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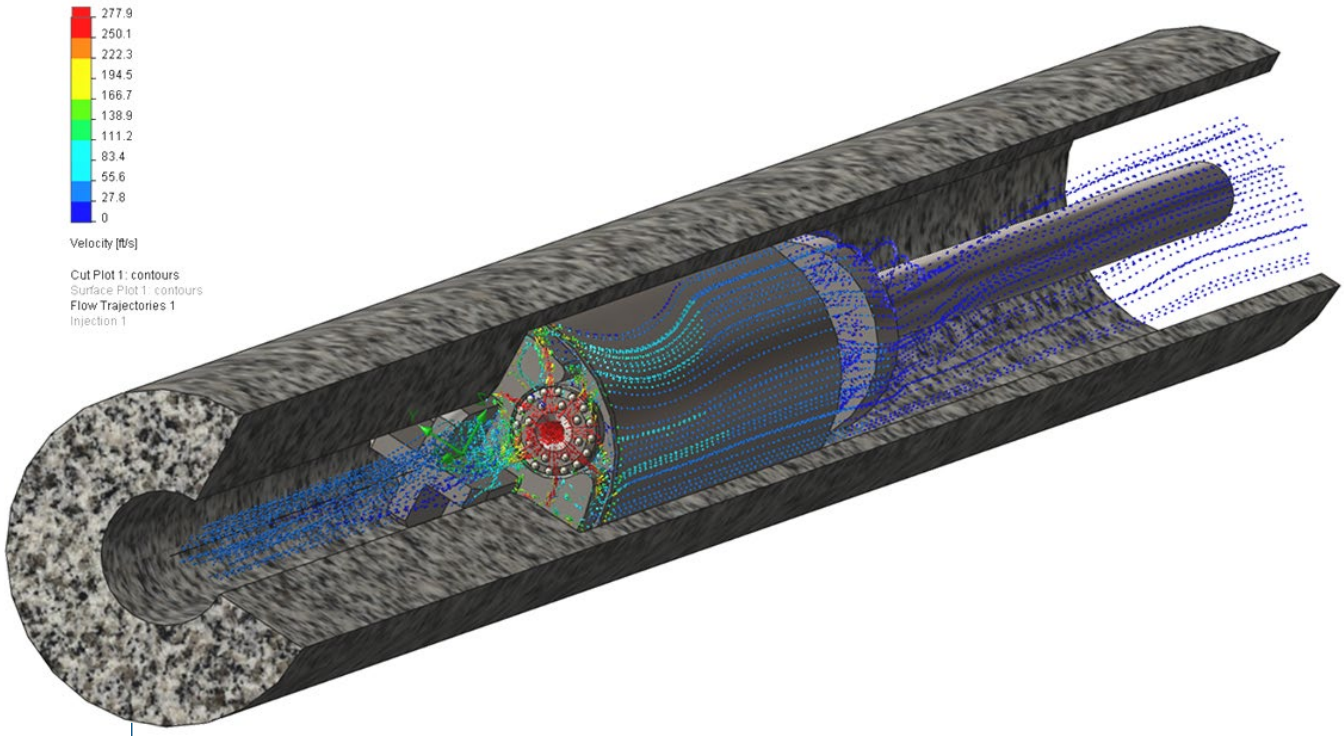
CENTER ROCK INC.

ENABLING THE RESCUE OF 33 CHILEAN MINERS USING SOLIDWORKS SIMULATION



With the results of a SOLIDWORKS Flow Simulation study, Center Rock customized its percussive rock bit design to let cuttings fall by gravity, accelerating the rescue of 33 trapped Chilean miners.

CRI
CENTER ROCK INC.

Challenge:
Efficiently increase the number of drilling products offered, while maintaining the flexibility to resolve engineering challenges and redesign drill bits on the fly in situations such as the rescue of the trapped Chilean miners.

Solution:
Implement SOLIDWORKS Professional and SOLIDWORKS Premium design software, as well as SOLIDWORKS Simulation Premium and SOLIDWORKS Flow Simulation analysis software.

Results:
- Reached miners two months ahead of projections
- Redesigned drill bit in three days
- Cut design cycles by 66 percent
- Quadrupled product offering

As the world watched the miraculous rescue of 33 Chilean miners—trapped 2,000 feet underground for two months—few knew that a redesigned drill from Center Rock Inc., made the rescue possible. Center Rock is a leading manufacturer of drilling supply equipment. The company's pneumatic bits utilize wear-resistant carbide and diamond tips on a series of rotating hammers. Unlike the bits in conventional rotary drills, Center Rock's percussive hammer bits can tunnel through even the hardest, most abrasive rock, as was the case at the San José Mine in Chile.

Developing its industry-leading technology demands 3D design and simulation tools, according to Rudy Lyon, Center Rock's senior engineer and product development manager. "Designing an effective percussion rock bit is challenging," Lyon explains. "You have to visualize how the hammers will function underground, analyze the structural stresses involved, and even understand the impact of air flow on cuttings removal. We usually perform these simulations concurrent with the design process, but, at critical times, we need to conduct simulations and redesign bits during an actual deployment. That was the scenario during the Chilean mine rescue."

Center Rock also relies on 3D technology to meet its product expansion goals. "Not every bit satisfies every situation," Lyon adds. "There are different sizes of drill holes, several types of drilling rigs, and rock of varying density, hardness, and thickness. To meet the full range of customer demands, we need to design and manufacture an extended line of products."

To meet its product development objectives, Center Rock acquired SOLIDWORKS® 3D design and simulation solutions, including SOLIDWORKS Professional and SOLIDWORKS Premium design software, and the SOLIDWORKS Simulation Premium and SOLIDWORKS Flow Simulation applications for nonlinear structural and computational fluid dynamics (CFD) analysis. Center Rock chose SOLIDWORKS software because it is easy to use for multidisciplinary engineering and provides an integrated suite of design visualization and simulation solutions.

A RACE AGAINST TIME

During the Chilean mine rescue, expanding the 5 ½-inch probe hole—first to 12 inches and then to 28 inches—using a Center Rock CR120 hammer and hole opener and then a 28-inch Low Profile multi-hammer, was one of three simultaneous rescue attempts and was known as plan B. Most estimates projected that the rescue would take at least four months. Using Center Rock drill bits and drilling rigs from Schramm, Inc., "We believed we could drill the hole faster than that," Lyon says.

Center Rock's assertion proved to be accurate when the rescue team pulled the 33 miners to safety inside a 28-inch-wide escape capsule on October 9, 2010. Many watched the miraculous event unfold on television. However, only the Center Rock team knew about the important contribution of SOLIDWORKS Simulation in the redesign of the bit that enabled the miners to return to the surface two months ahead of schedule.

SIMULATION CRUCIAL TO REDESIGN

Using SOLIDWORKS Flow Simulation, Center Rock customized the bit to let drill cuttings fall into the mine. "The SOLIDWORKS Flow Simulation studies enabled us to customize the tool by putting a band around the bit, so that two-thirds or more of the air went down the shaft," Lyon recalls. "We needed an adequate split of air to let the cuttings fall by gravity, where the trapped miners kept busy clearing about eight dump-truck loads of spoil. SOLIDWORKS Flow Simulation allowed us to reconfigure the tool and reach the miners faster."

> **"SOLIDWORKS Flow Simulation allowed us to reconfigure the tool and reach the miners faster."**
>
> — Rudy Lyon, Senior Engineer and Product Development Manager

When the drilling slowed because the bit hit a metal rock-bolt support, Center Rock used SOLIDWORKS nonlinear analysis studies to redesign the bit, resolve the snag, and continue drilling. "SOLIDWORKS Simulation Premium helped us tweak the bit by thickening the space between the carbide buttons," Lyon explains. "We ran the analysis, did the redesign, manufactured the new design, and delivered the bit in just three days. The ease of use and integration of SOLIDWORKS Simulation analysis tools helped the process go much faster and provided comfort that we had done the best we could."

EFFICIENCY EXPANDS PRODUCT OFFERING

SOLIDWORKS solutions also have helped Center Rock develop new products more efficiently. With SOLIDWORKS, the company has quadrupled its product offering, while cutting design cycles by 66 percent.

"Many of our products come in different sizes," Lyon points out. "Using SOLIDWORKS design configurations, we can develop product families three times faster, taking advantage of standardization and design reuse. We also use eDrawings® as our standard file format for document control. SOLIDWORKS solutions support high-end engineering and manufacturing, and give us the ability to quickly turn on a dime when necessary."

Center Rock used integrated SOLIDWORKS solutions to substantially expand its product offering of drilling supply equipment.

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