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TANCO

Tantalum Mining Corporation of Canada,Ltd.

Overview

Tantalum Mining Corporation of Canada, Limited or "Tanco" is located close to the Whiteshell Provincial Park, approximately 180 kilometers east-northeast of Winnipeg in the Province of Manitoba, Canada. Most of the employees live in nearby Lac du Bonnet on the Winnipeg River or in Pinawa.

Tanco is 100% owned by Cabot Corporation whose headquarters are in Boston, Massachusetts, United States.

The Origins of Tanco

Perhaps the first persons to walk over the famous orebodies at Bernic Lake were the township subdivision survey crews led by Harry E. Beresford and James Nicol when they located their survey camp on the shores of the Lake on January 1st, 1914. The first three letters of each name were used to form BER-NIC, and the lake was so named. On November 20th, 1973 Harry Beresford was honored with a special certificate, commemorating the naming of the lake, and his contribution to Manitoba history. A few years later Nicky Gilleran assisted by Fernie Calverley staked claims in the area for Leibert, a Latvian who discovered minerals but did not know how to stake.

During the gold rush years of the early 20s, a well known Manitoba prospector named Jack Nutt, active in the Central Manitoba Mines (Bisset area) and Flin Flon area engaged Mr. W. Jackson Bull M.E. to relocate the workings on Bernic Lake. Alex McIntosh of Lac Du Bonnet, whose teams of horses provided the first transportation to the area, coming in via Pointe Du Bois and Shatford Lake accompanied him to the location. Another winter route to the more northerly mining areas followed Lac du Bonnet and the Bird River valley, only a mile or two from Bernic Lake.

In 1926 Kenneth E. Miller discovered tin at Shatford Lake, about 3 miles south of Bernic Lake, and staking of pegmatites took place in several surrounding areas. The Shatford property was transferred to Mr. P.E. Hopkins, then to Manitoba Basin Mining Company and shortly after to the Manitoba Tin Company. A 110-foot shaft was sunk, and some 250 feet of drifting done to explore the tin values encountered on Tin Island. During the same year Peter Osis staked the Brilliant and Ken Miller staked the Coe at the east end of Bernic Lake, and these claims were staked and re-staked before being consolidated into the present group known as the Buck-Coe-Pegli, and owned by the Lithium Corporation of Canada Limited.

The discovery on the north shore of Bernic Lake was a narrow pegmatite outcrop in the form of a flat dipping dyke about five feet thick that exists on the point of land where the camp was sited, and part of the old workings are buried under the concrete that supports the present mill building. Jack Nutt Mines Limited was formed on October 18th, 1928, with John Nutt as President and Col. Ralph H. Webb, Mayor of Winnipeg, as Vice-President.

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In April 1929 work started on the Jack Nutt shaft to develop the narrow dyke. The timber is still in place and the old shaft is now used to circulate fresh heated air into the Mine. In March 1929 several log buildings were erected, a small steam boiler and mining plant were installed, and a small 10 ton per day test mill was built to process samples from surface and underground prospecting.

During the summer of 1929 some 100 tons of ore mined from the surface was processed in the small mill. A sample of the concentrates ran over 70% tin oxide and 3.4% oxides of tantalum and columbian combined. In February and March 1929 Western Canada Airways flew several trips with their tri-motor Fokker to Bernic Lake, Shatford Lake and Bird Lake. Many distinguished Canadian mining people visited; Dr. E.L. Bruce, R.S. Lowe, Professor Stanley Graham and Dr. George Brownell amongst others. Owing to the severe financial market crash and the fact that uncontrollable water was encountered in a crosscut from the shaft, the shaft was reported closed down on October 1st, 1929. Diamond drilling of five holes with poor results had been completed at Bird Lake, the drill moved to Bernic Lake, and here the drilling was rewarded by the discovery of a large massive dyke at 250 feet depth which was reported in the Northern Miner on September 16th, 1929. This dyke was 250 feet thick, and its' presence was not known or suspected before.

Almost by accident the now famous Bernic Lake pegmatite dyke was discovered – nowhere does it appear on the surface. In an attempt to develop the massive dyke, which had almost no tin values, the company was reformed into the Consolidated Tin Corporation Limited on May 15th, 1930 to solicit new financing. In spite of a fine engineering report prepared by F.M. Smith the venture failed, the property was abandoned in 1932, and the claim eventually reverted to the Crown.

However, geological examinations and records were made of the drill cores and these first drill holes put down into the massive pegmatite zone did discover 17 feet of Spodumene, an ore of lithium. There was other mining activity in the area; the claims staked by Ken Miller and Peter Osis in 1926 on the east end of Bernic Lake were eventually restaked in 1934. During 1936-37 approximately 70 tons of lithium ores were quarried and hand sorted in this area, and in 1940 an additional 100 tons were produced. Apparently little or none of it was shipped, and once again the area became inactive, and claims lapsed.

In 1955 the use of lithium in greases caused a great demand for the metal. Two prospectors, George McCartney and Stan McLeod, knowing of the existence at Bernic Lake, arranged to stake claims at the present minesite. Steve Grewinski did the actual staking in March 1955. Shortly after the claims were sold to Montgary Petroleum Corporation Ltd. A new 400-foot drill hole indicated 56 feet of lithium ore, and in 1957 Montgary granted an option to Americal Metals Ltd., a New York company. Other metals, cesium, rubidium, gallium, beryllium, tantalum and columbian were also found to occur in the massive pegmatite. A new shaft was collared and sunk over 300 feet into the bedrock, and development was started at the 285-foot horizon. The company was reformed into Montgary Exploration Ltd., and with funds provided by American Metals Ltd. work progressed rapidly, but was stopped due to financial difficulties when the option was dropped. In the spring of 1959 new financing was arranged, Ken Brown was appointed Manager and Dr. H. Quinn, Geologist, and work was resumed.

Once again in December 1959 the company was reorganized to Chemalloy Minerals Ltd. Diamond drilling was started off the ice of Bernic Lake and a concentrated effort was made to develop metallurgical processes to bring the mine into production. By this time well over a mile of tunnels had been driven from the shaft, exploring the lithium zone, and thousands of feet of diamond drilling had been completed.

During these periods numerous studies of the drill cores and mine workings and ore samples were conducted, and excellent geological, mineralogical and metallurgical records were kept. By 1961 over $2.5 million had been spent on the mine, with no returns. The mine was again closed down in early 1961, and in the spring of 1962 the pumps were pulled out, the mine allowed to flood, and the camp maintained by a watchman. In 1966 new uses developed for tantalum created a market for this product, and A.C.A. (Peter) Howe, long time geologist for Chemalloy, evaluated the property as a tantalum mine. As a result funds were obtained from the Goldfield Corporation, and a joint venture was arranged to determine the possibility of starting to mine and process the tantalum ore.

In March 1967 the mine was re-opened under the guidance of Lucien Cloutier and Bob Crouse, under the direction of A.C.A. Howe, and in November 1967

the Tantalum Mining Corporation of Canada Limited was formed as a Joint Venture, and C.T. (Dibs) Williams was appointed as Manager. Additional diamond drilling was carried out, with four drills on the property, and in 1968 a concentrator was designed to produce tantalum concentrates, and construction was started. In March 1969 the first concentrates were produced, and by September 1969 the plant was in full production, mining and milling over 500 tons of ore per day. By this time nearly $9.0 million had been spent on the property.

Since beginning production in 1969 the tantalum plant has been expanded to include better machinery for recovering the tantalum and the capacity has been increased to process 700 tons of ore per day. Minor amounts of other ores have been produced and shipped, such as lithium ore, rubidium ore and cesium ore. Much metallurgical and chemical research had been done on the Lithium ore, and it was expected that the not too distant future would see the construction of a multi-million dollar chemical plant to process this ore into a lithium carbonate. By the end of 1977 about 2.6 million pounds of tantalum oxide had been produced from a million and a quarter tons of ore extracted from underground, just slightly more than two pounds for each ton processed. Over 90 people are continuously employed, contributing more than $1.5 million per year in payroll alone into the economy of the Lac du Bonnet area.

In the 1920's the Bernic Lake pegmatite was referred to as "The Geologist's Paradise" and today over fifty different minerals have been identified, and a new one, name Cernyite after the discoverer, Dr. Petr Cerny of the University of Manitoba, was first discovered in Bernic Lake ore. Geologists from all over the world, including Russia, visit the mine to study its structure.

Cesium ores shipped to Russia have been used in the generation of electricity by magnetohydrodynamics, a method still under experimentation in North America. Lithium ores have been shipped to Corning N.Y. and used to make the famous Corningware. Tantalum concentrates have been shipped to Russia, to the Peoples Republic of China, to Britain, but mostly to Germany and the U.S.A. The bright red drum with the trademark showing TANCO, LAC DU BONNET, MANITOBA has become recognized throughout the world, helping to place Lac du Bonnet "on the map"

The late C.T. Williams former General Manager of Tanco provided the above summation on November 15, 1978.

The Production Process

The final packaging of the various products is just the final step in a complex process, which starts with the original discovery of the different ores, and includes its mining, and its mineral processing, or treatment, to concentrate the ores to their final state.

Geology

The Bernic Lake pegmatite is located in the Bird River greenstone belt within the Superior geological province in the Canadian Shield, and is composed of metavolcanic and derived metasedimentary rocks and synvolcanic to late tectonic intrusive rocks.

The TANCO pegmatite is one of a number of sub-horizontal pegmatite sheets, which make up the Bernic Lake pegmatite group and is hosted by a synvolcanic metagrabbro intrusive. Over the years since its discovery, the deposit has been the subject of many studies because of its uniqueness.

Internally, the pegmatite is composed of eight discrete mineralogical zones with the different ores of economic interest – those of tantalum, Spodumene, cesium and rubidium – each essentially occurring in different zones. The pegmatite is the host of more than 80 different minerals, some of which were first identified at TANCO; the most important, economically, are listed as follows:

Mineral	Chemical Formula
Spodumene	Li Al (SiO_6)
Montebrasite	Li Al PO_4 (F_9OH)
Wodgonite	Mn4(Sn>Ta, Ti, Fe)$_4$ (Ta>Nb)$_8O_{32}$
Microlite	$(Na, Ca)_2Ta_2O_6(O,OH,F)$
Pollucite	(Cs,Na) ($AlSiO_6$) H_2O
Lepidolite	(K, Rb) $(LiAl)_2$ $(Al, Si)_4$ O_{10} $(OH, F)_2$
FeldsparK	($AlSi_3O_8$)

Mining

The pegmatite is situated some 60 metres below Bernic Lake, and is accessed by both a shaft and a 20-degree decline from the surface.

Mining is carried out using the room and pillar method. Originally rooms were 16 m square; however, rock mechanics studies have shown that the rooms can be increased to 22m square, by shaving the pillars. The roof averages 20-m above the current working levels, and in places reach 30-m; due to the nature of the ore and the mining

method, rock bolting is rarely required. However the back is carefully monitored from custom designed Giraffes (areal lifting devices) and present geological pressures are actually pushing up. Mining is carried out using two boom hydraulic jumbos for drifting and benching, and a single boom Simba long-hole drill for pillar recovery. Broken ore is transported by 3.8m^3 L.H.D. units to the various orepasses, from which it is transported to the shaft by train and hoisted to the coarse ore bins on surface.

Ventilation is downcast through the old Jack Nutt shaft and a 1.2-m diameter raise and then upcast through the decline. Fresh air volume exceeds 3,400 m^3 per minute.

Processing

Due to land constraints, the concentrator is constructed on a peninsula formed by two inlets on Bernic Lake. The building is multi-floored, with equipment on a total of six levels. The major items of concentration equipment are on two levels, with feed preparation equipment, filters and driers, on the upper levels, with pumps on the lower levels.

The first stage of processing, common to all four mineral products, is crushing, where the coarse ore from underground (-300 mm in size) is broken down to –12 mm in size. The Tantalum and Spodumene ores are crushed into separate fine ore storage bins; the pollucite and rubidium ores are crushed into covered stockpiles for direct sale. The new dry grinding plant supplies ground pollucite for the cesium formate pilot plant.

Each ore is concentrated by different processes. Tantalum is processed by gravity concentration, a process that makes use of the fact that tantalum minerals are much heavier than the waste minerals. Spodumene, on the other hand, is primarily processed by flotation, which makes use of the different physical and chemical characteristics of the surfaces of the various minerals. Pollucite is ground and then subjected to acid leaching and other chemical processing to produce cesium chemicals.

Plant Control

With such a complex plant, effective Statistical Process Control, instrumentation and metallurgical accounting regimes are essential.

Instrumentation

Whilst the type of plant and processes do not lend themselves to fully instrumented control, various segments of the plant are being instrumented. Such areas as density control in the heavy medium circuit, flow and density control in the tantalum cleaner circuit, and an integrated control system linking the filtration, drying, and pneumatic handling sections of the spodumene plant are already in operation. Other control circuits are being designed and installed.

Metallurgical Accounting

Complete daily metallurgical accounting of both the tantalum and spodumene plants is carried out. Analyzes are carried out by X-ray fluorescene, Atomic Absorption spectrophotometry, or Ultraviolet spectrophotometry, and metallurgical balances computed on an IBM microcomputer system.

Support Services

The minesite is some 50-km from the nearest community, Lac du Bonnet, and full ranges of support services have been installed. Power is supplied by Manitoba Hydro from a nearby hydroelectric power generating station. Half of the water required for the operation is drawn from Bernic Lake; the other half recirculates from the tailings pond discharge. Fully equipped machine and diesel repair shops, and equipment repair bays, maintain the mining and processing equipment at peak efficiency, and a large inventory of spare parts is held in the Company warehouse. Financial accounting, cost analysis and inventory functions are computerized on a Local Area Network, which is itself directly connected to Cabot Corporation's Wide Area Network.

TANCO has embraced the concept of TOTAL QUALITY, and all operations are judged against our requirement to be better every day.

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