



Scheduling and Cutoff Grade Optimization with MineSight® Economic Planner Program MSVALP

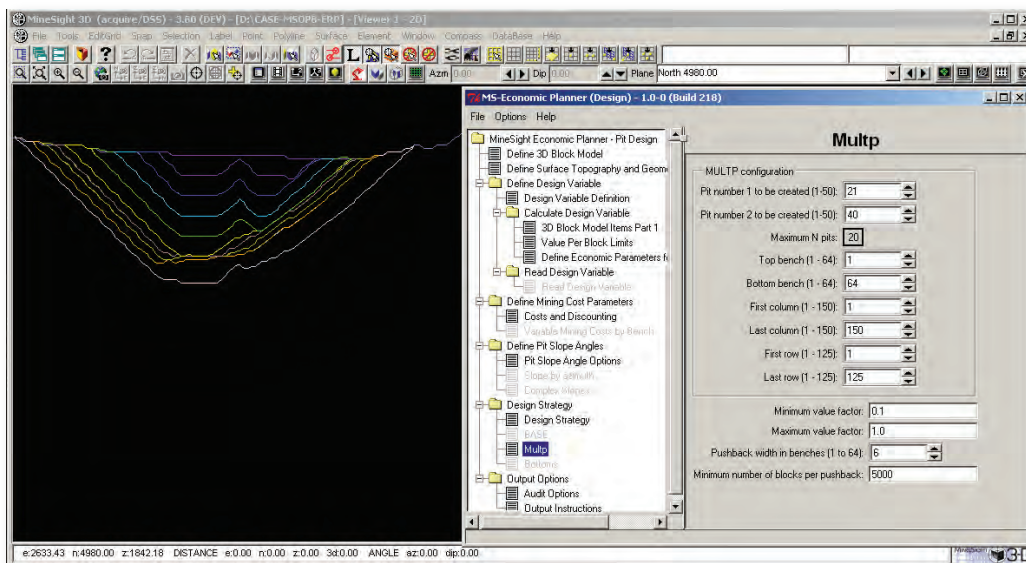
MineSight® Economic Planner (EP) has two major components: MSOPIT and MSVALP. MSOPIT is used for open pit optimization studies and the quick generation of shells representing Pits, Phases, or Pushbacks. MSVALP is used to obtain a Simplified Long-range Production Schedule from a series of shells using cutoff grade optimization and Net Present Value (NPV) analysis.

This two-part article (part one was published June 2007) presents the long-range scheduling and cutoff grade optimization methodologies used by MineSight® EP program MSVALP. Part two continues here covering the input data required to run the program and the output produced by the program.

Input Data Requirements

Data input requirements for running program MSVALP include the following:

- A set of pit shells input in sequential mining order. The shells are Gridded Surface File items and are cumulative in nature (i.e., shell 2 includes shell 1, shell 3 includes shells 1 and 2, etc.).



The shells can be obtained using any of the design strategies in MSOPIT. Mintec suggests using the MULTP design strategy which will allow the user to design a set of shells based upon economic and geometric constraints as well as production requirements. Phases designed with the MineSight® Pit Expansion Tool and converted to Gridded Surface File format can also be used.

A series of pit shells are required and it is suggested to use the MULTP strategy in MSOPIT.

- Raw economic data (prices, recoveries, costs) or pre-calculated Net Value/tonne. The program will either calculate a Net Value/tonne based on raw economic data provided by the user or read a previously calculated Block Value/ tonne from the 3-D Block Model.
- Cutoff grade item and increment range for use on cutoff grade optimization analysis. The cutoff grade item must exist in the 3-D block model and can be a grade (copper), an equivalent grade (copper-moly equivalent), or an economic value (\$/tonne).

(continued on page 7)

(Scheduling and Cutoff Grade Optimization with MineSight® Economic Planner Program MSVALP continued from page 6)

- Plant/process requirements and total mining capacity by period.
- Discount rate to use in NPV (Net Present Value) analysis.

MSVALP Output Files

Several ASCII output files containing summary and detailed information about the scheduling results are produced by program MSVALP:

Standard report file (rptval1) – Similarly to other MineSight® programs, MSVALP has a standard report which summarizes the input data used, summarizes the reserves in each shell, and summarizes the scheduling results.

Detailed file (det) – This file provides a more detailed breakdown of the input data and audit-type detailed information on the generation of the Base Case schedule and Optimized (Best) schedule. The cutoff grade optimization results are presented in this file.

Reserve file (res) – The reserve file contains a listing of the Mining Units (Reserve Records) for each shell. Information listed for each Mining Unit includes Reserve record#, Pit Number, Level#, Material Code, Best Destination Code, Cutoff Bin, Best \$ Value, Tonnes, Grades, and \$ Values for other sub-optimal destinations.

Schedule file (sch) – The schedule file lists detailed audit-type information for the results of the cut-off grade optimization analysis on each Reserve Record. It shows which Reserve Records are sent to stockpile during cut-off grade optimization and when they will be reclaimed and processed in the future. Various economic values used during the cut-off grade optimization for each Reserve Record are listed.

Summary file (sum) – The summary file contains a period-by-period summary of the life-of-mine schedules for the Base Case, the Best Case, and the series of Constant Cutoff cases.

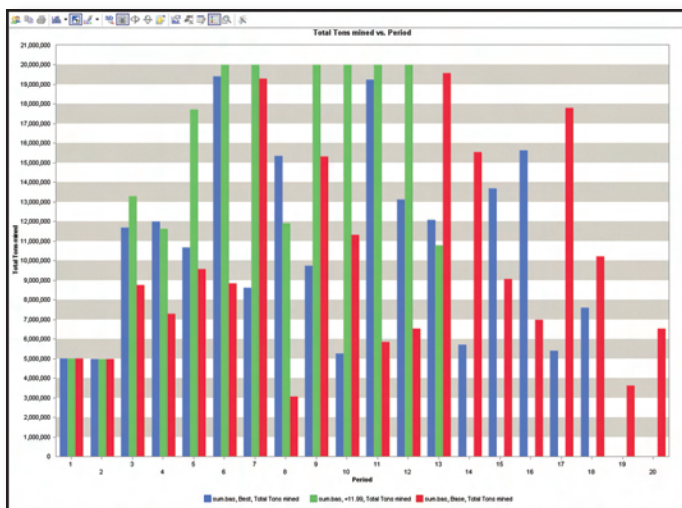
Audit File (workmsvalp) – The audit file shows parameters and calculations for a chosen column.

Analyzing MSVALP results with MineSight® Economic Planner (MSEP) Charting Tool

The information, in tabular form in the Schedule File and in the Summary file, can be graphed using the auxiliary program MSEP Charting tool (MSEP-C). This is a useful tool for schedule analysis as well as a final presentation.

MSEP-C can be started from **MineSight® | MSEP menu** (Programs folder) and uses the Summary and the Detailed files. Once the files are loaded in the tool (**Open | Summary** or **Open | Schedule Files**), the user can select which series to display in a chart.

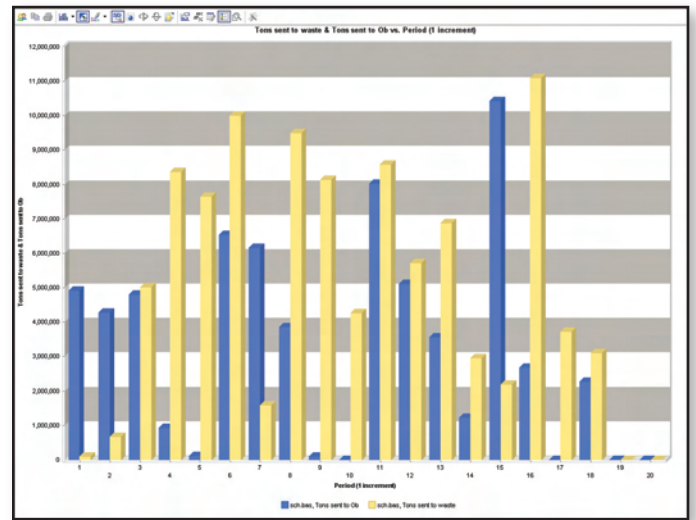
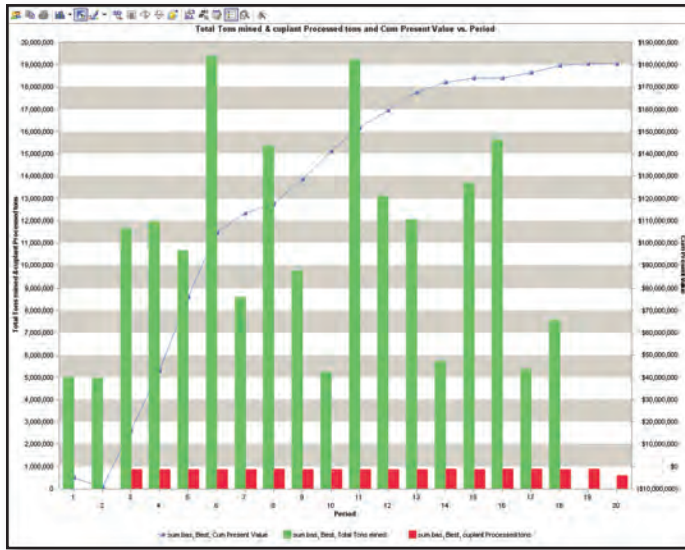
If using the Summary file, the user can plot variables such as Capital, Cashflow, metal units going to the different processes, Mining Capacities, Stockpile re-handling, etc., by period for each schedule, Base, all the constant Cutoff grades, and Best Case.



Comparing Total Tons Mined for Best Case, Constant (+11.99), and Base Case Schedules.

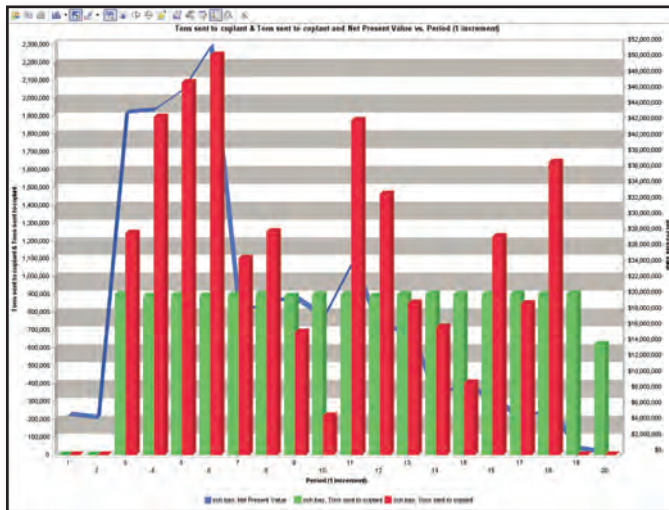
(continued on page 8)

(Scheduling and Cutoff Grade Optimization with MineSight® Economic Planner Program MSVALP continued on page 7)



Mining Capacity, (Cu) Processing Capacity, and Cumulative NPV Shown by period.

The Schedule file allows the user to plot results only for the Best Case schedule. Once the file has been loaded in MSEP-C, the user can select variables such as NPV, tons processed for each of the processes including Stockpile and Waste, or \$ value sent to each destination. The series can be plotted by period or by PIT number.



Tons Sent to Cu and Mo Plants. Controlling process is kept constant (Cu).

Tons Sent to Stockpile and Waste.

Additionally, as an option, the user can store the following scheduling results in the 3-D Block Model:

- Shell Number for each block
- Schedule Period for each block
- Schedule Final Destination Code for each block (Plant, Leach, Dump, etc)

Conclusions

MSVALP is a tool for generating quick optimal production schedules using cut-off grade optimization and NPV analysis. The results from these preliminary production schedules can be used to evaluate different processing plant sizes and associated mining capacity requirements in addition to the normal economic sensitivity analyses performed during feasibility and pre-feasibility studies. The results from the MSVALP scheduling studies can be graphed for quick comparative analysis and display. The cut-off grade optimization results can be used in the more detailed MineSight® Strategic Planner scheduler for further evaluation and verification.