Calculate haulage while scheduling

Maptek™ Evolution calculates haulage data on the fly when running schedules, helping to rationalise costs early in a mining project.

With mine haulage accounting for around 45% of operating costs it makes sense to use a solution where haulage data is an integral part of the scheduling process.

Maptek™ Evolution allows dynamic creation of production schedules alongside automatic haul route allocation, cycle time, productivity and fuel burn calculations.

The critical deficiency of spreadsheet or fleet calculator approaches is that the choice of waste destination and the associated costs are pre- or post-scheduling decisions.

Accounting for waste

Many open pit operations are in reality waste mines due to high stripping ratios. The cost of waste mining effectively drives costs. Optimising the waste as part of the scheduling process inherently leads to an optimal schedule and therefore maximises value.

Accurate waste location data is vital for obtaining accurate haulage hours for scheduling.

Evolution integrates haulage into a continuous flow of information where the haulage network is defined as in-pit and ex-pit roads, and waste dump ramps. Haul profiles are imported and equipment fleet/s attached to the set of profiles.

Gradient, rolling resistance, minimum and maximum speeds, cycle times and fuel burns are automatically calculated. Traffic control networks can be added.

Evolution approaches scheduling on a block-by-block basis to ensure the integrity of the geo-metallurgical model is not smeared or averaged. Waste material that needs to be encapsulated for environmental rehabilitation can also be modelled and accounted for.

Waste destinations can be determined on the fly. When choosing which block to mine, Evolution considers all objectives and constraints, as well as the cycle time of each block to reach its final destination.

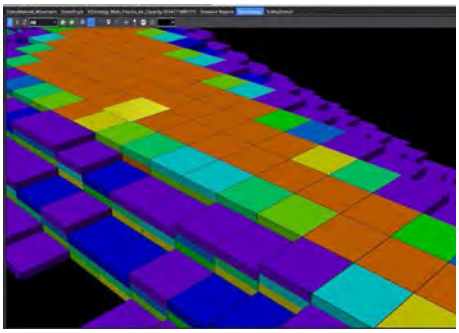
Therefore, waste blocks are dynamically assigned to their most economic locations within a waste dump, resulting in a development sequence for building the waste dumps as the pit is being mined.

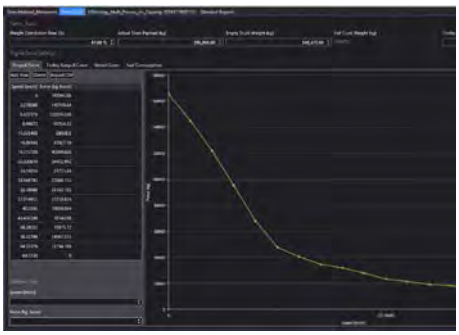
Optimising fleet

The number of trucks and the resultant truck hours per period are the variables used in scheduling. Balancing truck numbers against material movements for a period is an iterative process. Mine planners seek the right trucking level to move the required tonnes of ore, while minimising the tonnes of waste.

Another practical issue is how to maintain smooth, step-wise changes to truck numbers. It is a challenge for material movement focused schedules to avoid large variations in the truck fleet.

Using truck count as a variable, practical truck fleet numbers can be set to ensure ore production is met. Evolution can quickly determine if it is possible for an operation to maintain its current fleet.





Optimisation algorithms

The Vulcan Pit Optimiser uses the **Lerchs & Grossman, and Push and Relabel algorithms** to find the ultimate pit extent based on a set of cost and price assumptions. It can apply geotechnical constraints during processing.

Evolution uses **genetic algorithms** to determine the sequence of mining stages within the ultimate pit which return the highest Net Present Value (NPV) for the project. The Evolution algorithms also take into account the haulage cycle and waste dump sequencing during optimisation.

Project value

Two ways to increase project value are to reduce costs or increase revenue, particularly early in the mine life. Evolution allows scheduling of higher value ore in parallel with following the lowest cost mining approach. Limiting the number of trucks required in start-up years favourably impacts both capital and operating costs.

Evolution helps to balance the benefit of deferring truck usage as long as possible without generating an insurmountable ‘wall of waste’ down the track.

Summary

Evolution acknowledges the importance of haulage optimisation in order to minimise haulage costs. Optimal fleet haulage routes can be achieved without the headaches of a manual approach.

Mine planners using Evolution can be confident that all factors are taken into account, including where each block will be mined from, the time it takes to be transported to its destination, the return trip time and fuel burn.

Evolution ensures haulage costs are minimised by planning everything down to the optimal waste landform shape.

Data can be displayed graphically for transparency, auditability and for negotiating haulage contracts.

Evolving functionality

Evolution continues to be developed. Enhanced haulage tools allow import of .csv files, automatic addition of rolling resistance and speed, and also accounts for stockpile overflow.

Dynamic destination modelling and blending enables an optimised schedule with no pre-definition for multiple destinations (i.e. wet and dry plants). Classification is based on the required blend and capacity constraints.

Users will be able to target ore or total tonnage on a period by period basis, and turn sources on/off as part of the blend process for short term campaigning. Other enhancements include lithology breakdown for different processing streams, phase optimisation, cloud implementation and blend optimisation.

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