

O T T A W A

November 12th, 1943.

R E P O R T

of the

ORE DRESSING AND METALLURGICAL LABORATORIES.

Investigation No. 1531.

Pilot Plant Tests on Molybdenum Ore
from Indian Molybdenum Limited,
Preissac, Abitibi County, Quebec.

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Shipment:

A shipment of 70,000 pounds of molybdenum ore was received on July 3rd, 1943, for bulk sampling and pilot plant testing. The shipment was submitted by Mr. J. G. McCrea, General Manager, Indian Molybdenum Limited, Preissac, Quebec.

Location of Property:

The property of Indian Molybdenum Limited, from which this ore was taken, is located in the northwest portion of Indian peninsula, Lake Kewagama, in the township of Preissac, Abitibi county, northwestern Quebec.

Purpose of Investigation:

The primary purpose of the investigation was to obtain an analysis of the shipment, to determine the grade of mill feed to be expected. A pilot plant run was also desired in order to determine the grade of concentrate and the manner in which the bismuth in the ore would react to the circuit and reagents used for the concentration of the molybdenum.

Sampling and Analysis:

The entire carload of ore was put through the sampling plant and an assay sample obtained by standard methods. Analysis of the head sample so obtained is as follows:

<u>Determination</u>		<u>Per Cent</u>
Molybdenite (MoS ₂)	-	0.67
Bismuth (Bi)	-	0.03
Iron (Fe)	-	1.46
Copper (Cu)	-	Trace.

Results of Investigation:

The results of the tests indicate that a concentrate assaying 89 per cent MoS₂, with a recovery of 88 to 89 per cent of the MoS₂, can be made without much difficulty. This would give a tailing assaying 0.07 per cent MoS₂.

The concentrate should be well within the maximum limits allowed on copper, iron, phosphorus, arsenic, and tin. The only troublesome element is the bismuth and, while the bismuth only rose to 0.86 per cent (Run No. 4), every indication is that it will probably be about 1.5 per cent in the final concentrate obtained in actual operation.

DETAILS OF INVESTIGATION:

During the period of the investigation, Mr. W. D. McKinley, the mill superintendent of **Indian Molybdenum Limited**, was present and assisted in the tests made.

On December 15th, 1942, small-scale tests were made on a 200-pound shipment of rejects from diamond drill cores. The results given in the report **made at that time** (Investigation No. 1315) compare very closely with the results obtained in the pilot plant tests. The main difference between them was that the ore did not require the use of sodium silicate as a depressor for the mica.

Characteristics of the Ore:

The gangue material was mainly quartz or quartzose material. Micaceous material was fairly abundant. There was also a black mineral (hornblende?) that was quite low in specific gravity and which had a tendency to report in the concentrate. The molybdenite occurred in the form of masses down to very small flakes widely disseminated throughout the ore.

Mill Runs:

Test Runs Nos. 1 and 2 are not given in detail as they were used mainly in building up the circuit and getting the reagents adjusted.

The feed rate was 3,000 pounds per hour, distributed to three banks of cells. (For complete details of the flow-sheet see page 7.). These cells had a capacity of 1 cubic foot each.

Reagent Consumption:

Place of Addition:	Reagent	Consumption, lb./ton of feed.			
		Run	Run	Run	Run
		No. 1.	No. 2.	No. 3.	No. 4.
Ball mill	Kerosene	0.21	0.21	0.28	0.28
	Pine oil	0.03	0.04	0.04	0.04
Flotation cells	Pine oil	0.02	0.03	0.04	0.04

Results of Tests:

Sample	MoS ₂ , per cent				Bi, per cent			
	Run	Run	Run	Run	Run	Run	Run	Run
	No. 1.	No. 2.	No. 3.	No. 4.	No. 1.	No. 2.	No. 3.	No. 4.
Classifier overflow	0.65	0.60	0.84	0.67				
Final concentrate	82.60	88.40	89.40	89.60	0.47	0.69	0.76	0.86
Mill tailing	0.17	0.07	0.14	0.12				

(Results of Tests, cont'd) -

	Run No. 1.	Run No. 2.	Run No. 3.	Run No. 4.
MoS ₂ recovery, per cent (cal.)	74.0	88.4	83.5	83.0
Classifier overflow, per cent +48 mesh	5.1	4.0	1.9	1.1
Classifier overflow, per cent -200 mesh	54.1	49.5	51.2	58.7

A complete set of samples was taken during Runs Nos. 3 and 4. The results of the analysis are given in the following table:

	MoS ₂ , per cent	Bi, per cent	Fe, per cent			
	Run No. 3.	Run No. 4.	Run No. 3.	Run No. 4.	Run No. 3.	Run No. 4.
Feed	0.70	0.67	0.03			
Mill discharge	0.99	1.01				
Classifier sands	1.01	1.04				
Classifier overflow	0.84	0.70			1.21	
Rougher feed	3.45	6.08				
Rougher conc.	83.15	82.60				
Scavenger conc.	18.70	16.20				
Cleaner conc.	86.00	87.40	1.51			
Cleaner tailing	50.00	42.49		1.46		
Recleaner conc.	87.85	88.20				0.65
Recleaner tailing	75.15	78.80				
Callow Screen conc.	89.40	89.60	0.76	0.86	0.35	0.35
Callow Screen fines	87.85	88.00		1.58		0.65
Middlings return	81.90	80.20				
Mill tailing	0.14	0.12	0.02			

Analysis of Final Concentrate from Run No. 4:

Determination	Per cent
Molybdenite (MoS ₂)	89.60
Bismuth (Bi)	0.86
Copper (Cu)	0.04
Iron (Fe)	0.35
Arsenic (As)	None detected.
Tin (Sn)	" "
Phosphorus (P)	0.01
Insoluble	1.75

The above concentrate is well above the minimum grade required for MoS₂ and, except for the bismuth, contains

(Analysis of Final Concentrate from Run No. 4, cont'd) -

no harmful ingredients above the maximum allowable.

An examination of the bismuth assays indicate that the circuit was building-up in that element and that, using the given flow-sheet, a concentrate carrying about 1.50 per cent bismuth is to be expected. The fines from the Callow screen are particularly high in bismuth and it is thought that the elimination of this screen from the circuit might be beneficial.

The iron content presents no problem, as it did not go above 0.65 per cent in the recleaner concentrates at any time.

Discussion of Results:

From the above tests it can be seen that a concentrate assaying 89 to 90 per cent MoS_2 can be expected from this ore. While the recovery is only 83 to 84 per cent in Tests Nos. 3 and 4, no difficulty should be found in obtaining a tailing assaying 0.07 per cent MoS_2 , which would give a recovery of about 89 per cent of the MoS_2 . The higher tailing in Runs Nos. 3 and 4 is thought to be due to the building-up of the circulating load from the Callow screen which was not fully compensated for by an adjustment of the reagents.

From these tests and also from the tests given in Investigation No. 1315, December 15th, 1942, a grind giving about 60 per cent passing 200 mesh appears to give the most satisfactory results.

From a review of the information in the pilot plant tests it is doubtful if the Callow screen is of any value. By using the recleaner circuit a high-grade concentrate can be obtained low in iron, and as the main purpose of the Callow screen is the dropping of the iron minerals it is felt that it

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(Discussion of Results, cont'd) -

may be doing more harm than good. The elimination of the Callow screen would decrease the circulating load returning to the roughers, which would, in turn, mean a lower amount of reagents required. While it was not found possible to determine whether this would have any effect on the bismuth content of the final concentrates produced, it is thought that the use of less reagents might allow this mineral to drop out more readily in the primary float.

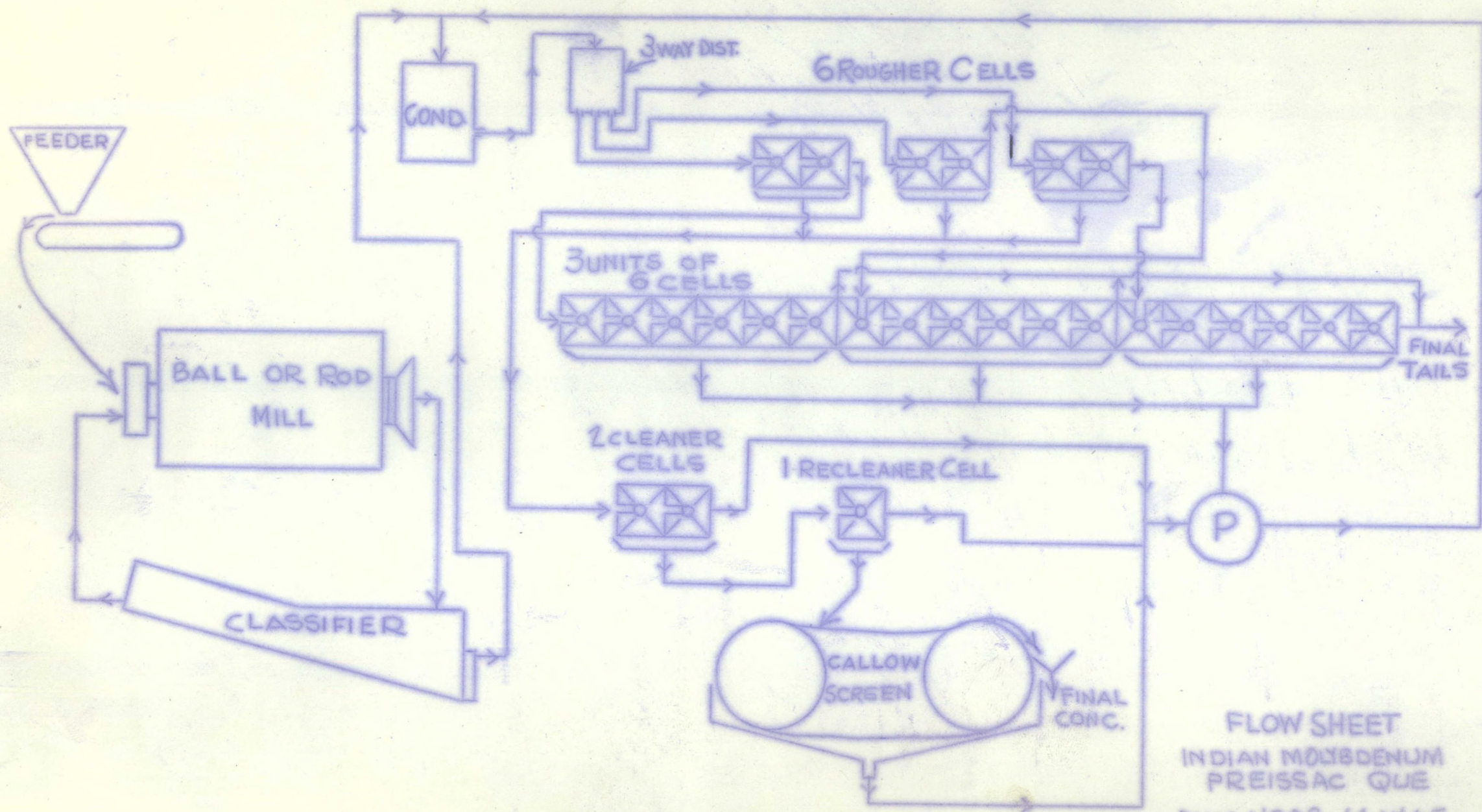
As can be seen, the micaceous material in the ore did not prove troublesome, and the use of sodium silicate is not required.

In Run No. 3 the rod mill was used, while in Run No. 4 a ball mill replaced the rod mill in the circuit. No appreciable difference was noted in the grind as represented by the classifier overflow.

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(Page 7, following,
(contains the pilot
(plant test flow-
(sheet.)
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FLOW SHEET
INDIAN MOLYBDENUM
PREISSAC QUE
DWG NO 92-14 W.A.E.