Temiskaming Testing Laboratories

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Manager.

The Ontario Department of Mines has operated a bulk sampling plant at Cobalt, since 1921. The present plant was installed during the years 1942 - 43 in the building, which formerly housed the Municipal Offices of the Town of Cobalt. A detailed description of this building, plant and laboratory was published by Mr. D. G. Sinclair, Assistant Deputy Minister of Mines in the August 1945 issue of the Canadian Mining Journal.

The bulk sampling mill is located in the south end of the building. The basement and three floors are used in its operation, each floor being serviced by the freight elevator.

The assay sample preparation rooms, containing the assay jaw crusher, crushing rolls and the Braun pulverizers are on the second floor. These units have hoods to collect the dust, which is drawn by a suction fan into a small Sly Flat Bag Dust Filter. The dust is withdrawn from the hopper of the filter as required.

The central section of the building, on the first floor, contains the fire assay room (complete with electric furnace since 1950) along with the fluxing room, laboratory and balance room. Also on this floor are the offices of the T.T.L. The offices of the resident Provincial geologist are on the second floor.

In the shed attached to the main building is the bullion melting furnace, an oil-fired, low pressure burner, Rockwell type installed in 1952 to replace a small crucible tilting furnace.

The equipment installed in the sampling mill is as follow:

The primary crusher, a 10" x 16" Blake type Buchanan jaw crusher, set to crush to 1½".

The secondary crusher, a 6" x 10" single toggle type jaw crusher,

set to crush to $\frac{3}{4}$".

One 2' Symons Cone Crusher, short head type, set to crush to 1/8". (Installed 1950 to replace the rolls)

One 4' x 34" Krupp dry grinding ball mill. (Installed 1950 to replace a 2' unit)

Three Dillon 18" x 4' double deck totally enclosed vibrating screens. (The third installed 1950 on the discharge of the secondary crusher feed bin)

One 12" x 8' feeder conveyor, with a 12" Dings Alnico Perma Magnetic pulley, for removal of tramp iron in the feed leading to the secondary crushing circuit. One quartering machine and sampling machine which were especially designed and built for our ores, are the only ones of their kind in operation. The necessary steel bins, hoppers, and chutes, the bottoms of which slope from 50 to 70 degrees, ensure the free flowing of the ore.

Dust is caught at all main dust producing points, and is drawn by a suction fan through pipes to a Sly Flat Bag Dust Filter. The Filter is equipped with an automatic shaking device arranged through a timer relay, so that the filter bags are shaken for a period of three minutes each time the fan is shut down. The dust shaken from the bags is retained in a hopper at the base of the filter. The hopper is emptied twice each shift, and at the finish of the lot. At each time the dust is returned to the lot from which it was extracted.

All conveying of the ore between the crushing, grinding, and screening units is done in standard concrete buggies, except where gravity flow can be utilized. The concentrate for bulk sampling are received via trucks or rail freight at the plant in canvas bags, the cobbed ore in jute bags. The ore is placed upon four wheeled hand pushed trucks, which are run onto the Toledo Print Weight Scale, for weighing, then are trammed to the elevator.

The cobbed ore is taken to the primary crusher on the first floor, the concentrate elevated to the secondary crusher feed bin, on the third floor.

Each lot of ore received, which may vary from a few hundred pounds to 40 or 50 tons, is assigned an identifying number for use during the milling, sampling, assaying, storage, shipping, and settlement by the smelter.

Silver ore or gold ore is crushed, ground and screened to pass a standard 14 mesh screen. Grinding is continued until the metallic portion of the ore is fairly clean of rock and vein minerals. The metallics which do not pass the screens, are weighed, fluxed and melted into bullion bars. These are sampled by drilling three 5/16" holes through the centre from top to bottom. The drill cuttings are ground in a Braun pulverizer, which have toothed plates, instead of the standard grinding plates. The bullion sample from each bar is assayed to determine its fineness. The ore passing the 14 mesh screens is now ready for the sampling circuit. For processing cobalt ore a 4 mesh screen is utilized preparatory to sampling.

The sampling circuit consists of a feed bin, chutes, feeders, quartering machine, sampling machine, and bagging bin.

The prepared ore is transported in the concrete buggies, elevated from the basement floor by the freight elevator, and is discharged into the feed bin. The ore is drawn through a small surge bin and chute by an electric vibrating feeder which delivers the ore in a constant stream through a vertical funnel to the quartering machine. This consists of a revolving funnel with a side delivery spout feeding the stream of ore over the tool steel cutting blades and dividing the four hoppers of the quartering machine. Now the ore is split into four separate parts.

Four electric vibrating feeders deliver the ore from the hoppers to the first stage sampling wheels, which cut 10% of the ore from the stream. This 10% is fed by another set of four electric vibrating feeders, feeding the ore onto the second stage sampling wheels, where 10% is cut from this stream and flows by gravity through a receiving hopper and pipe into canvas bags. The 90% rejects from both sets of sampling wheels are discharged into the bagging bin. We now have four separate samples cut from the ore by the machine in one pass. These samples represent one per cent of the ore sampled.

The ore is drawn from the bagging bin into large heavy double jute bags. From the bag a dip sample is taken and placed in a covered tin to determine the moisture content of the ore. The bags are weighed, tagged with the lot and bag numbers, then placed in storage by lots for shipment to the smelter.

The samples of silver ore from each quarter are numbered one to four, and are prepared separately for assaying. The samples of cobalt ore, also numbered one to four are combined for assaying, one with three and two with four to make two separate samples. Each sample is thoroughly mixed and cut , by means of either coning and quartering or by the Jones riffle sampler to samples weighing between 2 and 3 thousand grams.

The samples are dried for a period of twelve hours or more, then ground in a Braun pulverizer, and screened on a 100 mesh assay sieve. Grinding and screening is continued until all of the metallic portion is clean of rock and vein minerals.

The ore passing the assay sieve is called the Fines. This is thoroughly mixed by screening, spreading, and rolling on a rubberized sheet for a period of fifteen or twenty minutes. It is then divided

and put into four packages. Each package is sealed and labelled with the date, owner's name, lot and sample numbers, and the weight of the Fines and Metallic portions. One package is retained by the T.T.L. Laboratory, the remaining three are allocated for Owner, Buyer, and Reserve, respectively.

The metallic portion called scales, is placed in a small pan, labelled with lot and sample number, and weight of scales and fines, of the sample to which the scales belong. It is then taken to the laboratory for assaying. Three one quarter assay ton charges are used for assaying of the scales. The balance, if sufficient, is divided into two portions, one for the buyer and one for reserve.

Two charges each of one quarter assay ton, are taken from the fines, fluxed, fused and cupelled. The resultant silver beads are weighed and reported in ounces per ton of ore, These beads are then used as pilots, or controls. They are again fluxed, fused and cupelled along with four charges from the Fines. The loss of weight of the pilot is added now to the weight of each bead from the charges. Then 1% of the total is subtracted, giving the final assay of the fines. The reason for this correction is two-fold, first it allows for variations of losses due to temperature and draft control and second it eliminates the unnecessary delay of adjusting the furnace to precise temperature.

The total silver assay is reported as the assay of the fines, plus or minus the scales assay. The correction for the scales will be a plus quantity when the scale assay is greater than the assay of the fines. It will be a minus quantity when the scale assay is less then the assay of the fines.

The combined fines and scales assay of each of the four

samples on a silver lot, must check within one and one one-half per cent of the average of the four assays, otherwise, the lot is re-sampled.

To determine the silver assay on a lot of silver ore, we have run thirty six fusions, and cupellations. On each lot of silver ore there are also assays made for cobalt, nickel, copper, and antimony.

Cobalt ores are assayed for silver, cobalt, nickel, and copper.

The ores are bougnt and paid for by the smelter on our determinations.

In 1950, due to the increase in the volume of silver ore received for sampling, it was necessary to increase our staff by four men to cope with the extra work. For a period in the early Fall the sampling plant was operated on two shifts.

Our staff consists of a Manager, Stenographer, Chemist, Assayer, Sampler, five mill operators, one helper, and two watchmen. We endeavour to get the work done as speedily as is consistent with accurate results, thereby rendering a service comparable with others doing the same work in the district.

During the past year there were 14 shippers of silver ore, 12 from the Cobalt Area and 2 from the Gowganda Area. The prospects for this year are for a further increase in volume due to the increased production of cobalt ore, and a probable increase in the volume of silver ore as well.

Herewith are tables showing the data on the silver and cobalt ores for the years of 1948 to 1951 inclusive.

I have endeavoured to give you a brief resume of the type

of work handled by our organization. It will be apparent that the services rendered by the T.T.L. to the silver and cobalt producers is important.

(8) T.T.L.

The total number of assays made for the years 1948 to 1951 are shown in Table No. 1.

Table No. 1

Year	Number of assays	Per cent increase or decrease over previous year
1948	4,635	
1949	3,589	22% decrease
1950	9,151	255% increase
1951	9,439	1% "

Table No. 2 shows the data on the silver ore sampled and shipped from T.T.L. for the years of 1948 to 1951 inclusive.

Table No. 2

Year	Tons of ore	Silver ounces	Cobalt lbs.	Nickel lbs.	Copper lbs.	Per cent increase over previous year
1948	106	282,829	10,096	493	46	
1949	244	941,807	22,605	2,181	--	130
1950	932	2,618,077	105,252	14,227	28,556	282
1951	1,831	3,547,329	213,447	44,099	31,237	96

The bullion shipped from the metallics screened from the silver shipments are shown in Table No. 3.

Table No. 3

Year	Silver ounces	Per cent increase over previous year.
1948	39,229	
1949	72,140	84
1950	408,791	467
1951	420,004	5

Direct shipments by the mines to the smelter are shown in Table No. 4

Table No. 4

Year	Tons of ore	Silver ounces	Copper lbs.	Per cent increase or decrease over previous year
1948	628	217,938	9,145	
1949	595	157,992	--	5% decrease
1950	1,540	345,929	26,647	259% increase
1951	2,800	660,206	34,744	182% "

Table No. 5 shows the ounces of silver shipped in the silver ores, and the percent of the total from the Cobalt and Gowganda Areas.

Table No. 5

Year	Silver ounces	Cobalt Area Silver ozs.	Per Cent	Gowganda Area Silver ozs.	Per Cent
1948	539,996	369,581	68.44	170,415	31.56
1949	1,171,939	601,069	51.29	570,870	48.71
1950	3,372,797	2,650,889	78.60	721,908	21.40
1951	4,310,335	3,039,357	70.52	1,270,878	29.48

Table No. 6 shows the data on cobalt ore sampled and shipped by T.T.L. for the years 1948 to 1951 inclusive.

Table No. 6

Year	Tons of ore	Silver ozs.	Cobalt lbs.	Nickel lbs.	Copper lbs.	Percent decrease or increase over previous year.
1948	615	30,467	137,184	53,360	10,709	
1949	359	27,239	70,542	20,792	5,253	42% decrease
1950	180	14,333	37,156	9,886	3,918	50% "
1951	468	39,104	86,855	31,000	19,739	160% increase

Table No. 7 shows an analyses of a composite sample of a year's production of a silver, and a cobalt ore.

Table No. 7

	Silver ore		Cobalt Ore	
Silver	8.72 %	(2,543.6 ozs.)	.32 %	(92.3 ozs.)
Cobalt	6.24	per ton	10.04	per ton
Nickel	.65		5.04	
Copper	.60		.40	
Antimony	1.48		.32	
Bismuth	Trace		.72	
Lead	.15		Trace	
Zinc	Trace		Trace	
Arsenic	33.90		38.76	
Sulphur	1.89		3.67	
Iron	10.77		7.97	
Lime	4.28		5.30	
Magnesia oxide	Trace		Trace	
Silica	20.45		14.97	
Alumina	3.40		5.64	
Carbon dioxide	3.44	95.97	4.16	97.31

Cobalt, Ontario.
March 12, 1952.