

***Investigation of the Impact of
Steel Chip Removal from Grinding Charge***

Objective

A significant proportion of the charge in a ball mill consists of undersize media, such as steel chips and worn balls, that contributes little to the grinding effect but occupies mill volume. The chips recirculate in the grinding circuit via the cyclone underflow. The adverse affect of such material is well known in the cement industry where operators regularly dump the charge from ball mills and replace it with a sorted charge of round balls. A recent test at Escondida indicated that removal of undersize media gave a 5% improvement in grinding performance and an improvement in time between cyclone feed pump rebuilds of 300%.

The objective of this project is to quantify the effect of ball chips on grinding mill efficiency and, if it is determined to be significant, to develop a method of efficiently removing such material from the mill circuit - probably magnetically. The project would involve a literature survey, pilot-scale quantification of the benefits of removing undersize media, investigation and development of a practical method of removing undersize media, and plant validation of a suitable system.

Potential Benefit

As an example of the potential savings, if the grinding energy efficiency could be improved by 5% in a 30 000 t/d operation, the power savings would be \$500,000/a. Other benefits could include increased mill throughput, reduced introduction of finely divided and dissolved iron to downstream flotation or leaching circuits, and reduced grinding media costs.

Scope of Research Activities

The project is to be split into four phases. Successful completion of each phase triggers the next phase.

Phase 1 Literature survey.

Phase 2 Pilot plant ball milling with and without the inclusion of chips to quantify the effect on grinding mill efficiency.

Phase 3 Investigation of practical methods of removing chips from a mill charge.

Phase 4 Plant scale validation of the process developed during Phase 3.

Time Frame

A total project duration of one and a half years is expected.

Phase 1 One Month

Phase 2 Six Months

Phase 3 Six Months

Phase 4 Six Months

Potential Sponsors

Agnico-Eagle, Barrick Gold, INCO, Noranda, Rio Algom, Rio Tinto, Teck,

Budget cost

The following draft budget has been prepared.

Budget cost estimate

| Item | Cost C\$ |
|--|------------------|
| Phase 1 Literature survey | \$5,000 |
| Phase 2 Pilot scale quantification | \$40,000 |
| Phase 3 Develop chip removal technique | \$50,000 |
| Phase 4 Prototype instal and test | \$50,000 |
| Total | \$145,000 |
| CAMIRO Fee (10% of Total Budget) | \$14,500 |
| Total cost to sponsors | \$159,500 |
| Cost per sponsor (assumes ten sponsors) | \$15,950 |

Specific Deliverables

- Progress Reports (Quarterly) and presentation at end of each Phase
- Final project report

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