 | 28.8 | -- | 2.43 | 0.64 | 49.2 | 1650 | 1730 |
| North Ural | Bementite | 57.6 | 2.64 | 22.0 | 1.05 | 3.0 | 0.95 | 21.9 | 1690 | 1755 |
| North Ural | Diasporous | 63.7 | 3.6 | 11.3 | 2.44 | 2.65 | 1.2 | 17.7 | 1730 | 1820 |
| North Ural | Diasporous | 52.6 | 3.26 | 28.5 | -- | 2.37 | 0.76 | 16.1 | 1600 | 1650 |
| South Ural | Bementite | 56.6 | 3.91 | 21.23 | 1.72 | 3.75 | 1.10 | 14.2 | 1595 | 1735 |
| North Ural | Diasporous | 56.9 | 4.08 | 23.0 | -- | 2.29 | 0.86 | 14.0 | 1580 | 1630 |
| North Ural | Diasporous | 59.26 | 4.52 | 19.01 | -- | 2.32 | 0.84 | 13.1 | 1630 | 1700 |
| North Ural | Diasporous | 61.94 | 5.88 | 10.41 | 6.48 | 2.62 | 1.02 | 11.4 | 1670 | 1730 |
| North Ural | Diasporous | 55.5 | 6.12 | 21.3 | -- | 2.17 | 0.70 | 9.1 | 1650 | 1730 |
| South Ural | Bementite | 55.2 | 6.86 | 16.8 | 5.72 | 3.10 | 1.10 | 8.3 | 1565 | 1640 |
| Tikhvinsk | Bementite | 51.25 | 6.6 | 26.2 | 0.86 | 1.80 | 1.39 | 7.8 | 1580 | 1675 |
| Tikhvinsk | Bementite | 57.5 | 7.54 | 18.4 | -- | 3.21 | 1.30 | 7.6 | 1575 | 1680 |
| North Ural | Diasporous | 54.12 | 7.74 | 20.1 | -- | 2.23 | 0.90 | 7.0 | 1595 | 1710 |
| Tikhvinsk | Hydrargillite-Kaolinite-Calcite | 44.2 | 7.22 | 18.7 | -- | 1.43 | 8.2 | 6.1 | 1500 | 1640 |
| North Ural | Diasporous | 50.2 | 9.16 | 23.5 | 0.43 | 2.37 | 0.65 | 5.5 | 1580 | 1650 |
| Tikhvinsk | Bementite-Kaolinite | 46.5 | 10.1 | 20.4 | -- | 3.83 | 4.80 | 4.6 | 1525 | 1640 |
| North Ural | Diasporous | 46.96 | 12.1 | 22.4 | -- | 2.45 | 0.94 | 3.9 | 1560 | 1590 |
| Tikhvinsk | Bementite-Kaolinit | 46.1 | 13.1 | 25.5 | -- | 2.57 | 0.63 | 3.5 | 1545 | 1600 |
| North Ural | Kaolinite-Diasporous | 43.8 | 14.0 | 26.4 | -- | 2.17 | 0.90 | 3.1 | 1460 | 1520 |
| North Ural | Diaspo-Bementite-Kaolinite | 38.3 | 15.4 | 14.5 | 16.4 | 2.25 | 1.28 | 2.5 | 1440 | 1480 |
| Tikhvinsk | Bementite-Kaolinite | 51.1 | 20.2 | 22.5 | -- | 1.50 | 0.40 | 2.5 | 1570 | 1635 |

In 1934 the estimated deposit of Tikhvinsk bauxites was 5,680,000 metric tons.
In 1934 the estimated deposit of North Ural bauxites was 10,920,000 metric tons.

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