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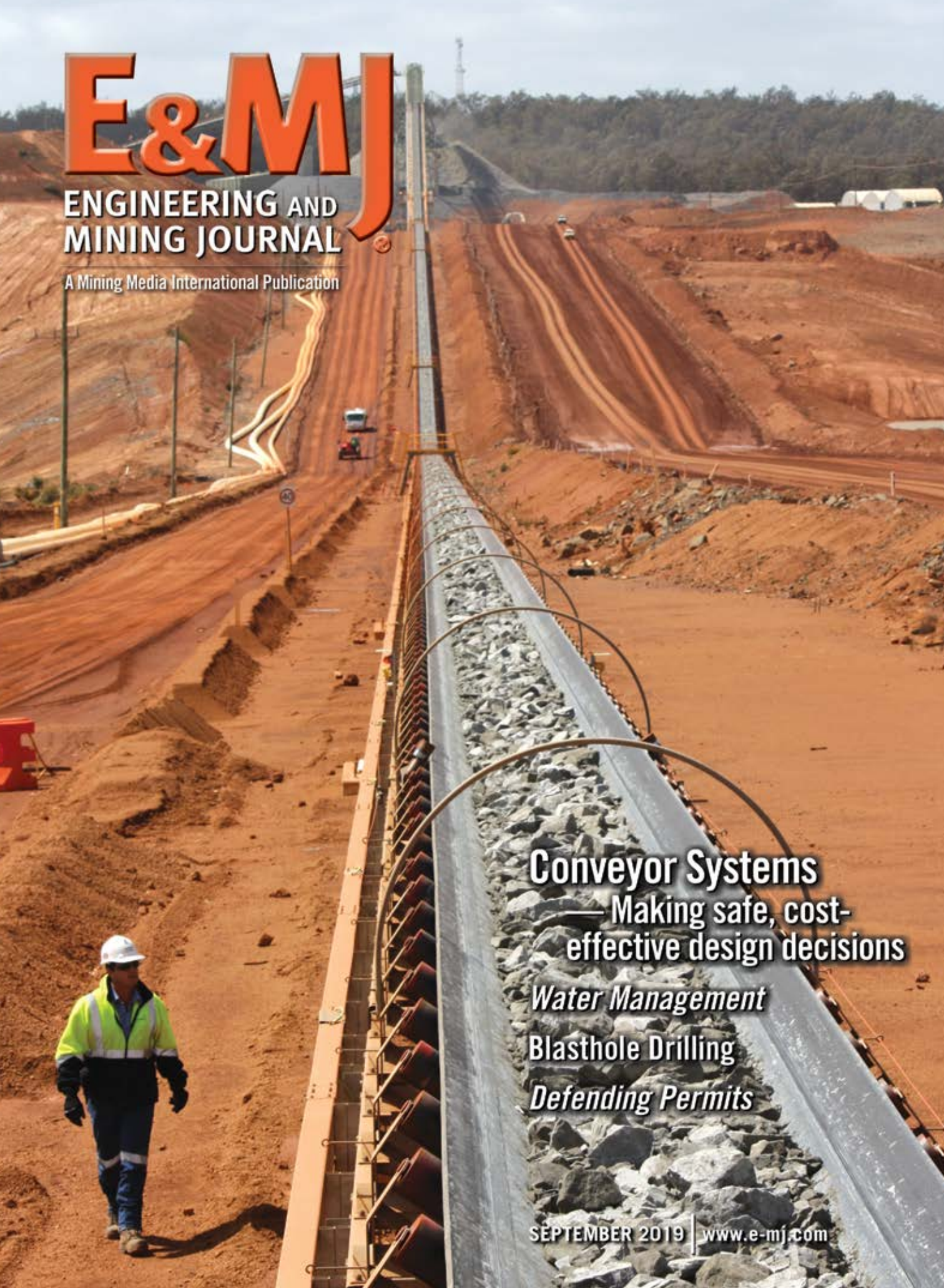

Conveyor Systems
— Making safe, cost-effective design decisions

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models representing a wide range of rocks and ores. This, according to the developer, means users can access fit-for-purpose material models that produce realistic material behavior and they can fully set up materials for a simulation without being a DEM expert. In terms of performance, the company said users can expect quicker performance with the possibility to run simulations on their computer's Graphical Processing Unit (GPU) — delivering simulation results up to 12 times faster than by using traditional desktop CPUs. On the post-processing side, users can benefit from faster data export and advanced tools to create more realistic and dynamic videos.

Containment Systems Can Curtail Conveyor Problems

Most conveyor-related injuries occur though routine maintenance or cleanup of spillage and dust, particularly around transfer points and chutes. Controlling fugitive material in these areas should be one of the primary elements in any program aimed at reducing hazards and preventing injuries.

"Conveyor operators need only take a broad look at the expense that fugitive material has on a system to realize the full cost that accompanies inefficient transfer point designs," according to Jerad Heitzler, product specialist at Martin Engineering. "Problems such as improper belt support, badly sealed chutes, damaged idlers and uneven cargo distribution can all result in spillage and belt mistracking. They also contribute to increased costs for lost material, premature equipment failure, maintenance and cleanup, as well as the potential for injury and compliance issues. These factors raise the cost of operation and reduce profit margins."

Transfer Points

Containment is the key to avoiding spillage and dust, and there are a number of components designed for this purpose. Although shaped transfer chutes and rock boxes direct the material flow to mitigate the concussion of material on the belt, most high-volume operations need one or more impact cradles to absorb the force of the cargo stream. Heavy-duty impact cradles can be equipped with rubber or urethane impact bars with a top layer of slick UHMW plastic to minimize belt friction. Able to withstand impact forces as high as 17,000 lbf (53.4 to 75.6 kN) and drop heights of up to 50 ft (15.2 m), support beams in the center of the cradle are set slightly below the receiving belt's line of travel. In this way, the belt avoids sustained friction when running empty and yet can absorb hard impacts during loading, while still retaining a tight belt seal.

Within the settling zone, located after the impact cradle in the conveyor chute box, slider cradles provide several functions. One is to create a trough angle that adequately centers the load. The trough angle also plays an important part in retaining a tight seal between the belt and the skirt. Lastly, by utilizing track mount idlers in between each cradle, a smooth belt path is created through the settling area — one that can be easily maintained. A smooth belt path should have no gaps, minimizing disruption and promoting containment, allowing dust and fines to settle into the cargo stream prior to leaving the containment area.

Mark Cook, EDEM product manager, said, "EDEM BulkSim is a key design tool that enables engineers of all experience levels to get critical insight into transfer points performance. It has been developed to easily integrate in the design process and means engineers can increase the quality of their designs by performing 'virtual testing' to assess performance under differing operating conditions. Version 2.0 means users can introduce materials quickly and easily by selecting a fit-for-purpose material model from our extensive materials library. Performance has also greatly improved, which means users can run their simulations much faster and perform analysis quicker, leading to increased productivity."

Airflow

With a constant stream of material hitting the impact point of the receiving belt, the transfer point can be extremely turbulent, and this turbulence must be contained. By slowing the airflow in the skirted area, suspended dust is allowed to settle onto the cargo path. To contain the mixture of air and disrupted material a stable, correctly supported belt is needed for the sealing components to function properly. Without a stable beltline, the belt will sag between idlers, and sealing components will not prevent air and fine material from escaping out of the resulting gaps, causing spillage and dust emissions.

Chute Sealing

To close gaps and keep a tight seal on the belt, apron seals can also be attached to the chute walls to prevent fugitive dust and fines from escaping. Modern designs featuring external skirting require minimal tools and no confined space entry to inspect, adjust or replace wear liners or skirts, and in most cases can be performed by a single worker. The low profile of the skirting assembly needs only a few inches of clearance, allowing installation and maintenance in space-restricted areas. The design drastically reduces scheduled downtime and the potential workplace hazards associated with replacement and adjustment.

Dust Filtration

In operations with limited space for a settling zone or especially dusty materials, dust bags and curtains may be essential components. Providing passive relief via positive air pressure created at belt conveyor loading zones, dust bags prevent the escape of airborne particulates by venting the air and collecting dust at the same time. Installed at the exit of the loading zone and mounted in the skirtboard cover, dust curtains can help create a plenum for dust suppression and dust collection. For additional dust control, an integrated air cleaner system can be installed at the point of emission, containing a suction blower, filtering elements and a filter cleaning system.

Managers concerned with the overall safety and cost of operation need to review potential hazards, the impact of rising labor costs for cleanup and maintenance, combined with the expense of potential fines or forced downtime, to determine specifically how they can affect the bottom line. Using the technologies described here, even poorly performing conveyors often don't need to be replaced or rebuilt, but merely modified and reconfigured by knowledgeable and experienced technicians installing modern equipment.