

# MINE SIGHT® in the Foreground

Volume 23, Number 6, June 2007

## Tips from Tech Support:

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

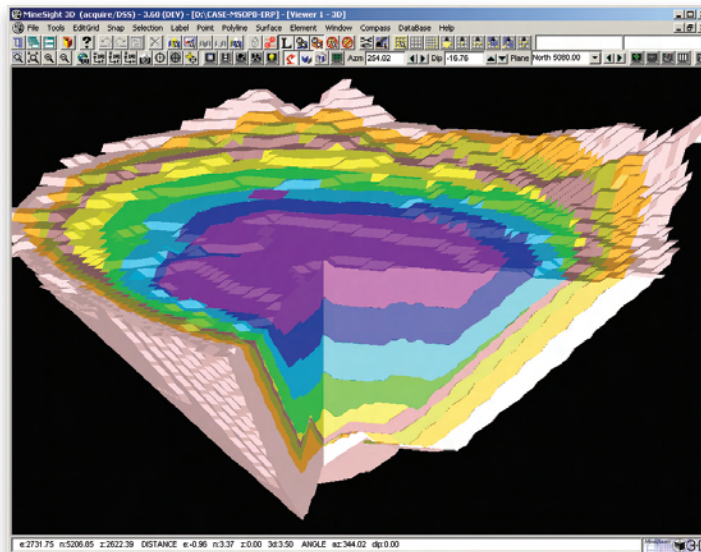
MineSight® Economic Planner (EP) has two major components: MSOPIT and MSVALP. MSOPIT is used for open pit optimization studies and the quick generation of shells representing Pits, Phases, or Pushbacks. MSVALP is used to obtain a Simplified Long-range Production Schedule from a series of shells using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

This two-part article presents the long-range scheduling and cutoff grade optimization methodologies used by MineSight® EP program MSVALP. Topics covered include the underlying logic and assumptions made by the program, the input data required to run the program, and the output produced by the program.

The scheduling capability of MineSight® EP does not replace the usage of MineSight® Strategic Planner (SP), which is a more detailed long-range scheduler program. The main purpose of the MineSight® EP scheduling tool is to quickly generate and compare life-of-mine schedules for different cases that have different ore processing plant capacities and/or different total mining rates. Cutoff grade optimization techniques are used to maximize the NPV for each case evaluated. The results from the MineSight® EP scheduling studies can then be used as input to the more detailed MineSight® SP scheduler.

## MSVALP Logic and Assumptions

MSVALP schedules a series of shells that expand a pit in mineable width increments from the current



pit topography (original ground if no pit exists) to the final pit topography. These shells are typically produced by program MSOPIT, but one can also use shells produced by other programs or actual phase designs produced by the MineSight® 3-D Pit Expansion tool.

MSVALP produces several schedules for each case being analyzed:

### 1. A Base Case

schedule that processes all material above the internal cutoff grade and satisfies the processing plant requirements each year. This schedule maximizes total profit. The shells are mined one at a time in progressive order at the mining rate needed to satisfy

*(continued on page 2)*

## Inside This Issue:

2007 Training Schedule... page 11

Current Affairs

Creating Geologic Maps in MineSight® 3-D from 2-D Field Maps... page 4

Mintec Directory... page 3

Mintec, Inc. Continuing Education and Training... page 11

Seeking Submissions of Mine Photos for Calendar... page 10

Tips from Tech Support

Scheduling and Cutoff Grade Optimization with MineSight® Economic Planner Program MSVALP... page 1

Trade Shows and Seminars... page 12

Web-based Training... page 12

# TIPS

from



# Tech Support

(Scheduling and Cutoff Grade Optimization with MineSight® Economic Planner Program MSVALP continued from page 1)

the plant requirements each year. Smoothing of stripping spikes is limited to moving waste mining forward only when needed to assure that the total mining capacity/period is not exceeded.

2. A series of Constant Cutoff schedules that process ore material above a set cutoff grade and stockpile lower grade ore material that is below the cutoff grade. The processing plant requirement is satisfied each year. The shells are mined one at a time in progressive order at the mining rate needed to satisfy the plant requirements each year. Smoothing of stripping spikes is limited to moving waste mining forward only when needed to assure that the total mining capacity is not exceeded in any period. Stockpiled lower grade ore material below cut-off is reclaimed during scheduling with the highest grade material used first.

3. An optimized schedule using cutoff grade optimization techniques. This evaluation will find the cutoff grade to use each year to maximize the NPV of the schedule. The evaluation is based on using any available excess mining capacity to mine higher grade material earlier in the schedule to increase the NPV. User-specified cutoff grade increments (or bins) are evaluated each year in the following way:

- a. Replace material going to the processing plant from the lowest cutoff bin with higher grade material and recompute the schedule economics.
- b. If the value of the higher grade material is sufficient to pay the opportunity costs associated with the replacement (i.e. the value of the higher grade material must cover: 1) the value lost by not processing the lower grade material, and 2) the additional mining costs associated with mining more material which includes the material sent to stockpile and any additional waste mining required to access the higher grade ore) then the replacement is implemented because it improves the NPV of the schedule.
- c. Increment the cutoff to the next lowest bin and repeat steps a. and b. The optimization

for each year stops when there is no improvement in the NPV of the schedule (i.e., when the test done in step b. fails) or when there is no longer any accumulated excess mining capacity in the period.

Analysis of Schedules			
	Base Case	Const. Cutoff + 11.999	Best Case
Tons Processed	35,595,928.	35,595,928.	35,595,936.
Tons Ore Mined	33,287,466.	27,396,112.	30,780,692.
Tons Waste Mined	162,117,808.	168,009,168.	164,624,560.
Tons Total	195,405,280.	195,405,280.	195,405,248.
Profit	377,151,232.	374,203,904.	376,046,752.
CFPV 5years	52,176,444.	78,603,616.	76,607,384.
CFPV 10 years	118,567,128.	159,287,744.	142,594,448.
CFPV total	168,396,608.	187,695,712.	182,104,528.
PV of Capital	-0.	-0.	-0.
NPV	168,396,608.	187,695,712.	182,104,528.
STP Processed	2,308,464.	8,199,819.	4,815,237.
STP Available	2,310,204.	8,201,559.	4,816,977.
Add PP Stripping	0.	0.	0.
CFPV of Adj WM	0.	-3,328,081.	0.
Period Max Mining	17.	11.	6.
Max Mining Rate	10,997,592.	19,155,154.	13,449,759.
Destination Capacity used			
cuplant	91.	54.	74.
coplant	45.	45.	46.
waste	26.	28.	26.
Ob	17.	17.	17.

MSVALP gives you a BASE case, a series of Constant Cutoff, and Optimized BEST schedules.

While optimizing, the scheduler will also test the economics of reclaiming ore from stockpile versus mining ore in the pit. If the value of the highest grade ore bin on the stockpile is sufficient to pay the opportunity costs associated with the pit ore that it is replacing (i.e., the value of the stockpiled ore must cover: 1) the value lost by not processing the pit ore, and 2) the additional stockpile rehandling costs) then the replacement is implemented because it improves the NPV of the schedule. The scheduler thus has the capability to consider the effect of reclaiming stockpiles during the cut-off grade optimization/maximize NPV process.

Certain assumptions are made to perform the cutoff grade optimization quickly. These assumptions include:

- Excess mining capacity is accumulated by the scheduler. This means that the capacity constraint is the cumulative excess

(continued on page 3)

(Scheduling and Cutoff Grade Optimization with MineSight® Economic Planner Program MSVALP continued from page 2)

mining capacity and not the period excess capacity (i.e., if the total mining capacity is underutilized in earlier periods, it will be assumed that this underutilized amount is available for later periods).

- The reserves are grouped into **Mining Units** or **Reserve Records** which are tonnes and grade units categorized by Shell, Bench, Best Destination, Material Type, and Cutoff bin. The mining units have a maximum size based on a tonnage specified by the user.
- Stripping can be moved to earlier periods based on available excess capacity. Whether or not this movement is geometrically reasonable is not considered.
- Selectivity in the stockpiles is based on the **Mining Units**.
- Mining sequence is defined by mining the shells one at a time in progressive order. Stripping of the next shell, however, can begin earlier to coincide with ore mining in the current shell if excess mining capacity exists and if the earlier stripping is required by the cutoff grade optimization results for improving the NPV of the schedule.

The second part of this article will be published in the July issue and will continue by covering the input data required to run the program and the output produced by the program.

## Special Announcement:

Microsoft® Windows Vista is not currently a supported Operating System for MineSight®. Mintec, Inc. is testing this OS and will inform you when it is a supported product.

# Mintec Directory

## Mintec Contacts

Accounting/Billing	Diane Hanna Aida Molina Myrna Azares acct@mintec.com
Consulting/Projects	Fred Fest
Contracts and Proposals	Shirley Deslauriers Ida Cole Laurie Goble
Friendly Operators	Maria Contreras Celest Montijo
Hotel/Travel Arrangements	Deb St. Aubin
Newsletter Editor	Robert Ashbaugh
Training Seminars/ Short Courses/ On-Site Training	Rudy Moctezuma
Training E-mail	train@mintec.com

## How to Reach Us

### Telephone Numbers

<b>Tucson Office (Main)</b> 520.795.3891	<b>Chile Office</b> 56.2.231.3591
<b>Calgary Office</b> 403.256.4988	<b>Peru Office</b> 51.1.434.2382
<b>Toronto Office</b> 705.735.1015	<b>South Africa Office</b> 27.11.804.0620
<b>Vancouver Office</b> 604.681.4547	<b>Perth Australia Office</b> 61.08.9389.4446

### Tucson Office (Main)

3544 East Fort Lowell Rd.  
Tucson, AZ 85716-1705 USA  
Fax: 520.325.2568 E-mail: market@mintec.com  
Web site: <http://www.mintec.com>

## Toll-free Tech Support Telephone Numbers

<b>Brazil:</b>	0800.891.4181
<b>Canada:</b>	1.800.548.6337
<b>Chile:</b>	123.0020.2154
<b>Mexico:</b>	001.800.548.6337
<b>Peru:</b>	****
<b>South Africa:</b>	0800.996052
<b>USA:</b>	1.800.533.6337
<b>Australasia Technical Support</b>	
E-mail: TS@minesightapplications.com.au	
<b>Chile Technical Support</b>	
E-mail: soporte@mintec.cl or contactenos@mintec.cl	
Tel: 56.2.365.1924; 1925; 1926	
<b>Peru Technical Support</b>	
E-mail: soporte@mintec.com.pe	
Tel: 51.1.358.8800	
<b>Tucson Technical Support</b>	
E-mail: TS@mintec.com	
Tel: 520.326.1860 Fax: 520.326.1008	
<b>Staffed Technical Support Hours</b>	
Mon - Fri: 6 a.m. - 6 p.m. (Arizona time)	
<b>Extended Hours:</b> Mon - Fri: 6 p.m. - 9 p.m.;	
Sat - Sun: 8 a.m. - 5 p.m.	

Standard support hours are from 6 a.m. to 6 p.m. weekdays. Extended support hours by telephone and E-mail are from 6 p.m. to 9 p.m. Monday through Friday, and 8 a.m. to 5 p.m. Saturday and Sunday, Arizona Time. Technical support is provided by telephone, E-mail, and Fax. Mintec provides regional toll-free telephone numbers from several countries for clients to contact the Tucson office. Using the Mintec web site and E-mail attachments, support staff is able to pass relevant data and information quickly between sites. In-bound and out-bound support E-mail is routed to all support staff in the Tucson office and copied to the regional office. Mintec support is based on a team response model to ensure consistent and timely responses, as support analysts rotate through training assignments.