

Mine Design to Extract Optimal Mining Value

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Program - Our industry often forgets the critical aspect of creating and safely maximizing the value from a mineral deposit. Our past experience is largely based on the desire to increase productivity and reduce costs. A different approach must be integrated into all aspects of the design to achieve a value focused design. Hence, CEMI has initiated this project as part of a larger strategic research program (SRP#3) focusing on value-driven design methodologies, for short, "ValueMine".

Project – Mine Design Handbook A CALL FOR AUTHORS!

Purpose - Create a best practice handbook for value-driven underground hard-rock mine design.

Context - Our industry is currently experiencing a significant turnover in personnel and many lifetimes of experience in mine design will be leaving the industry. We do not have a readily available means to preserve this experience for future mining professionals. Our universities are suffering from the same demographics shift, and a handbook would benefit them from a teaching and training perspective. The development of a best-practice mine design manual or handbook presents a unique opportunity to enhance collaboration between multiple universities and industry representatives. The handbook must also serve the needs of current new professionals, who are much more technology savvy than previous generations, as well as consultants who play an increasing role in mine design.

Many textbooks have been written on underground mine design. Printed material is difficult to keep current and doesn't readily allow alternative views or adaptations to be presented. Current publications do not cover the wide range of tasks required of a Mining Professional, nor do they adequately link the theory with the practical applications. Case studies are often presented as part of a textbook, but do not offer related data or an adequate discussion of the design process that was undertaken in the mine development. As part of this project, individuals have been or will be commissioned to assist in assembling relevant case histories and in providing data for case studies.

The handbook must assist recent graduates and junior consultants who currently lack the experience in mine design in the principles of maintaining value in mine design. The work of capturing the current best practice in mine design will also allow CEMI to identify research opportunities to establish excellence in value-driven mine design. It is understood that specific research projects will be required to improve or develop new tools for the mine design process to achieve this desired excellence.

Outcomes (Quality)

1. The mine design handbook will be an online Wiki-style document (exact format to be determined) produced to allow ease of access, updates, and inclusion of new knowledge.
2. The handbook chapters will be co-authored among industry, consulting agencies and academia to allow for a discussion that balances theory and practice, and allows for two-way knowledge transfer from a broad range of perspectives.

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3. During the development of the handbook there will be regular consultation meetings with the sponsors to ensure that the purpose of the handbook is being achieved.
4. During the development of the handbook there will be regular (web) meetings with the editor-in-chief and the authors to ensure that the content is well-coordinated.
5. By compiling a best-practices handbook, shortcomings in current knowledge and tools will be identified. A concurrent gap-analysis will be undertaken by CEMI. The framework for future work will be developed from the production of the handbook, as each contributing author will be asked for input on what the desired future state of mine design could be.
6. The format of the handbook will follow the author's guidelines. (Guidelines need to include the appropriate use of case studies and data-sets)

The handbook is part of a three-year strategic program (SRP#3; see www.miningexcellence.ca) that will initially run three years at a minimum project cost of \$1M.

Industry Sponsorship

It would be valuable to have industry participation in this project through sponsorship and collaboration.

a) Current program sponsors:

- Vale Inco and Xstrata Nickel through CEMI with Ontario Government leveraged funding.

b) New program sponsors can join as:

- A single strategic research program (SRP) sponsor and contribute \$50,000 per year for 3 years. If the program is extended, new sponsors will be expected to contribute at a higher rate to buy into previous achievements (\$75,000/years). Program sponsors are also expected to make in-kind contributions by providing access to data and information and by designating an active program participant.
- Multiple strategic research program sponsor and CEMI membership (as per bylaws) at \$100,000 per year for 3 years. CEMI Membership allows the member to participate in up to two SRPs and to assume technical advisory functions within CEMI's program management structure.

Benefits to Strategic Research Program (SRP) Sponsorship

- Free access to the all products of the research (e.g., handbook) for the duration of the project and for use at all of its operations (some confidentiality, IP or copyright rules may apply)
- Receive a final reports in electronic form (e.g., the online handbook) for free use within all their operations.
- Members have the ability to focus the research on sponsor specific sites, data and case studies.

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Call for Authors

We invite consultants, members of academia and industry, as well as recent retirees, who are interested in making a valuable contribution and learning in the process, to contribute their experience and expertise to the writing of one or more chapters for the new collaborative online handbook.

Proposed Table of Contents

Chapter	Chapter Description
1	The general environment in which the mine exists. The mine design must meet conditions that go beyond the actual orebody. This chapter covers the company objectives and the social/environmental commitments.
2	The stages of mine planning . The complexity of the design will be a function of the stage of evaluation.
3	The information required for mine design . This chapter will describe the information required before the work on the mine design can proceed.
4	Selection of Mining Method . Trade-off analyses must be conducted to determine the most appropriate method(s) to use for the deposit.
5	Mine Design . This chapter covers the detailed mine design in enough detail to determine the operating and capital costs
6	Infrastructure Design . This chapter will cover the trade-off analyses required to determine material movement and services design in enough detail to determine the operating and capital cost.
7	Simulation . Simulation is a relatively new tool that can be used to assess the risks associated with a given design and to help develop strategies to mitigate the risks. Simulation can be used in each step of the mine design.
8	Scheduling . The objective of this chapter is to develop a mine plan covering development and production, determine the critical path during the construction, and ramp-up to full production.
9	Economic and risk analysis . The cash flows of the mine are calculated, sensitivity and risk analysis undertaken, description of the hill of value concept and best practices to preserve ore value.
10	Metrics . This chapter will discuss the common metrics used in the design and those that should be used in the operation to ensure preservation of ore value.
11	References .
12	Glossary of Terms .
13	Case Studies . The case studies are included to serve as an example of the application of the principles described in the various chapters of the book.