

Mining



e3k have been providing services to the mining industry and their suppliers since 1999. As specialist mechanical engineers we conduct studies in a variety of applications from efficiency maximisation and failure analysis to design auditing and capital equipment reporting. Our engineers are skilled in design and analysis using Finite Element Analysis (FEA) and Computational Fluid Dynamics (CFD). Further, we have completed projects using safety standards and experimental testing.

Examples of mining industry studies undertaken include:

Energy Efficiency Modelling of Haul Trucks

Leighton Contractors commissioned a study into the energy efficiency of their haul truck fleet. e3k developed a set of 3 equations to compare actual live data from the haul truck to the optimum performance as determined by the type of truck and path. E3k were finalists in the 2010 Engineers Australia Excellence Awards, in the research and development category.

Provisions Modelling for Fleet Maintenance

Maintenance resources were being threatened by competing departments, so e3k determined the minimum OPEX requirement for a haul fleet, to enable the maintenance department to protect its future expenditure requirements.

Ore skip passing through a mine shaft

An investigation of the lateral motion of an ore skip within a vertical mine shaft due to aerodynamic and other effects was carried out using CFD. This analysis looked at the forces on the sides of the skip as it travelled towards the surface. The model included details of the openings in the top of the skip and the air velocity down the shaft.

Failure Analysis of a Boom Crane

A boom crane was supporting a large piece of mining equipment, when it failed causing loss of both pieces of equipment. e3k investigated the source of the failure and drew conclusions on the factors which contributed to the loss.

Capital Expenditure Reporting

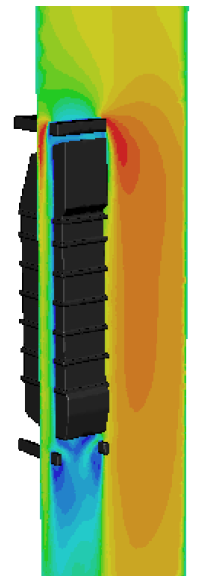
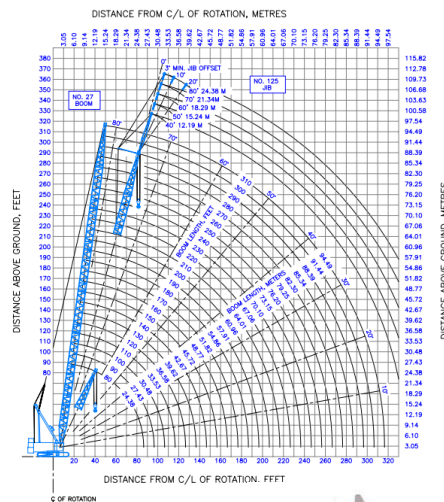
As part of a mine life extension, e3k engineers researched inefficient, unsafe and under capacity equipment at a copper and gold processing plant, proposing upgrades that would allow fit-for-purpose production to continue for 20 years. \$4.2 million of capital equipment and spares was approved. Another \$20.75 million of equipment was investigated and recommended for upgrade.

Safety Investigation for Haul Truck Personnel Access

After a mine safety incident, e3k were engaged to design a safe access system for a Caterpillar 777D. Australian Standards requirements were researched and a new access platform was designed to minimise cost, but ensure the safety of the operators.

Design of Custom Hydraulic Excavator Arm

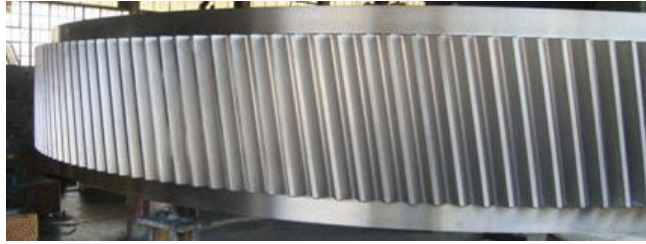
Sandstone mining requires manipulation of large cutting discs to slice up the rock. A1 hydraulics contracted e3k to design a hydraulic arm to connect to their existing excavator, which held the 5 metre spinning disc. The retrofitted components enabled the sandstone miner to reduce their fleet size by dual-tasking the excavator.





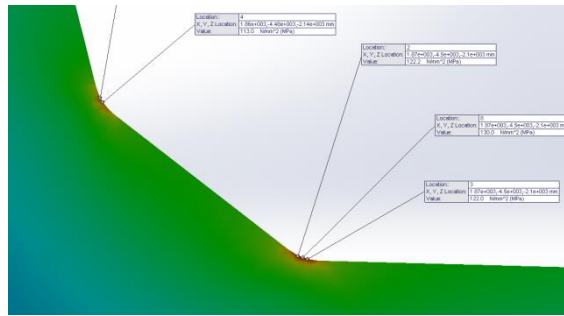
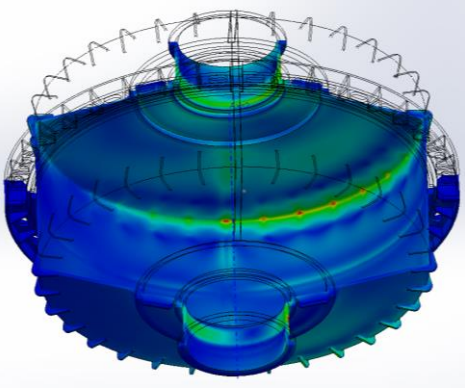
Failure Analysis of a Girth Gear

KCGM contracted e3k to review a mill girth gear failure and the numerous reports that had been produced regarding the excavation. E3k produced a management-level report analysing the failure and providing a recommendation for the potential remaining life of the gear.



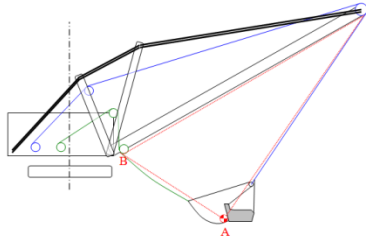
Failure Analysis of a SAG Mill

A 34ft diameter SAG mill developed cracks in the corner weld near the end of its service life. e3k conducted FE analysis on the mill to determine the reduction in stress intensity at the repaired site and provided recommendations for continuing use and the potential replacement.



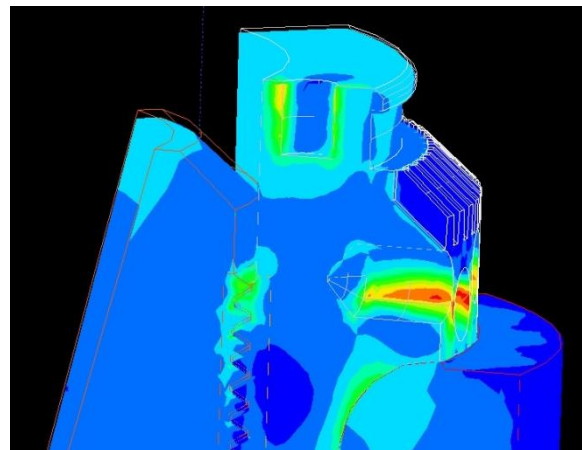
Dragline Bucket Dynamic Optimisation

Coal dragline optimisation is a highly researched field. In 2004, e3k performed a dynamic payload analysis of a dragline at Norwich Park, operated by BMA Coal. The resulting Payload Mass Algorithm was verified with a short data set by e3k and over 9 hours by BMA Coal. It used dynamic sensor input to determine the mass of the payload during continuing operation.



Novel Cone Nut Tensioner Stresses - FEA

Technofast Industries contracted e3k to perform FE analysis on their conical-threaded bolt tensioners. A custom thread design enabled Technofast to reduce the number of cyclic load tests on a range of products, allowing them to win a key contract.



Skardon River Mine Kiln inspection

A refractory kiln was inspected to determine if the installation was using best practice techniques for the industry. Excessive use of shims and undersized bricks led e3k to recommend further repair work be considered.