Gippsland Minerals NL

RAZORBACK MILL – DUNDAS

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Friday 22nd October, 1971

Gippsland Minerals N.L.,
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Dear Sirs,

Razorback Mill - Dundas

As requested by you, this report deals specifically with a simplified flowsheet for treating a minimum of 160 tons of Razorback ore per day on a two shift basis and the approximate cost of the required items and their installation.

Reports examined in detail were as follows:

Department of Mines Laboratory, Launceston Report R631 of 16th August, 1971 dealing with the sampling and evaluation of the Razorback mill, Dundas. Report R631 of 24th August, 1971 from the same source which dealt with a proposed flow sheet based on 24 hour per day operation for treating 200 tons of ore per day.

Site Inspection

The site inspection on Monday 18th October provided several points of interest which would have a bearing on mill lay out and ore treatment.

1. The disposition of the ore-body and the slope of the site should allow for adequate drainage of the open cut and provide good conditions for daily storage of ore and its movement to the crusher and mill. It is in this area that some operational savings could be made by providing up to 250 tons surge bin storage ahead of the crusher, thus allowing for a one shift open cut programme and probably limiting crusher operation to the mill feed bin for part of day shift only. This would allow the crusher operator ample time to attend to mill feed, classifier operation and other duties.
2. Although the ore being currently treated is obviously carefully selected and therefore clean and gritty, the proposed open cut area clays and other fines appear surprisingly friable even when wet.

Flowsheet

The attached proposed flowsheet is based on a two shift operation.

The items involved will initially be discussed in sequence and in general terms.

Surge or Pocket Bin

This bin should be of sufficient capacity to provide a three shift supply of about 250 tons which would allow a small margin of surge capacity between the mine and the mill.

Construction could be simple, consisting basically of an excavation into the hill and allowing a 45 degree slope for the bottom which should narrow to door width at the front. The bottom should preferably be lined with either steel plate or timber. Front and side walls of bush timber need only be strong enough to contain the material. A simple counterbalanced gate control in the front designed with sufficient lift to clear larger lumps (usually 3½ times the diameter of the largest size) would be adequate and relatively cheap.

Grizzley

Owing to the fine nature of much of the ore, crusher duty will be light. The grizzley spacing should be ½" below the maximum ball mill feed size of 1½".

Construction, using 25-30 pound rails with the flanged foot cut off, thus allowing the thinner web of the rail to seat in slots cut in cross members of heavy plate is simple. The grizzley should be about 5 feet long and have sufficient width of say 20 inches for the crusher feed opening. The required slope of 45 degrees would be a follow through from the surge bin floor and gate.

Crusher

The 16" x 10" crusher has a capacity of about 10 tons per hour with fairly hard ore. On Razorback ore which has a predominance of finer sizings the throughput rate could possibly be doubled, thus allowing the mill feed bin to be filled in four to five hours.

Crusher foundations need not necessarily be of concrete. Rough squared timber of about 10" x 10" would probably be adequate provided the ground is solid.

Power requirement would be about 15 horsepower. A feed belt to take grizzley and crusher undersize to the mill feed bin would be required but the minus 1½"material would not require more than a light conveyor.

The length of the belt would depend on the site requirement but the cost would probably be low as this type of equipment is usually available second hand.

Mill Feed Bin

This bin should have a capacity of about 100 tons and could probably be sited to take advantage of the terrain as in the case of the surge bin. It should also have a bottom slope of 45 degrees preferably lined with steel plate.

Construction could be similar to that employed for the surge bin. Instead of a door, a simple type of plate feeder consisting of a plate resting on rollers and provided with a variable reciprocating motion, would be positive and easily adjusted. This again is a simple construction job.

Feed to the mill would then pass to the scoop box via another 45 degree steel chute.

Ball Mill (5 x 7)

This mill will require a considerable amount of cleaning up and repair work. Various parts missing from the mill appear to be lying in the area, but until a complete examination is carried out the cost of bringing it up to standard is hard to assess. However, unless something not presently apparent is found to be defective, the figure should not be excessive. The condition of the liners will also have to be checked when the mill is opened up, and the ball charge said to be in the mill could partly offset the cost of subsequent requirements.

The generally soft and friable nature of the Razorback ore could result in a fairly low consumption of grinding media, and the harder inclusions should assist in grinding the softer ors. Although a full ball load for this mill would be about 10 to 11 tons it is possible that this could be decreased.

The calculated horsepower for this mill and duty is within 75 and this capacity is recommended. New cost for a 960 or 1440 r.p.m motor would be about $20 per horsepower or $1500. Suitable pulleys for the motor and mill pinion shafts, together with wedgerope drive belts would be required.

This mill would require concrete foundations and about 25 yards would be necessary. Including excavations, reinforcement, forming and placement the cost per yard would very between $100 and $120.

Critical speed for this mill is 34 r.p.m. and the optimum speed for this application 27 r.p.m.

Ball Mill Classification

Closed circuit grinding could be effected either by a rake, spiral or drag classifier or by a D.S.M screen. A D.S.M. screen is the logical choice but, with the ancillary dewatering and other equipment, could be several times as expensive as a secondhand Dorr Classifier at $1500. A new Dorr or Spiral type classifier would cost about $11000 .

As the feed to a four spigot hydraulic classifier should contain 40-60% solids, and as the Dorr classifier would be operating within these overflow limits, the circuit would therefore be simplified.

The tendency to overgrind the cassiterite would be counteracted to some extent by keeping the classifier overflow at the maximum density consistent with the required mesh separation.

Hydraulic Classification.

Classified table feed is probably the most important requirement for efficient rougher tabling.

Four product hydrosizer equipment may be sophisticated and expensive or relatively simple and inexpensive depending on the degree of automation involved in control of entry water and material withdrawal at the spigots. Examples of simpler four spigot machines for the required tonnage are the Stokes from England at about $7000-$10000 or a Denver at about $4000. The Stokes machine would have to be imported, or the Denver machine fabricated in Australia from plans to be obtained from the U.S.A. Delivery on either would be 6-9 months.

A four spigot hydraulic classifier could be fabricated locally for under $3000 including a steady head water supply and pump. This machine would depend on manual control at each spigot for water inlet and material withdrawal. Design work and drawings could be produced locally.

Required water pressures would be from 5 to 15 lb. per square inch. Feed would contain 40 to 60% solids and the overflow would be in the range of 5 to 20% solids.

Cyclones

Cyclones will be required ahead of the vanners and the regrind mill for de-watering and de-sliming purposes. They will be relatively small units and efficient in operation.

Tabling

If an extraction approaching the optimum of 60% is to be obtained the recommended number of tables and vanners should be installed. Some latitude in type of machines in the vanner section is possible but the cost of these is high unless some

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PRELIMINARY COST ESTIMATE - RAZORBACK MILL

ITEM	COST
Surge Bin	$2500
Grizzley (5 ft.)	200
Crusher Foundation, Timber	100
Conveyor Belt	500
Mill Feed Bin	1500
Plate Feeder	100
Ball Mill Foundation at $100/Yard	2500
Ball Mill Repairs including scoop	2000
4 ft. Dorr Rake Classifier Including foundations	2000
4 Spigot Hydraulic Classifier	3000
Cyclone ahead of Regrind Mill	1000
Cyclone ahead of Vanners	1000
= Tables x 4	4000
Vanners x 2	2000
Regrind Mill Resiting and drive	200
Roof Structure	10000
Concrete Flooring (to be determined)	
TOTAL	$32600

Crusher + Motor 3,500

Ball Mill 6,000

Power Supply 10,000

Mill Excavation ~~2,000~~

Water Supply 2,000

Drive Motor + Gear 2,000

Assembly + Cartage 1,000

Erection of plant 7,500

$ 71,600

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PROPOSED FLOW SHEET

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