

Opti-Cut was released in 1995 and represented a world first in the industry by optimizing the value of cut-off grades. Processing cut-offs had previously been a game of hit-and-miss. How much and for how long you should raise the cut offs before it ceases to be profitable has usually depended on economic factors at the time of processing. But ore that you reject now, may be worth something in the future. Opti-Cut helps you determine whether to use stockpiles and can increase the NPV of your mine over time by up to 10 per cent by finding the most profitable cut-off grades.

How Opti-Cut works.

The software can take data directly from any Generalised Mining Package, work in conjunction with Four-D and Four-X, or be used as a stand-alone program. Given the correct resource and mining sequence, Opti-Cut will find the optimal cut-off grade for any mine. Users simply give Opti-Cut a scenario which describes the economic conditions, mining and processing throughput capacities and the resource to be mined and Opti-Cut will determine a set of cut-offs, stockpile utilisation and actual mining and milling throughputs. You can create as many different scenarios as you like, building

a database of each scenario as you go.

What it can do.

Opti-Cut can process any given mining sequence, from multiple ores, multiple rock types, multiple processing methods, multiple deleterious elements, and multiple stockpiles. It can also calculate user-defined production limits, prices which vary with grade and time and costs which vary with rock type, grade and time. At the completion of each case, Opti-Cut produces a report

which gives you a complete audit trail through the entire cut-off determination process. The report also details period by period, all mining and processing throughputs and stockpile utilisation.



Users can then design their own spreadsheet format to include all the information produced by Opti-Cut. The program is flexible enough to be used for scoping studies, design work, sensitivity analysis and production planning, with countless mineral combinations. The benefits of Opti-Cut in the formative years of a mine are obvious. By raising the processing cut-off grade above the marginal cut-off early on, you can substantially increase the cash flow of the mine which more than compensates for the loss of production towards the end of the project.



HARDWARE PLATFORMS

IBM compatible PCs. The minimum requirement is a PC 386 with 4MB of memory, a maths co-processor and 50MB of free disk space. The preferred specification would be a fast 486DX, or better, 16MB of memory and 100MB of free disk space. The programs will run under DOS and in DOS windows under Windows 3.x, Windows NT, Windows 95 and OS/2.

Unix workstations. In general, workstations have adequate memory and hard disk space so that the above specifications are not relevant. Supported hardware includes: DEC Alpha, DEC Ultrix, HP-UX, SGI Irix, Sun Solaris 1 and Sun Solaris 2.

INTERFACES

Opti-Cut imports data from Whittle Four-D. Interfaces under development: DATAMINE, MEDSYSTEM and VULCAN.

Other interfaces are easy to create because all Whittle input and output files are text files.

Opti-Cut exports data to: Excel, Lotus 1-2-3, Quattro Pro, Supercalc and other spreadsheets and graphics packages.

CAPABILITIES

- 10 Elements • 30 Rock types
- 30 Processing-method/rock-type combinations
- 10 Throughput limits • Time variant data
- 20 Stockpiles with time dependant recoveries
- Discount and inflation rates • Capital and time costs
- Variable mining costs and throughputs
- Variable processing costs, limits and recoveries
- Sales and environmental costs • Spreadsheet output
- Open pit and underground processes

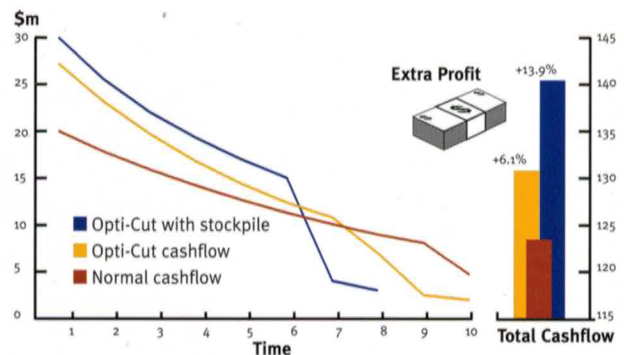
CUT-OFF GRADE MODELLING

Opti-Cut is an excellent modelling tool. Its uses include:

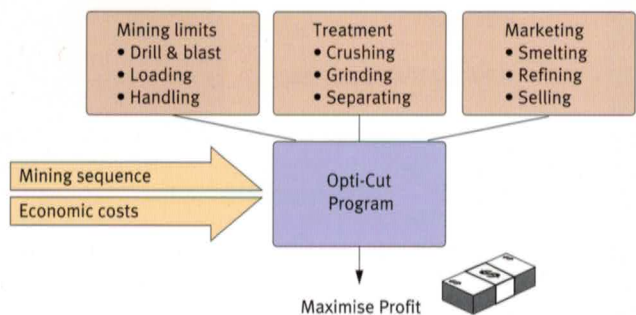
- Maximization of Net Present Value • Risk analysis
- Plant and mining capacity sizing • Scoping studies
- Evaluation of stockpiles • Sensitivity analysis
- Evaluation of multi-element deposits.

With the aid of spreadsheet output all these concepts can be put into graphical form for ease of presentation

Opti-Cut discounted cashflows

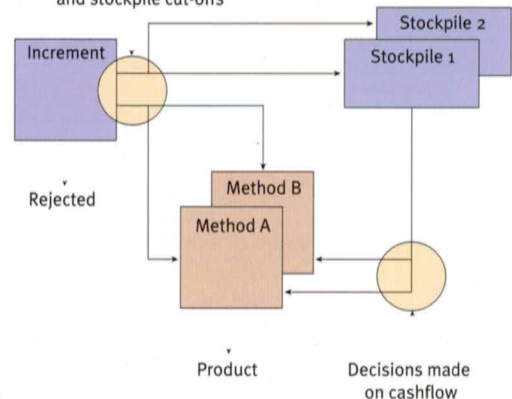


Uses constraints and resources to maximise profit



Stockpile decisions

Decisions made using processing cut-offs and stockpile cut-offs



Whittle Programming Pty Ltd

There are many technical papers and case studies on the use of Whittle software. Request literature from:

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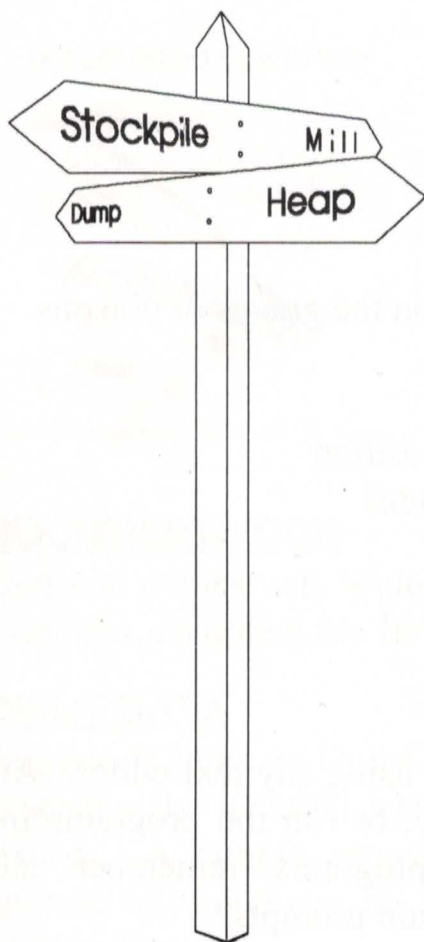
Opti-Cut

Cut-off Optimization Software

by Whittle Programming - The Mining Optimization Specialists

You can make a marginal mine profitable or a good mine even better by optimizing your cut-off grades with Opti-Cut

Whittle Programming's **Opti-Cut** makes the optimization of cut-off grades generally available to the mining industry for the first time. The software can be applied to both open pit and underground mines and will run either stand-alone, in conjunction with Whittle Four-D or directly with data from a generalized mining package.



It has long been known that there is more to processing cut-offs than just balancing the day-to-day costs of processing against revenue. Modern concepts involve calculating cut-offs which would maximize not the cash flow but the Net Present Value (NPV) of a mine.

Raising the processing cut-off above the marginal cut-off in the early years of a project can increase the average grade into the mill and, in consequence, the cash flow. This increased cash flow in the early years can more than compensate for the consequent reduction in cash flow at the end of the project. *How much and for how long should you raise the cut-offs?*

Ore that you reject now, might be worth something to you at some time in the future. Determining whether or not to use stockpiles involves difficult calculations which depend in complicated ways on the throughput capacities, on the grade distribution of the mining sequence, and on the prices and costs throughout the life of the mine. *How can you calculate whether or not you should use stockpiles?*

When economic factors are set to change, how do you incorporate these changes into your cut-off calculation model?

Opti-Cut will produce optimal cut-offs for a given resource and mining sequence. It can handle all the requirements of real mines, including multiple products (e.g. copper and gold); multiple rock types; multiple processing methods; multiple poisons; multiple stockpiles; user-defined production limits; prices which vary with grade and time; costs which vary with rock type, position, grade and time.

OPTI-CUT OUTPUT/REPORTS

Each of the Opti-Cut programs produces a report at the completion of each run, constituting an audit trail through the entire cut-off determination process.

Following an optimization run, a full report is produced showing period by period, all mining and processing throughputs and stockpile utilization. In addition, users can design their own spreadsheet data file format to include virtually any of the data used by or produced by Opti-Cut.

PROGRAM FLEXIBILITY

User-defined mining sequence descriptions are flexible enough to allow the user to specify them for scoping studies, design work, sensitivity analysis and production planning.

The software can handle:

- Multiple rock types
- Multiple processing methods
- Multiple products
- Multiple poisons
- Capital injections in nominated periods
- A non-zero terminal value
- Sales costs
- Environmental costs
- Recoveries and processing costs which depend on the grades of poisons as well as of products
- Maximum and minimum cut-offs
- Variation of mining and processing costs with position
- Multiple stockpiles with initial tonnages and grades
- Stockpile degradation with time
- Complex throughput limits

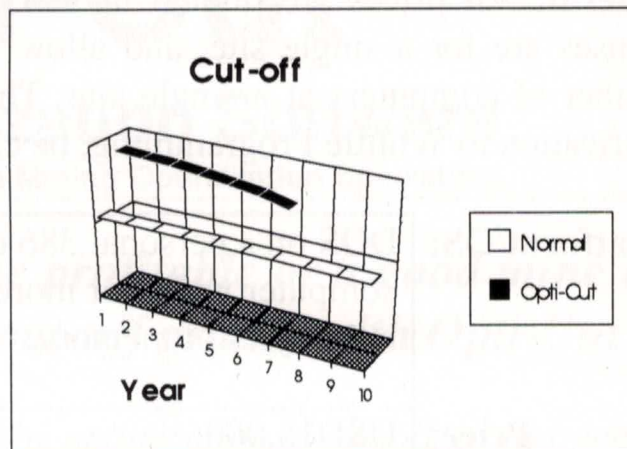
USER INTERFACE

Scenarios are set up in the input files which can be created using any text editor. At program run time, users can enter file names interactively, or run the programs in batch mode using the in-built logging facilities. The programs 'remember' all recently used file names and offer sensible defaults to program prompts.

The user interface is consistent over all platforms.

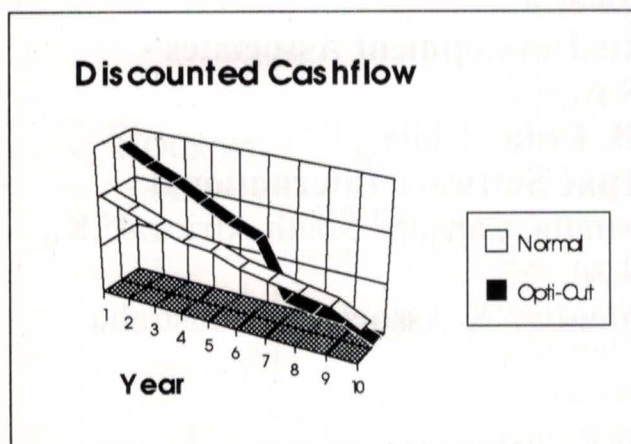
HOW NPV CAN BE INCREASED

If we raise the cut-off above the marginal cut-off, there are two effects. One is that we reject ore that could otherwise have produced a positive cash flow. The other is that we increase the average grade through the mill. Consequently, we increase the amount of product produced by the mine per year, and hence our cash flow per year.



How much, and for how long, should we increase the cut-off? Should we stockpile the rejected material and process it later, even if there are extra handling costs involved? What effect does a future economic change have on the cut-off and

stockpile plan? To find answer these questions, users give Opti-Cut a 'scenario' which describes the economic conditions, mining and processing throughput capacities and the resource to be mined. Opti-Cut will determine a set of cut-offs, stockpile utilization and actual mining and milling throughputs for the scenario that maximises NPV. Each run takes only minutes or seconds, so it is easy to build a database of different scenarios and results for what-if and sensitivity analysis.



DOCUMENTATION

Opti-Cut comes with a clear and concise User Manual, which includes tutorials and exercises, complete file format details and program operation instructions.

INPUT DATA

All data is input to Opti-Cut in the form of two text files. The Sequence Text File describes the material which is to be mined and the sequence in which it is to be mined. A simple sequence text file can be prepared using a text editor, or alternatively, one can be generated by Whittle Four-D or by a GMP (Generalised Mining Package).

The Economics Text File describes the economic and operational conditions under which mining is to take place. This is a small file prepared with a text editor.

The two files together constitute a 'case' or 'scenario' that is processed by Opti-Cut.

PRICES

General: All prices are quoted in U.S. Dollars and are ex any tax or duty. All licenses are for a single site, and allow for the installation of the software on any number of computers at a single site. The site which is nominated may, with prior notification to Whittle Programming, be changed twice per calendar year.

Platform/OS:	DOS on a personal 386 or 486 computer with 4 or more megabytes of memory.	DEC Alpha OSF/1, DEC Ultrix, HP700 HP-UX, SGI IRIX, SUN Solaris 1 and SUN Solaris 2.
Price:	USD15,000	USD20,000

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