CAVING

AT BECK ENGINEERING, WE BELIEVE THAT A PRODUCTIVE AND SAFE CAVING MINE RELIES ON A CLEAR UNDERSTANDING OF THE UNDERLYING CAVING MECHANICS.

TO ACHEIVE THIS UNDERSTANDING OF CAVING MECHANCS REQUIRES A COUPLED SIMULATION THAT CAPTURES THE FLOW OF BROKEN ROCK WITHIN THE CAVE COLUMN AND THE CAVE'S PROPAGATION THROUGH THE ROCK MASS.

THIS IS ACHIEVED WITH BECK ENGINEERING'S INDUSTRY LEADING, FULLY COUPLED, THREE-DIMENSIONAL, NON-LINEAR SIMULATION

These industry leading techniques are able to capture the system's response as the cave propagates as a result of the mine's draw schedule being simulated.

Simulation Aided Engineering gives a full appreciation of stress change, seismic potential, pillar loading and drive deformation.

The design and engineering phases of a caving project can utilise this information to test design options and improve the reliability of the final design.

The application of sub-modelling can then be used to refine design aspects such as ground support.

Beck Engineering has an established track record of assisting in caving operations across 6 continents from concept studies through to operating mines. Beck Engineering has experience in caving projects across a diverse range of mining environments.

A key to achieving this record has been Beck Engineering's continual research into improving methods for simulating caving.

Speak to one of our engineers about assisting you in developing and improving your caving mine.

Beck Engineering is an Australian-based engineering firm that specialises in mining and rock mechanics analysis for the global mining industry.

We apply realistic physics-based simulations to forecast the geotechnical performance of underground and open pit mines, across a broad range of mining methods, geotechnical conditions and commodities. Our experienced mining engineers work with our clients to integrate these performance forecasts into practical mine designs, schedules and operating plans.

Beck Engineering shares a common goal with our clients: To design, plan and operate safe, productive and reliable mines.

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OUR APPROACH

- Beck Engineering's own rock mechanics specific numerical code generates large scale, 3D Finite Element models.
- Our simulations use non-linear, strain softening, dilatant material models for each geotechnical domain.
- Faults are built explicitly to match the geotechnical structural interpretation. Slip, separation and accumulation of damage is realistically represented along faults.
- The full extraction history and planned mining sequence is built into the model.
- Sub-models for higher resolution in areas of particular interest.
- Direct calibration: Measured deformation and energy (seismicity) are directly compared to deformation and energy in the model.
- Coupled cave flow simulator for forecasting the cave propagation and cave shape evolution.

WHAT YOU GET

- Powerful, non-biased, physics based predictive tool for:
  - o Geotechnical Engineers
  - o Mining Engineers
  - o Geologists
  - o Managers
- Full 3D results database available for site engineers to use for ongoing confirmation, analysis and refinement of mine design.
- Full transparency: We will assist you how to get the most out of the results, what information would improve the forecasts and work with you to continually improve your mine.
- Quick turnaround time between iterations.

CASE STUDY 1

In order to capture realistic cave behaviour this simulation used a fully coupled cave flow simulator along with the LR2 rock mass model. This coupling resulted in a free forming cave shape, a forecast of cave growth rate and timing of interaction with an adjacent cave. Changes in stress, strain and seismic potential were indicators of the interaction between the caves. The sensitivity of the forecasts and range of outcomes were assessed by varying the material properties used in the simulation.
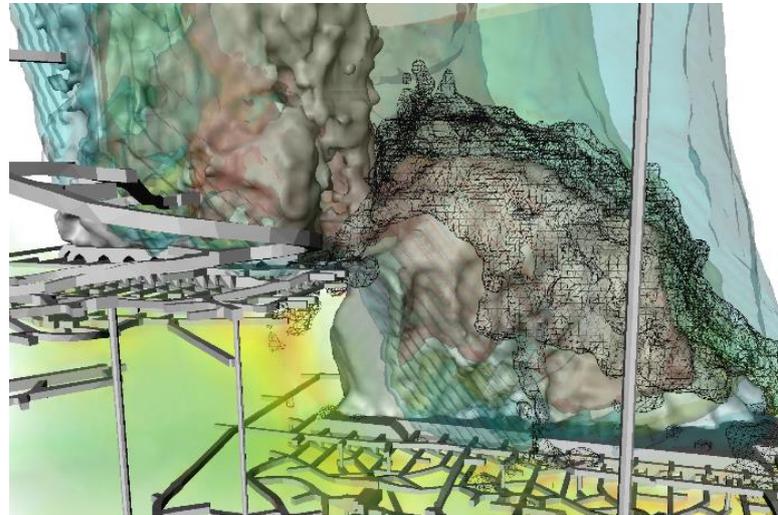
CASE STUDY 2

Simulations built by Beck Engineering incorporate all the excavations at a mine site. For detailed simulation of areas such as extraction levels, tunnels are excavated in a sequence and at increments comparable to the full scale mine. The use of sub-models allows for the inclusion of far greater detail such as drive scale structure and even ground support elements, giving the client the ability to investigate the performance of an extraction level and make forecasts such as the timing for support rehabilitation.

BECK ◻ ENGINEERING