

MET ENGINEERS LTD.

(403) 463-1513

5404 - 40 Avenue Edmonton, Alberta T6L 1B2

(403) 892-3038

May 31, 1982

MEMO TO: Mr. W. N. Wallinger
 FROM: Mr. P. J. Brown
 SUBJECT: Site Visit - May 24th - May 29th, 1982

Following our discussion on this subject, I have attempted to indicate in this report pertinent data regarding those areas of the operation to which you directed my attention. Please let me know if this new format better serves your requirements and if there is anyway in which further modifications can be made.

Plant Operation1. Grinding

Although there has been much progress in optimizing the grinding circuit operation, average grind still remains at the 70 μ m level. The reason for the coarse grind is still the low pulp densities in some of the grinding mills. Shown below in Table 1 are averaged data taken from recent grinding circuit studies.

TABLE 1
Critical Grinding Circuit Parameters

Unit	Density		Comments
	Target	% Average	
Rod Mills 1, 2, 3	86	80-82	Density control improved since recycled water removed from rod mills
Rod Mill 4	86	80-83	
Ball Mills 1, 2, 3, 6	83	84-87	Improvements in 1, 2, 3 since 20" cyclones installed
Ball Mills 4, 5	83	80-81	These units still are not functioning reliably despite 15" ϕ cyclone installation
Lead Re grind	85	60-70	Cyclopac D63 operational but not optimized
Zinc Re grind	70	L60	Cyclopac D10B not optimized

L means "Less than"

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I have recommended that further work with the adjustable apexes be halted and a suitable range of fixed apexes purchased. For the critical D15B cyclones, sets of ceramic apexes of 2.5", 3.0" and 3.5" should be purchased. Also, at least one spare D15B should be purchased on a most urgent basis.

Grinding mill power meters are still not receiving the attention they merit. If the electrical department cannot repair these units then this work should be contracted out.

The calculations on grinding rod consumption are most interesting. However, before a decision is made regarding a change in media size, I recommend that the rod mill rejects be weighed over a period of several days. Probably, you will find that steel rejection from the rod mills is of the order of ten percent or less, and certainly not as high as indicated by the theoretical calculations. (None-the-less, it is possible that the use of 4" rods throughout the mill may result in some cost savings.)

2. Flotation Plant

General Operation

There has been, in recent weeks, an increase in the incidence of pH probe failures with significant deleterious effects on metallurgy. I strongly recommend that these concerned meet and formulate a plan to solve this problem. The same group could most usefully address the phenomenon of reagent delivery system failures too.

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The Courier system seems to be functioning well and, as far as I could judge, the operators are most enthusiastic about using the data outputs. Now that the system is operational it may be worth considering some major remodelling of the hourly assay sheet. (I have mentioned to Jakko that Highmont do have an 8 - 24 hour trend processor with C.R.T. on key XRF streams: Cost quoted was less than \$ 2,000.)

The valving systems, installed to permit changes in flowsheet are largely inoperative. This is most unfortunate because with different ore types, throughputs and metal loads, it may be most useful to be able to manipulate the circuits by simply changing a valve set.

I concur with the planned conversion of the remaining lead conditioner to rougher duty. It would be most useful, however, to have some before and after data regarding mass flows - possibly a plant sampling campaign might yield useful results.

Sodium Sulphite Test Program

I have reviewed the data available regarding the use of sodium sulphite. Shown below in Table 2 are data extracted from Stan Chemelyk's recent report.

TABLE 2
Metallurgical Comparison - Sulphite Effects

	Grade		Recovery	
	Lead	Zinc	Lead	Zinc
Standard Reagents - Lead	56.6(5.2)		69.3	
Standard Reagents - Zinc		48.1(2.4)		68.0
Sulphite Circuit - Lead	59.6(2.8)		71.8	
Sulphite Circuit - Zinc		48.6(1.2)		70.4

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The numbers in parentheses in Table 2 are the calculated standard deviations of the data and show clearly the relatively greater scatter in the data for standard circuits. I suggest that this data be reviewed again and results beyond the standard deviation limits "culled" as being non-representative. Probably, the results will then show a somewhat less optimistic picture regarding sulphite effects.

However, despite these reservations, the sulphite effects are interesting and even reworking of the data may still show a significant advantage for sulphite usage. I concur with the idea of continued sulphite testing on non-oxidized ore species.

Treatment Schemes for Graphitic Quartzites

A synopsis of the work carried out at Kamloops aimed at the development of treatment schemes for graphitic quartzites was presented to the metallurgical group. Briefly, the best results appear to be generated by using starch to depress galena and graphite and then reactivating the galena using xanthate.

A review of test data now being processed will be available by month end: At that time a decision will be made regarding the direction and extent of future work. Probably the work will be focussed on starch or starch/SO₂ combinations either at the head of the circuit or as a post-flotation treatment scheme.

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Laboratory Flotation Studies

The development of laboratory techniques has improved markedly since my last visit. At least now the laboratory has cleaner test capability. I have the following comments regarding the progress currently in progress.

- a) The advantage of R241/242 as a lead collector is well demonstrated in the laboratory. However, our plant experience suggests that the use of this material may present insurmountable operational difficulties. If 241/242 are considered for plant operation they should be introduced with great caution.
- b) Although final results are not yet available, preliminary indications are that the lead regrinding effects tests did show, as anticipated, considerable metallurgical gains with finer regrinding.
- c) The use of Depramin/Dextrine as a post-flotation treatment is to be tested in the laboratory. Tests will consist of conditioning plant lead concentrate pulps with depressants and then attempting to refloat the galena.

3. Oxide Ore Treatment

A review of the oxide ore metallurgy during the last three months indicates that metallurgy is remarkably uniform. The recent decline in zinc metallurgy being attributable to slightly lower zinc feed grades.

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TABLE 3
Oxide Ore Metallurgy*

Period	Lead		Zinc		Reagents g/tonne			
	Grade	Rec**	Grade	Rec**	NaCN	CaO	CuSO ₄	Z-11
March 11th - 31st	59.2	69.2	48.4	74.1	90	5000	800	400
April 1st - 30th	59.4	69.8	47.9	72.3	100	6700	810	370
May 1st - 20th	57.7	68.9	49.3	69.7	91	6800	736	420

* D.P.R. data

** Recovery

An examination of the tailings assays for the same period indicates remarkable consistency. These consistent results, especially with regard to zinc assays are surprising since in the laboratory zinc tails are seldom above 0.5% zinc. This phenomenon is worthy of the most detailed investigation - all data suggests that even the most severely oxidized material should produce significantly higher zinc recoveries.

TABLE 4
Oxide Ore Tail Assays

Period	Lead	Zinc
March 11th - 31st	0.78	1.20
April 1st - 30th	0.75	1.18
May 1st - 20th	0.78	1.21

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4. Long Range Planning Options

The long range planning options available to the mill have been detailed in my notes to you on this subject. The key data is summarized below to serve as a reference. I recommend that Jakko and Ron re-calculate the K_{80} values when you finally select a case of more detailed examination.

TABLE 5
Comparison of Options
Power, Grinding Media and Metallurgy

Option	Tonnes/yr	Kwh/year	Steel Used	Change from Base Met	
	10^6	10^6	Tonnes	Lead	Zinc
Base Case	3.75	65.5	7157	∅	∅
1. High Tonnage	3.06	49.2	5416	0.5	1.0
2. Maximum Tonnage	4.73	63.3	6964	1.5	3.0
3. New Circuit Only - 7 days	3.40	37.8	4155	2.5	5.0
4. New Circuit Only - 5 days	2.45	26.4	2908	2.5	5.0

NOTES: Power is for primary grinding circuit only
Steel is based on 110 g/Kwh - 1982 Y.T.D.
Metallurgy assumes recovery units gained at constant grade, of 0.10 and 0.20 for lead and zinc, per %-325 Mesh increase in primary grind.

Yours sincerely,



Peter Brown, P. Eng.
Consulting Metallurgist

PJB/rl

cc: Peter Taggart - Vancouver