## THE TUNGSTEN ORE MINE OF PECHTELSGRUEN, SAXONY

### Location, Ownership, etc.

The mine, until 1945 the property of "Gewerkschaft Vereinigung," Halle, an I.G. Farben subsidiary, is now nationalised as the "Volkseigener Betrieb Wolframitgrube Pechtelsgruen der VVB Buntmetall" (People-owned enterprise, Pechtelsgruen Wolframite Mine of the Association of People-owned Enterprises for Nonferrous Metals), and is owned by the Metallurgical Administration of the German Economic Commission. The mine is located near the town of Lengenfeld, Vogtland, near the Chemnitz - Hof "Autobahn."

The digging of the mine was begun in 1934, and production first began in 1936. The mine shaft was first dug to a depth of 100 meters and extended to 150 meters in 1943/1944. The washing plant had a capacity of 100 tons per day. The mine was also equipped with a rock-crushing and sorting plant, the capacity of which was increased to 200 tons per day in 1943/1944. The mine and the ore-dressing plant were connected by an aerial railway. The mine was in operation until 1945.

During the last phase of the war, the conveyor tower was blown up by the Americans and the mine was flooded. The ore-dressing plant resumed operations in September 1945. Until the new conveyor tower was set up, the ore-dressing plant processed crude ores and pyrite concentrates which had been stored.

### Present Condition

In February 1947, reconstruction work was hard hit by the confiscation of the crusher and dressing plant by the Wismut A.G. A small dressing plant was then built, which began operation in September 1947. It processes about 25 tons per day. Since the mine has to fulfill a quota, only high-content ores are processed.

Production from 1936 to 1944 in tons (wet) was as follows:

| Year | Crude Ore Production Tons Wet | Crude Ore Production To Dump | From Dump to Sorting | To Sorting | Sorted | To Dressing |
|---|---|---|---|---|---|---|
| 1936 | 2,950 | 2,950 | - | - | - | - |
| 1937 | 2,993 | 2,993 | 73 1) | 73 1) | - | 73 1) |
| 1938 | 684 | 684 | - | - | - | - |
| 1939 | 8,797.1 | - | 6,488.3 | 15,285.4 | 2,904.5 | 12,380.9 |
| 1940 | 26,866.1 | 314.3 | 380.0 | 26,931.8 | 7,395.8 | 19,536.0 |
| 1941 | 30,474.5 | - | - | 30,474.5 | 8,130.4 | 22,344.1 |
| 1942 | 35,959 | - | - | 35,959 | 5,980 | 29,979 |
| 1943 | 37,513 | - | - | 37,513 | 6,713 | 30,800 |
| 1944 | 36,594 | - | - | 36,594 | 3,694 | 32,900 |
| Total | 182,830.7 | 6,941.3 | 6,941.3 | 182,830.7 | 34,817.7 | 148,013.0 |
| Dry tons | 164,600 | 6,240 | 6,240 | 164,600.0 | 31,046.5 | 133,553.5 |

1) 73 tons of crude ore for ore-dressing experiments

Starting with 1945, the statistical data are less reliable. As far as can be ascertained, they are as follows:

| Year | Crude Ore Production Tons, Dry | Dressing Plant Throughput Tons, Dry |
|---|---|---|
| 1945 | 11,454 | 9,924 |
| 1946 | 18,297 | 14,710 |
| 1947 | 1,191 | 800 |
| 1948 | 3,888 | 3,923 |
| Total | 34,830 | 29,357 |
| 1936/48 | 199,430 | 162,910 |

## Mining Installations

The wolframite mined comes from the "Neue Hoffnung" mining region which covers an area of 8,512 hectares and which is adjoined, in the northwest, by the "Kirchberg-West" field with an area of 5.2 hectares.

Mining is carried out on four levels, 50 meters, 100 meters, 150 meters, and 180 meters. The horizontal tunnels are connected with each other and with the surface.

The mine, in addition to conveying, pumping, and compressor machinery, ventilation plants, repair shops, storehouses, miners' wash house and kitchen, and office buildings, also owns a small granite quarry.

The present mode of operation, that is, of processing only high-content ore, is dangerous, since the low-content ores are not even mined. Alone, they are probably not worth mining, and their tungsten content will be completely lost unless a much lower yield and correspondingly higher cost per kilogram of WO are accepted.

Personnel

The personnel of the mine has fluctuated a great deal, as shown in the following table:

| Year | | Mine, Underground | Mine, Surface | Dressing Plant | Total |
|---|---|---|---|---|---|
| 1944 | | | | | 425 |
| 1946 | | | | | 211 |
| 1947 | Jan | 96 | 128 | 131 | 355 |
| | Feb | 53 | 112 | - | 165 |
| | Apr | 40 | 45 | - | 85 |
| | Sep | 33 | 42 | 13 | 88 |
| 1948 | Jan | 36 | 46 | 17 | 99 |
| | Sep | 71 | 41 | 44 | 156 |
| 1949 | Mar | | | | 195 |

Prospects

The "Kirchberg-West" field may be considered a reserve field for this mine, because it should yield higher-content ores at greater depth. This has been proved by investigations.

## Geological Data

General geomorphological data:

The Pechtelsgruen wolframite mine is located 3/4 kilometer east of the village of Pechtelsgruen, on the eastern slope of the Höllberg (503 meters). The deposit is a pneumatolytic-hydrothermal transitional deposit. It is assumed that, in accordance with the nature of such deposits, wolframite ore will be found at greater depths.

Special characteristics of the deposit:

The wolframite deposit at Pechtelsgruen consists of a bundle of veins about 500 meters in length in individual quartz apophyses, accompanied by narrow greisen ribbons. At the point where the quartz apophyses vanish, they turn into narrow greisen zones on either side of a narrow fissure; then these too disappear. After a short distance, the greisen zones reappear, then develop into quartz, accompanied to a greater or lesser extent by greisen zones. The total thickness of the quartz apophyses and greisen zones remains fairly constant. Where the quartz apophyses lie close enough together to be mined simultaneously, they are worth mining for their wolframite content. At greater depths, there is a tendency for the individual quartz apophyses to concentrate into veins of lesser thickness, about 50-70 centimeters altogether.

Number of deposits or veins:

For a stretch of about 500 meters, the veins are close enough together to be worth mining. Similar zones have been found elsewhere in the vicinity, e.g. in the Lohnbach region, at the Jagdhuette, and on the Galgenberg near Stangengruen, but it has not yet been definitely established whether or not these deposits are worth mining. Further investigations are planned.

Country rock:

The country rock of the deposit is Kirchberg granite, a medium-grained biotite granite with about 33 percent quartz, 20-30 percent orthoclase, 30-40 percent plagioclase, and 7 percent biotite. Close to the wolframite-bearing quartz the granite has been metasomatically converted to greisen, and has been more or less kaolinized. It consists of quartz and muscovite, and also contains some apatite and very slight amounts of cassiterite. The latter is frequently fused with mica and is never larger than 100 microns. The greisen contains no topaz and no tourmaline, but does sometimes contain wolframite. The thickness of the greisen veins increases with depth, and sometimes exceeds 10 centimeters.

Position of the deposit:

The wolframite-bearing quartz apophyses trend regularly and in a straight line from northwest to southeast, dipping about 77° to the northeast. They increase in thickness with depth, but decrease in number.

The quartz apophyses diverge in bundles to the northwest and to the southeast, simultaneously becoming thinner and lower in wolframite content. The northwestern part of the bundle has a dip fault, trending to the north-northeast and having a 70° to 80° dip to west-northwest, of a height of 60 to 80 meters, so that the deposit at the 50-meter level is not worth mining while that at the 100-meter level, not touched by the fault, is a borderline case. It is probable that the quartz apophyses are more concentrated at greater depth and contain more wolframite beyond the fault. The southeastern part of the zone is also bordered by a fault, trending east-northeast with an 84° to north-northwest dip. This fault was found on the 150-meter level. The conditions beyond this fault are still unknown.

Composition of minerals:

The percentage of $WO_3$ in individual ore samples fluctuates so greatly - from 0.1 to several percent - that an average content figure cannot be given. The rubble which is called ore nowadays probably contains an average of 0.3 to 0.4 percent $WO_3$.

The tabulation given below applies not to average ore but to ore which may be called rich. Although the analysis has been computed to a 100-percent basis, the alkali analysis is obviously missing.

| | |
|---|---|
| $SiO_2$ | 81.16 % |
| CaO | 3.97 |
| $Al_2O_3$ | 10.31 |
| MgO | 0.10 |
| Fe | 2.07 |
| MnO | 0.05 |
| $WO_3$ | 0.72 |
| S | 0.96 |
| P | 0.02 |
| Mo | 0.01 |
| As | 0.04 |
| Cu | 0.01 |
| Pb | - |
| Bi | - |
| Rest-O | 0.58 |
| | 100.00 % |

Rest-O = residual O

The concentrates from the wet mechanical dressing process were divided into four classes, I, II, IIIa and IIIb, according to their magnetization capacity. Group I contained 12 percent of the concentrate, with a $WO_3$ content of over 70 percent. Group II contained 7 percent of the concentrate, with a $WO_3$ content of over 45 percent. Group III contained 81 percent of the concentrate, with a $WO_3$ content of over 9 percent.

In a second separation of group III into IIIa and IIIb, a small amount of highly concentrated ore was obtained, but the pure gravel still contained 3-4 percent $WO_3$ in the form of scheelite.

An analysis of ore samples in August 1946 showed the following result:

| Type of Ore | | I | II | IIIa | IIIb |
|---|---|---|---|---|---|
| $SiO_2$ | % | 1.32 | 0.99 | 1.03 | 9.57 |
| $WO_3$ | % | 74.33 | 68.13 | 39.46 | 2.93 |
| FeO | % | 19.48 | 22.61 | 33.81 | 0.91 |
| MnO | % | 5.30 | 5.53 | 7.05 | - |
| CaC | % | 0.17 | 0.16 | 2.03 | 1.0 |
| S | % | 0.16 | 3.68 | 16.40 | 46.05 |
| As | % | - | Spur | 0.06 | 0.02 |
| $P_2O_5$ | % | - | - | 1.60 | 0.94 |
| Fe | % | - | - | - | 38.31 |
| Pb | % | 0.3 | 0.2 | 0.3 | - |
| Cu | % | 0.05 | 0.1 | 0.25 | 0.2 |
| Mo | % | - | - | - | 0.24 |
| Sb | % | 0.05 | - | - | - |
| Ag | g/t | 25 | 60 | 42 | - |
| Bi | g/t | 25 | 40 | 45 | Spur |

Spur = trace

The values below the line are for another sample.

The spectroscopic examinations carried out on the same sample brought the following results:

| Type of Ore | I | II | IIIa | IIIb |
|---|---|---|---|---|
| Cu | // | // | /// | + |
| Sn | // | // | / | - |
| Ta | /// | // | / | - |
| Nb | // | // | - | - |
| Ti | + | + | // | // |
| Ag | - | - | / | // |
| Pb | // | // | // | + |
| Zn | - | - | /// | + |
| Y | + | + | /// | - |
| Mo | / | // | /// | // |
| $U_3O_8$ | - | - | - | - |



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Symbols: - ... none

/ ... trace

// ... approximately 0.001 to 0.01 percent

/// ... approximately 0.01 to 0.1 percent

+ ... above 0.1 percent

If these analyses are approximately computed on the basis of the mineral components, the result is as follows:

| Type of Ore | I % | II % | IIIa % | IIIb % |
|---|---|---|---|---|
| Quartz | 1.32 | 0.99 | 1.03 | 9.57 |
| Wolframite (H/F = 0.071) | 72.02 | 61.92 | 1.72 | - |
| Huebnerite | 22.79 | 24.92 | 36.79 | - |
| Scheelite | 0.87 | 0.84 | 10.43 | 3.64 |
| Magnetite | 3.79 | 0.75 | - | - |
| Pyrrhotite | - | 10.09 | 29.05 | - |
| Pyrite | 0.30 | - | 10.81 | 81.99 |
| Arsenopyrite | - | - | 0.14 | 0.06 |
| Vivianite | - | - | 6.08 | 2.46 |
| Apatite | - | - | - | 0.33 |

Method of assaying:

Assaying was carried out only during the first development period of the mine. No regular assaying was done while the mine was in production. No data are available on the actual metal content of the crude ore or on the yields. No tests whatsoever were conducted on the molybdenum content.

The sand dumps were once tested for molybdenum, showing 0.027 percent Mo and 0.45 percent $WO_3$. It was estimated that this corresponded to an average $WO_3$ content of 0.36 percent.

At the present no systematic assaying is carried out, either in the mine or in the processing plant. Only 10-day samples are tested for $WO_3$ to control the dressing process. The sulfur content in the concentrates is also determined.

Reserves:

(NOTE: Original contains a detailed breakdown of reserves in tabular form; a summary of total figures is given below.)

Certain ores: Crude ore: 211,370 tons, average $WO_3$ content 0.37 percent, 740 tons $WO_3$.

Probable ores: Crude ore: 89,500 tons, average $WO_3$ content 0.45 percent, 402.6 tons $WO_3$.

Possible ores: Crude ore: 500,000 tons, average $WO_3$ content 0.3 percent, 1,500 tons $WO_3$.

(NOTE: Page 14 is missing from original.)

Plans for further investigation:

Investigations are planned both along the trend of the veins and at greater depths. A 230-meter level is planned and the 180-meter level is to be extended to the northwest and the southeast.

The areas of Lohbach and Galgenberg give indications of the presence of wolframite and will also be investigated more closely.

Mining operations:

Method of operation:

The mine consists of one vertical conveyor shaft, from which tunnels run out at 50-meter intervals, with the exception of the lowest, which is only 30 meters below the 150-meter level. The headways are driven through vein sections which are connected by transverses to the conveyor shaft. Vertical overhand stopes and ramps with an inclination of 45° serve for ventilation, access, explorations, and for the transport of material to fill up the empty galleries. Since there are few lateral faults, the number of search tunnels is small.

The mining methods used are overhand stoping and magazine mining. [redacted] The latter was considered safe and was widely employed, since the granite around the veins seemed solid. Recently, however, a 20-meter stretch of the magazine on the 100-meter level collapsed, so that this practice will probably not be continued.

In overhand stoping, mostly outside material is used for filling, since all the material mined is conveyed to the surface. The fill material is obtained from the dead heaps and the waste from the dressing process. Separation by hand in the mine was carried out for a while, in order to bring to the surface only ore of the highest possible content, but since the poor lighting and the dirt make this a difficult and uneconomical process, it has been discontinued.

In overhand stoping, the mining depth varies between 1.5 and 3. meters. The height of the machine is 2 meters.

In February 1945, the output was 2.60 tons per man per shift. From 1944 to May 1946, mining costs for magazine mining were computed at 5.89 marks per ton of ore and 8.3 per ton of ore for stoping.

In stoping, the 2-meter high face is blasted with drill holes 1.5 meters in length, made by compressed air drills. The debris is hauled to roller conveyors in mining carts or wheelbarrows, then transferred from the rollers into mining carts of 0.4 cubic meters capacity and 600-millimeter gauge and pushed to the conveyor shaft by hand. The conveyor in the vertical shaft has a capacity of 22 tons per hour.

The capacity of the mine:

The bottleneck at the mine is the dressing plant, which is now a temporary installation. A new permanent dressing plant is to be built, with a capacity of 50 tons per day. In order to meet this figure, a production of 15,000 tons of ore per year is required. With the necessary expansion, the mine might attain a production capacity of 90,000 tons per year, but it may not be possible to reach this figure because of the danger of silicosis. Since the dressing plant at present has a maximum throughput of 25 tons per day, the ore production can be only 7,500 tons per year (650 tons per month, or 25 tons per day). According to the state of development of the mine, a dressing plant with 150 tons per day throughput would be most appropriate, plus a picking plant to remove about 21 percent, i.e. a crude ore production of 190 tons. The planned 50-ton-per-day plant is only an emergency solution, conditioned by the circumstances of the present times.

For the first half of 1949, the production quota of tungsten concentrate has been set at 45 tons of types I and II. According to this, using 1948 production as a basis of reckoning, the mine would have to produce 43 tons of 68 percent $WO_3$ and 2 tons of 50 percent $WO_3$, which would have to represent 88 percent of the $WO_3$ content of all the ore mined. Since the dressing plant can operate only at a 60-percent yield, production has been estimated at 34.4 tons of $WO_3$ (see table, p. 19). Under these conditions, the crude ore would have to contain 57.3 tons of $WO_3$. This means that the crude ore would have to have a $WO_3$ content of 1.53 percent with a throughput of 3,750 tons semiannually. The quota is thus much too high, and the mine is forced to employ spoliation practices to meet it. Even after the ore-dressing plant has reached a capacity of 50 tons per day, ore with a $WO_3$ content of 0.77 percent would have to be processed in order to fill the present quota. This fairly high percentage figure is not in accord with the ore reserve situation at the mine, and the quota should be considerably reduced, unless the mine is to be exhausted within a short time or unless poorer ores, which are worth mining only in conjunction with richer ores, are to be lost to production. Such a reduction would, of course, drive up the costs per ton of $WO_3$, but some of this increased cost could be made up for by a more rational operation of the mine. The optimal operational figure of 150 tons of ore per day throughput in the dressing plant cannot be achieved because of the prevailing conditions which do not favor further expansion of the installation.

In consideration of the ore reserve situation, the quota must be reduced. Otherwise, after a year, when the present rich ores are exhausted, the quota will either have to be reduced anyhow, or the mine will have to be shut down.

Drainage:

Since the dimensions of the underground installations are relatively small, the seepage is slight. The total seepage is 250 to 300 liters per minute, one-quarter on the 100-meter level, one-half on the 150-meter level, and one-quarter on the 180-meter level.

The 100-meter level is equipped with pumps with a capacity of 1.5 cubic meters per minute. The water is acid and is neutralized with calcium hydroxide.

The pumps on the 50-meter level have a capacity of 1.5 cubic meters per minute and those on the 180-meter level a capacity of 0.5 cubic meters per minute.

Ventilation:

The ventilator has a capacity of 300 cubic meters per minute. Special ventilation is provided for the faces.

Since several serious cases of silicosis have occurred in the mine during the past few years, the danger of dust must be checked by strict measures.

In order to make this possible, the mine will have to be expanded so that it can operate on only one production shift per day. This will allow the dust to settle, and give crews time to hose down all places which might be sources of dust.

Production losses:

The losses are either those connected with the type of mining method used, or those which can be controlled by proper operation. Both in magazine mining and in stoping, posts must be left standing to prevent collapse, and the ore losses caused by this practice vary between 5 and 20 percent. However, rock slides and collapses in magazine mining can increase this figure considerably.

No exact figures are available for losses in mining by the stoping method, but they can be assumed to be below 5 percent; however, while the manual separation method was employed for the purpose of producing only high-content ore, the losses probably were between 20 and 40 percent.

The average losses are estimated at 10 percent.

Miscellaneous:

Although the narrow cross-section of the shafts is sufficient for the conveying installations and carts, it is an obstacle to effective control of silicosis. It would have been better from the standpoint of silicosis control if the shaft had been wider.

## Ore Dressing

The crude rubble consists of quartz with coarse or fine interspersed wolframite. Pyrite and some molybdenum are also found. The associated rocks, greisen and granite, also form part of the rubble which is mined. The wolframite is mostly contained in the quartz; only very little of it is contained in the greisen, along with cassiterite. The ore dressing is comparatively easy.

The crude ore can be dressed, after it has been sorted, in a wet mechanical tub washing and buddle process. The wolframite-pyrite concentrate obtained thereby can be separated magnetically.

At present the dressing process is very primitive. The ore is first ground in a rock crusher and then finely ground in two roller mills. It is then graded on screens and washed in two tubs and one buddle. Since rich ores are given preference in processing, in order that the quota can be met, the waste from the washing still contains so much tungsten that it would be processed under normal circumstances. The waste from the tubs contains 0.3 to 0.6 percent WO and that from the buddles 0.12 to 0.25 percent. These wastes are usually put back into the mine as filler material, so that they can be mined again later and processed. The present-day throughput is 25 tons daily.

Amounts of crude ore processed and contents of crude ore:

(NOTE: Complete figures are given in Table 5, but this table is missing in the original.) The distribution of the contents of WO in the concentrates of Groups I, II, IIIa, and IIIb is shown in Table 6 ~~(p. 25)~~:

| | 1943 | 1944 | 1936/1944 |
|---|---|---|---|
| Amount of concentrate in tons, dry | | | |
| Type I | 77,896 | 82,875 | 351,268 |
| Type II | 31,947 | 42,038 | 194,753 |
| Type III | 499,020 | 498,970 | 2,307,834 |
| Total | 608,863 | 623,883 | 2,853,855 |

| | 1943 | 1944 | 1936/1944 |
|---|---|---|---|
| **Percentage distribution** | | | |
| Type I | 12.8 | 13.3 | 12.3 |
| Type II | 5.2 | 6.7 | 6.8 |
| Type III | 82.0 | 80.0 | 80.9 |
| Total | 100.0 | 100.0 | 100.0 |
| **Percent of $WO_3$ in concentrate** | | | |
| Type I | 69.90 | 70.89 | 71.00 |
| Type II | 43.91 | 47.97 | 46.72 |
| Type III | 8.39 | 7.07 | 8.74 |
| Total | 18.12 | 18.30 | 18.99 |
| **Tons of $WO_3$ in concentrate** | | | |
| Type I | 54.447 | 58.752 | 249.392 |
| Type II | 14.029 | 20.165 | 90.997 |
| Type III | 41.873 | 35.257 | 201.610 |
| Total | 110.349 | 114.174 | 541.999 |
| **Percentage distribution of the $WO_3$ content by weight** | | | |
| Type I | 49.3 | 51.4 | 46.0 |
| Type II | 12.7 | 17.7 | 16.8 |
| Type III | 38.0 | 30.9 | 37.2 |
| Total | 100.0 | 100.0 | 100.0 |

From 1946-1948 the distribution of the concentration was as follows:

| Year | Type I tons | Type II tons | Type IIIa tons | Type IIIc tons | Pyrite concentrate Type IIIb, tons |
|---|---|---|---|---|---|
| 1946 | 50.689 | 29.886 | 27.678 1) | 12.334 ) | 262.264 1) |
| 1947 | 3.031 | 3.080 | 0.872 | 20.881 1) | 186.976 1) |
| 1948 | 49.417 | 2.194 | 2.715 | 31.689 | 42.467 |
| 1946-1948 | 103.137 | 35.160 | 31.265 | 64.904 | 491.707 |
| Percentage | 14.3 | 4.8 | 4.3 | 8.9 | 67.7 |

1) Partly from processing of pyrite concentrates stored from previous years of operation

During the first quarter of 1949, production was as follows:

From a throughput of 1993 tons containing approximately 1.1 percent $WO_3$ the following were obtained:

Concentrate I 17.116 tons with a $WO_3$ content of 11.68 tons

Concentrate II 1.439 tons with a $WO_3$ content of 0.72 tons

Pyrite concentrate 21 tons.

The pyrite concentrate still contains 2 to 3 percent $WO_3$.

The following $WO_3$ balance can be set up from the data in Tables 1 to 3 for 1936-1944:

| | Amount (tons, dry) | $WO_3$ Content (%) | $WO_3$ Content (tons) |
|---|---|---|---|
| Crude ore production | 164,600 | 0.452 | 742.3 |
| Less dead rock | 31,046.5 | 0.05 | 15.5 |
| To be processed | 133,553.5 | 0.545 | 726.8 |
| Reserves at dressing plant | 670.5 | 0.545 | 3.67 |
| Throughput of dressing plant | 132,883 | 0.545 | 723.13 |
| Concentrate | 2,853.855 | 19.0 | 541.999 |
| Waste | 130,029.2 | 0.14 | 181.131 |

The total $WO_3$ yield is thus (including dead rock):

| Total Yield 1936-1944 | $WO_3$ Content in Tons | Total $WO_3$ Yield, % |
|---|---|---|
| Crude ore production corresponding to dressing throughput | 738.58 | 100.0 |
| (Minus 30,897 tons dead rock) | 15.45 | 2.1 |
| Dressing throughput | 723.13 | 97.9 |
| Concentrate | 541.999 | 73.3 |
| Waste | 181.131 | 24.6 |

Secondary products:

The tungsten-containing pyrite concentrate used to be sold for use as an additive to iron-tungsten alloys, but since the closing of the Zonal boundaries this can no longer be done. The 2-3 percent of $WO_3$, which is contained in the by-product from the $WO_3$ extraction from the pyrite concentrate and which cannot be removed, must thus be considered lost. It had originally been planned to extract the molybdenum, and plans for this were made in the projected 200-ton-per-day processing plant, but these plans were not realized. At present it is more important to extract all the $WO_3$ than to bother with the 0.027 percent of molybdenum. However, the projected 50-ton-per-day dressing plant is to include a molybdenum flotation installation.

Miscellaneous:

The confiscated dressing plant at the Plohbach was well provided with water supply and space for waste. The new temporary processing plant was erected directly in the mine area, and suffers greatly from lack of water and space for waste rocks.

SUMMARY

The wolframite deposit of the Pechtelsgruen mine occurs in a vein which extends for 500 meters and probably reaches a length of 600 meters at greater depth. The composition of the wolframite (Huebnerite/Ferberite coefficient 0.071) indicates hydrothermal origin. It is, therefore, expected that the deposit extends to greater depths than is the case with pressure-sensitive and temperature-sensitive pneumatolytic tungsten deposits. Possible deposits can thus be assumed to exist down to a depth of 300 meters. Another favorable feature is the fact that the individual quartz and greisen apophyses concentrate into more compact form with increasing depth, with improvement in their wolframite content.

From a geological point of view, therefore, the Pechtelsgruen mine is to be considered as a very favorable one. It is the most important tungsten mine in the Erzgebirge except for the tin-tungsten deposit of Zinnwald.

The mine was developed by I.G. Farben slowly and carefully. The selected production of 100 tons per day corresponded to the knowledge at that time of the importance of the deposit. If the deposit had been developed energetically, especially in a horizontal direction, it could have provided enough ore for a throughput of 200 tons per day, but this would have involved great difficulties in silicosis control.

The technical conditions for exploitation of the deposit may be called good. The ore can be mined by normal methods below ground. The wolframite is enclosed in the rocks in such a way that normal wet mechanical processing, with relatively high-content ores, can supply high-grade tungsten and pyrite concentrates which may be separated magnetically. A slight tungsten content in the pyrite is attributable mainly to non-magnetic scheelite.

During the last years of the war, tungsten prices were so high that the concentrates brought approximately 17 RM per kilogram of $WO_3$, so that only a very small subsidy was needed. The confiscation of the dressing plant has changed these conditions completely. The temporary dressing plant at the shaft is too small and too primitive to replace the old model installation. The optimal ore dressing for the mine would be a quantity of 150 tons per day. However, since overhead costs have increased considerably since 1944, even operations at this optimal figure would require considerable subsidies, especially if the mine were to process the average type of rock rubble instead of only high-grade ores, a practice which would be much more in keeping with the ore reserves. The overhead can undoubtedly be reduced if the operations are better organised, and improvement can be expected in the quantity of production. On the whole, however, the Pechtelsgruen mine, under present conditions, will have to remain a heavily subsidised enterprise. Above all, the preference for mining only high-content ores must be stopped at once, if the future development of the mine is not to be jeopardised.

A good comparison with similar enterprises or with previous years of operation in regard to manpower efficiency is given by the "metal yield," i.e. the metal content of the concentrate produced per man per shift. Since the content of the crude rubble is of importance here, this figure is also given. The best comparison is afforded by the "relative metal yield," which determines the metal content of the concentrate produced per man per shift from crude rubble with 1 percent $WO_3$.

| Year | Average Content of Crude Rubble, in % $WO_3$ | Metal Yield Kg of WO Per Man Per Shift | Relative Metal Yield, Kg of WO Per Man Per Shift, on Basis of 1% $WO_3$ in Crude Ore |
|---|---|---|---|
| 1942 | 0.55 | 1.58 | 2.87 |
| 1943 | 0.525 | 1.38 | 2.63 |
| 1944 | 0.511 | 1.3 | 2.54 |
| 1946 | 0.6 | 0.9 | 1.5 |
| 1947 | 2.38 | 0.35 | 0.15 |
| 1948 | 1.78 | 1.08 | 0.6 |
| I.Viertelj. 1949 | 1.1 | 0.97 | 0.88 |

Viertelj. - quarter

The "relative metal yield" shows that the mine is not operating at anything like its previous efficiency. Although it is unlikely that the previous efficiency will be attained again, because the nature of the enterprise has undergone a great change, these figures do show, in an indisputably clear and reliable fashion, not only the effect of the prevailing conditions but also the practicability of the operational installations and organization.