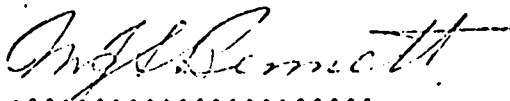


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Noranda Mines Limited,
Noranda, Quebec.

VANGORDA AND BRUNSWICK M. & S. ORE SAMPLES

Bench-tests carried out at the Galigher Company,
Salt Lake City, December 9 - 13, 1969.


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Distribution:
Mr. R. L. Coleman

INTRODUCTION

A short series of bench flotation tests were carried out at the Galigher Company laboratory in Salt Lake City between December 9 and 12, 1969. These tests were performed in an attempt to confirm the results obtained on samples from the Vangorda property which had been tested previously at both the Galigher Company and at Brunswick Mining and Smelting Corporation Limited.

The bench-tests comprised the following:

1. A differential flotation procedure on a sample of Brunswick No. 12 ore, according to Galigher's normal procedure for lead-zinc ores, including use of the reagent additions recommended by Galigher. A flow-sheet of this procedure is appended to this Report.
2. A differential flotation procedure on a portion of the same sample of Brunswick No. 12 ore using the Brunswick-recommended procedure and reagent additions.
3. A bulk-flotation procedure on another portion of the Brunswick No. 12 ore sample using the Brunswick-recommended procedure for bulk flotation.
4. A test similar to No. 2 above, except that soda ash was used in lead cleaning instead of lime.
5. This test was spoiled (See No. 6 below).
6. A differential flotation procedure on the sample of Vangorda ore which had been stored at the Galigher Company. This test was carried out according to the same Brunswick method used in Test No. 2.

7. A bulk-flotation procedure on another portion of the Vangorda sample (mentioned in No. 6 above). This test was carried out according to the same Brunswick method as used in Test No. 3.

Tests Nos.1 and 2 were carried out in order to compare the results obtained on a lead-zinc ore by the Galigher method (which entailed regrinding of both the lead and zinc concentrates) and by Brunswick method which employed finer grinding of the whole original sample.

A comparison of the results obtained in Tests Nos. 1 and 2 follows:

Test No. 1

Brunswick No. 12 Sample- Galigher Differential Method.

	Assays					Distribution				% -325 Mesh
	% Wt.	% Pb	% Zn	% Cu	Oz. Ag	Pb	Zn	Cu	Ag	
Heads (Calc.)	100.0	2.65	8.88	0.27	2.63	100.0	100.0	100.0	100.0	
Lead Ro. Conc.	14.4	11.58	7.13	0.55	8.34	62.8	11.7	29.0	45.7	
Zinc Ro. Conc.	18.3	2.01	35.05	0.48	2.43	13.9	72.7	31.8	16.9	
Tailing	67.3	0.92	2.05	0.16	1.46	23.3	15.6	39.2	37.4	73.8

Test No. 2

Brunswick No. 12 Sample - B.M. & S. - Differential Method (except lime used in cleaning)

Heads (Calc.)	100.0	2.65	8.85	0.27	2.66	100.0	100.0	100.0	100.0	
Lead Ro. Conc.	16.0	6.61	7.47	1.08	7.45	40.0	13.5	64.7	44.8	
Zinc Ro. Conc.	19.6	4.63	32.02	0.19	3.10	34.2	70.9	13.6	22.8	
Tailing	64.4	1.06	2.14	0.09	1.34	25.8	15.6	21.7	32.4	80.4

Note: See Flowsheet for Galigher method appended to this Report.
See also detailed Test Sheets appended to this Report.

These two tests were intended partially as preliminary work prior to performing the tests on Vangorda ore. Unfortunately no assaying was done in Salt Lake City to check the actual results; all samples were returned to Noranda for assay. Thus the final results were not known until over a week later. Therefore little was learned from these first two tests which might have been useful later for floating the Vangorda sample.

Neither test could be considered satisfactory. Froth formation seemed to be sluggish and much additional frother was required in Test No. 2 than had been recommended by Brunswick.

Test No. 3 was a bulk flotation procedure on Brunswick ore, using the reagent additions recommended by them. The results obtained are appended, but will be discussed later in this Report when a comparison will be made with the results obtained from a similar bulk test on the Vangorda ore sample.

Test No. 4 was carried out only to the point of making a lead concentrate, using the same procedure as in Test No. 2. This was done in an attempt to determine if cleaning the lead concentrate with soda ash rather than lime would improve concentrate grade. The results obtained in Test No. 4 were not even as good as those from Test No. 2. Test No. 5 was not completed.

Two bench tests were carried out on Vangorda ore. Test No. 6 employed a differential flotation procedure on the Vangorda sample similar to the Brunswick method used in Test No. 2. The lead content of the Vangorda sample was considerably higher than that of the Brunswick No. 12 sample - (4.37% Pb vs. 2.60% Pb) and the lead rougher concentrate recovery was much better.

The results obtained in Test No. 6 are summarized below:

Test No. 6

Vangorda - R.M. & S. - Differential Method.

	Assays					Distribution			
	% Wt.	% Pb	% Zn	% Cu	Oz. Ag	Pb	Zn	Cu	Ag
Heads	100.0	4.37	5.00	0.48	1.89	100.0	100.0	100.0	100.0
Lead Conc.	16.4	22.71	10.27	0.534	8.11	85.2	33.8	86.8	70.5
Zinc Conc.	12.4	2.23	24.23	0.077	1.51	6.3	60.0	9.4	9.9
Tailing	71.2	0.52	0.44	0.54	0.52	8.5	6.2	3.8	19.6

Remarks: "Excess iron floating in the zinc scavenger. Possibly too much collector used. Excess iron floating in zinc cleaners. No collector used in zinc cleaner No. 2.

The lead rougher concentrate grade was low at 22.71 per cent, and after two cleaning steps it was only raised to 28.70 per cent. Silver recovery with the lead concentrate was reasonably satisfactory and

silver losses in cleaning were not excessive. The zinc appeared to have been somewhat strongly preactivated, almost 3/4 per cent of it having reported with the lead rougher concentrate. The quantity of collector used in the zinc flotation was probably too high for the amount of zinc remaining after lead flotation, thus pulling down the grade of the zinc concentrate. The final zinc tailing was reasonably low.

Two bulk flotation tests were carried out using the Brunswick method in both cases. A comparison of these two tests follows:

Test No. 7

Vangorda Sample - Brunswick Bulk Method.

	Assays					Distributions			
	% Wt.	% Pb	% Zn	% Cu	Oz. Ag	Pb	Zn	Cu	Ag
Heads (Calc.)	100.0	4.40	5.05	0.057	2.00	100.0	100.0	100.0	100.0
Rough. Conc.	19.0	14.14	16.07	0.086	5.52	61.0	60.5	28.8	52.5
Tailing	81.0	2.12	2.46	0.050	1.17	39.0	39.5	71.2	47.5

Test No. 3

Brunswick No. 12 Ore - B.M. & S. - Bulk Method.

Heads (Calc.)	100.0	2.60	8.94	0.27	2.73	100.0	100.0	100.0	100.0
Rough. Conc.	27.0	5.74	13.91	0.67	5.37	59.6	57.2	67.3	54.8
Tailing	73.0	1.44	5.25	0.12	1.69	40.4	42.8	32.7	45.2

Neither of these tests could be considered satisfactory.

A number of locked tests on the Vangorda ore sample had been carried out previously at the Galigher Company and at Brunswick. The results obtained had been much better than those of the bench tests mentioned above. For instance, two such tests employing a differential flotation procedure gave results as follows:

Vangorda Sample - Brunswick Differential Test 114/119, November 17, 1969.

	Assays					Distributions			
	% Wt.	% Pb	% Zn	% Cu	Oz. Ag	Pb	Zn	Cu	Ag
Heading	100.00	4.10	5.17	0.30	1.59	100.0	100.0	100.0	100.0
Lead Conc.	6.47	<u>51.68</u>	8.09	1.03	<u>18.52</u>	<u>89.7</u>	11.1	24.7	<u>82.9</u>
Zinc Conc.	6.54	1.29	<u>55.35</u>	0.50	0.77	2.3	<u>78.1</u>	12.3	3.5
Tailing	86.99	0.38	0.65	0.22	0.25	8.0	10.8	63.0	13.6

Vangorda Sample - Galigher No. 1833 - Series 3 - July 1969.

Product	Wt (gms)	WT %	Assays			Distributions	
			Pb	Zn	Fe	Pb	Zn
<u>Series 3</u>							
Pb Cl Conc. # 3	63	6.1	<u>51.4</u>	7.05	13.2	78.9	8.9
Zn Cl Conc. # 3	72	7.0	2.80	<u>54.0</u>	7.25	4.9	<u>78.2</u>
Zn Rough. Tail	<u>891</u>	<u>86.9</u>	<u>0.74</u>	<u>0.72</u>		<u>16.2</u>	<u>12.9</u>
Head (Calc.)	1026	100.0	3.98	4.84		100.0	100.0
Combined Conc.		13.1	25.5	32.1	10.0	83.8	87.1
Total Test Head (Incl. C.L.*)	3049		4.32	4.87			

* C.L. - Circulating Load

Details of these two tests will be found in Brunswick's Report of November 17, 1969 and Galigher's Report of July 17, 1969 respectively.

It may be noted both tests indicated that a lead concentrate grade of 51 per cent could be obtained with a recovery between 79 and 89 per cent. The Brunswick test also indicated a silver content of over 18 ounces in the lead concentrate which would make this concentrate readily marketable. Silver recovery was 83 per cent.

Zinc concentrate grades of 54 to 55 per cent with 78 per cent overall recoveries were achieved in both these tests, which should be considered satisfactory.

DISCUSSION OF RESULTS OF BENCH-TESTS

A certain amount of oxidation must have taken place on both the Brunswick and Vangorda samples. While this factor does not seem to have affected the results obtained in the locked tests mentioned above it probably was the reason for the pre-activation of zinc noted in bench-test No. 6. The poor froth produced in Test No. 2 has also been mentioned previously.

The reagent quantities used in bench-tests Nos. ^{2 and 3} were taken from those recorded in the Brunswick Report of November 17, 1969. These reagents were originally intended for locked tests, in which some reagent values would be recirculated; the amounts may have not been optimum for bench-tests.

Apparently the greatest deficiency in the organization of the bench-tests in Salt Lake City was the failure to obtain control assays immediately. Correction of flotation conditions, including reagent additions, might then have been made before proceeding further. This would probably have delayed completion of the tests into another week, which had not been provided for in the itinerary of the writer.

Differential. - Galigher Method, 1833-B, test # 1.

1,000 gm ore
BALL MILL
 (7,000 gm. assorted balls)
 ($\frac{1}{4}$ " - 1")
 30 min. grind

Pb Rgr (3 min.)

Conc. Tailing

Pb Rgr (3 min.)

Conc. Tailing

Poured thru 325 mesh screen

+325 -325

Regrind mill (40 min.)
 3,000 gms. small balls ($\frac{1}{4}$ ")

Pb Clr # 1

Conc. Pb Clr Tail # 1
Final

Pb Clr # 2

Conc. Pb Clr Tail # 2
Final

Pb Clr # 3

Pb Clr Conc # 3 Final Pb Clr Tail # 3
Final

Lead grade very low indeed.

Zn Conditioning (5 min.)

Zn Cond (5 min.)

Zn Cond (5 min.)

Zn Rgr (5 min.)

Conc. Zn Rgr Tail
Final

Poured thru 325 mesh screen

+325 -325

Regrind Mill.
 (3,000 gms. small balls: $\frac{1}{4}$ ")

Zn Clr # 1

Conc. Zn Clr Tail #1
Final

Conc. Zn Clr Tail # 2
Final

Zn Clr Conc. # 3 Final Zn Clr Tail # 3
Final

Zinc grade excellent.