

Americas'

MINES & QUARRIES

Hooking up to the grid:

How trolley assist works

Have a mine with a long uphill climb? Want to reduce your diesel-fuel costs? Then you need to consider trolley assist for your haul trucks.

By relying on AC-powered overhead lines, the trolley-assist truck can use the full capacity of its wheel motors while idling the engine. This extends component life, reduces operating costs, and increases productivity — not to mention significantly reducing diesel-fuel costs.

A trolley-assist haul-truck application is composed of two parts: the electrical infrastructure, such as the power station, substations, and overhead grid; and the AC-drive haul trucks that have been specially configured for trolley-assist.

Siemens is the leading provider of trolley-assist infrastructure. Your Hitachi dealer, working with Siemens, can provide a site-specific evaluation, but generally speaking, power provided to the substations is cleaned and brought to the correct DC-line voltage. Siemens supplies and services the pantographs, overhead lines, substations, and line-position sensors — along with providing financing, construction, and maintenance.

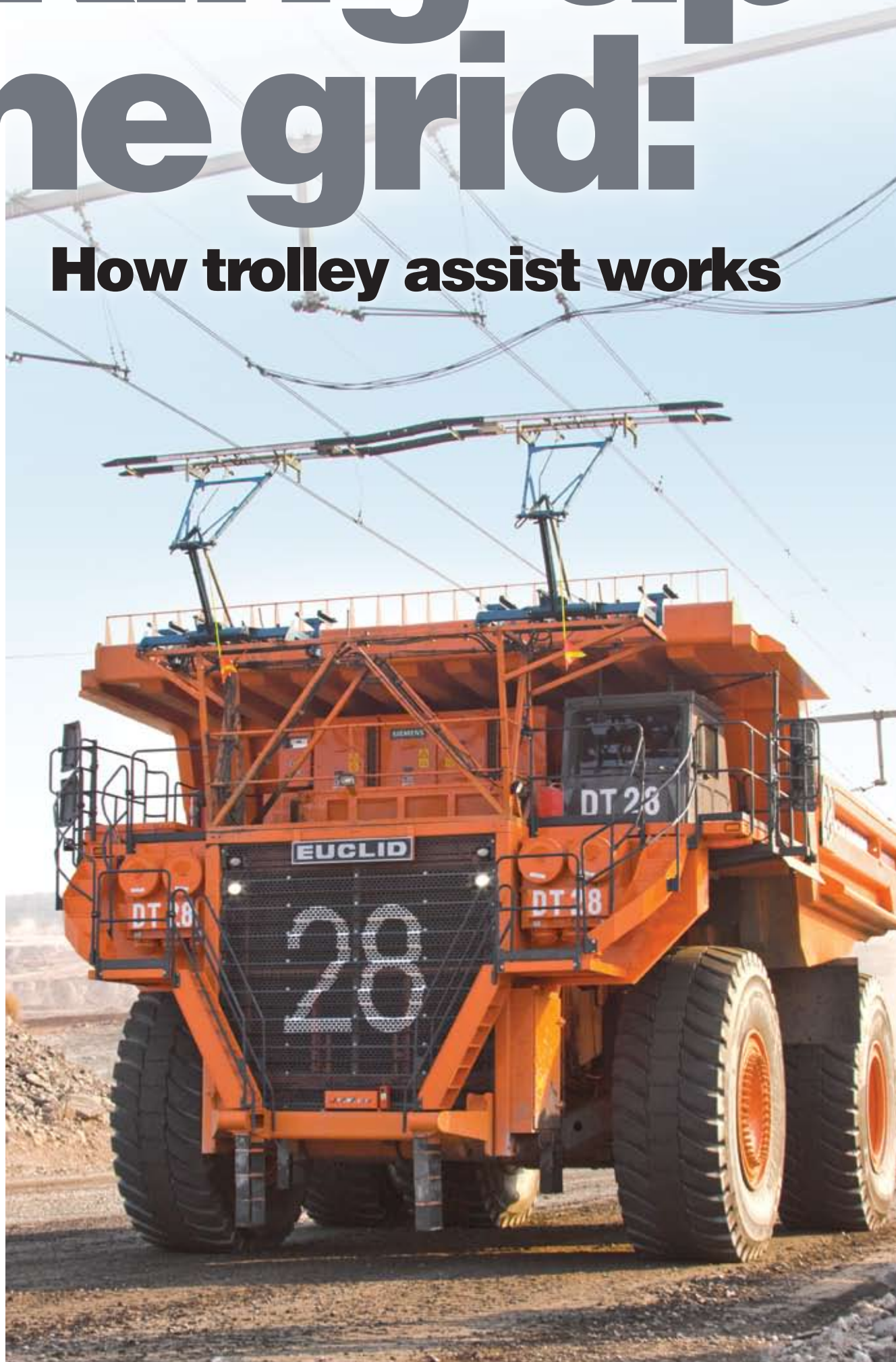
With trolley assist, the haul-truck operator can connect to the trolley at any speed. When the truck “takes the line,” it switches to trolley power and gets a 2,500-horsepower boost (rising from the 2,700 horsepower generated by the diesel engine up to a whopping 5,200 horsepower) that results in a 90-percent increase in speed up the grade.

The newly opened Lumwana Mine, located near the world-renowned Zambian Copper Belt in Africa, is an excellent example of a mine designed for electric trolley assist. Because of its remote location, the mine designers decided to minimize diesel-fuel consumption by using electric power wherever possible. Their project plan and budget designated trolley assist as a way to ensure the economic viability of the mine (www.equinoxminerals.com/Lumwana-Project).

TROLLEY-ASSIST BENEFITS

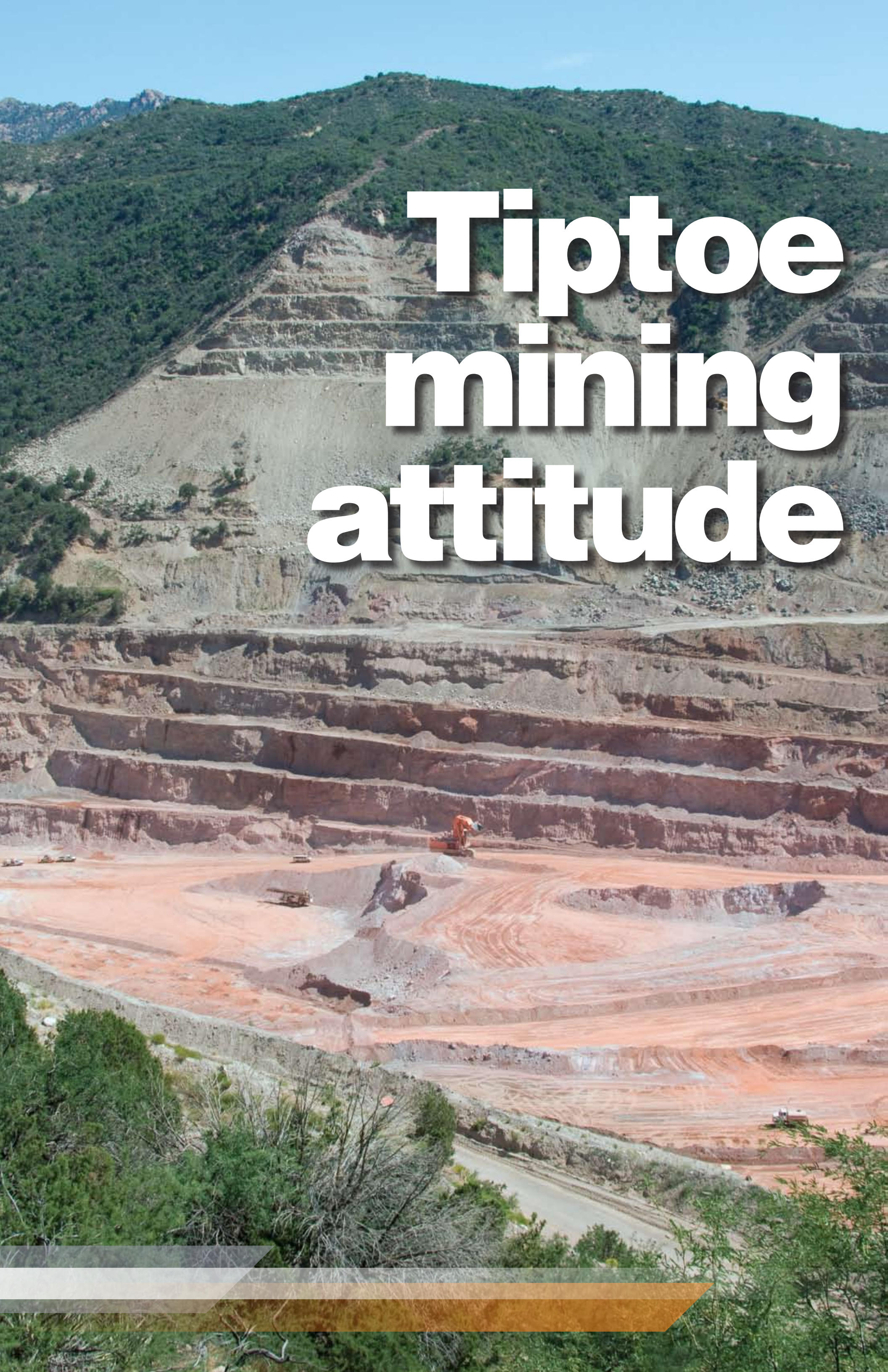
In a normal operation, 70–80 percent of the total fuel consumed in a haul truck occurs when it is on a grade. With trolley assist, the diesel-engine rpms drop to idle, which dramatically reduces fuel consumption. Likewise, engine overhaul intervals are also lengthened. An engine is normally overhauled every 540,000 gallons of fuel

Continued on page 4



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A large-scale open-pit mine is shown, characterized by its terraced, stepped levels. The upper levels are covered in green vegetation, while the lower levels are exposed earth and rock. A road runs along the bottom edge of the mine. In the foreground, there are green trees and a decorative graphic element consisting of a grey and orange triangle. The sky is clear and blue.

Tiptoe mining attitude



After 14 years of study and negotiation, Carlota's 2009 startup hits 30 million pounds of copper cathode

This is a mine that's unique because of its location. The topography is steep, making access and the location of the facilities a challenge. Two intermittent streams cut the site, draining runoff from the Pinal Mountains towards Roosevelt Lake. Finally, it's near the federally designated Superstition Wilderness Area and downwind of Phoenix, which brings additional quality scrutiny from citizens and state and federal regulatory agencies.

On the western edge of the massive Globe-Miami Mining District, the site was explored underground from around 1900 to 1910, and then mined intermittently from 1941 to the early 1960s. Environmental permitting began in the 1980s under current regulations, and after multiple studies by various agencies, final operating permits were granted, making Carlota Copper Company one of the most highly regulated mining sites in North America — with 689 permit-compliance requirements. Carlota joined two other open-pit and three underground mines as the copper-operating properties of QuadraFNX Mining Ltd. in the U.S., Canada, and Chile. Working closely with the U.S. Forest Service and the Arizona Department

of Environmental Quality, QuadraFNX received the final operating clearances and initiated construction in 2007.

"We're proud to be on the cutting edge of modern mining," exclaims Jarvis Helmandollar, Mine Superintendent. "We've handled the water-quality issue by constructing two major diversion channels to take storm water around and away from the pit. The water that falls within the mine we store and use for controlling dust. We aggressively monitor and control dust levels from our current 90,000-ton-per-day operation. We've instituted many safeguards to encapsulate potentially copper-laden materials in our stockpiles, and have already started concurrent reclamation on our stockpiles. Our leach pad is double-lined and constructed to monitor for leakage with best-of-the-industry standards."

From the beginning, QuadraFNX management focused on Hitachi for the stripping, with a wheel loader chosen for loading the ore. "I grew up with 801s in Alaska," says Helmandollar. "It was at a placer mine, and it was my first pit experience. The Hitachi UH801 was a wonderful machine. Tough,

economical, and extremely dependable. Since then, I've worked at other mines with different shovel brands as well as Hitachi. Consistently, Hitachi has been my best experience."

Small wonder that Hitachi had a leg-up when it came to choosing a shovel. "Of course we did a competitive analysis, but I felt good about Hitachi's chances after talking to John Ragsdale of Arnold Machinery Company. It also helped that our general manager, David Cook, had had a good experience working with Arnold Machinery in Nevada.

"We started with a Hitachi EX5500-5, but then brought in a new EX5500 Dash-6 because its Tier 2 engine complies with Arizona air-quality standards. Arnold Machinery devised a trade package that covered disassembly, refurbishment, and transportation of the old machine to a sister mine in Nevada.

"We're very pleased with the Hitachi shovel and with Arnold Machinery Company. One of their greatest attributes is that they truly provide Silver Service™. We have a great working relationship."

Carlota Mine is serviced by Arnold Machinery Company, Phoenix, Arizona.



The leach pad is double-lined and monitored for leakage.



Jarvis Helmandollar, Mine Superintendent, Carlota Copper Company. Note the copper sheets in the background.



Carlota constructed the Pinto Creek Diversion to channel storm water around the mining operation.

Monitoring your payloads on the go

Hitachi ACII Mining Trucks feature the updated Haultronics™ III System. During the loading process, the system measures the weight of material being added as accurately as industry transducers and software allow.

These “rolling scales” help maintain optimal payloads consistent with the Hitachi loading policy. They also provide hauling information such as number of passes, time loaded, and time empty — information mine personnel will find quite useful.

Here's how it works: A digital transducer is fastened to each of the four suspension struts to record differences in strut position and provide hardwired transmittal of this constant flow of data to the Haultronics III controller. The controller, calibrated to the truck and other environmental factors, translates this raw information into instant summaries of total weights. This information is displayed in the cab as well as on an optional external load-weight display.

Payload and load-cycle data can be downloaded directly from the machine using the WinDr tool. The data is also available through Hitachi Global e-Service, which provides once-a-day downloads via satellite. The data can also be integrated with a mine fleet management system such as Wenco International Mining Systems.



Trolley assist

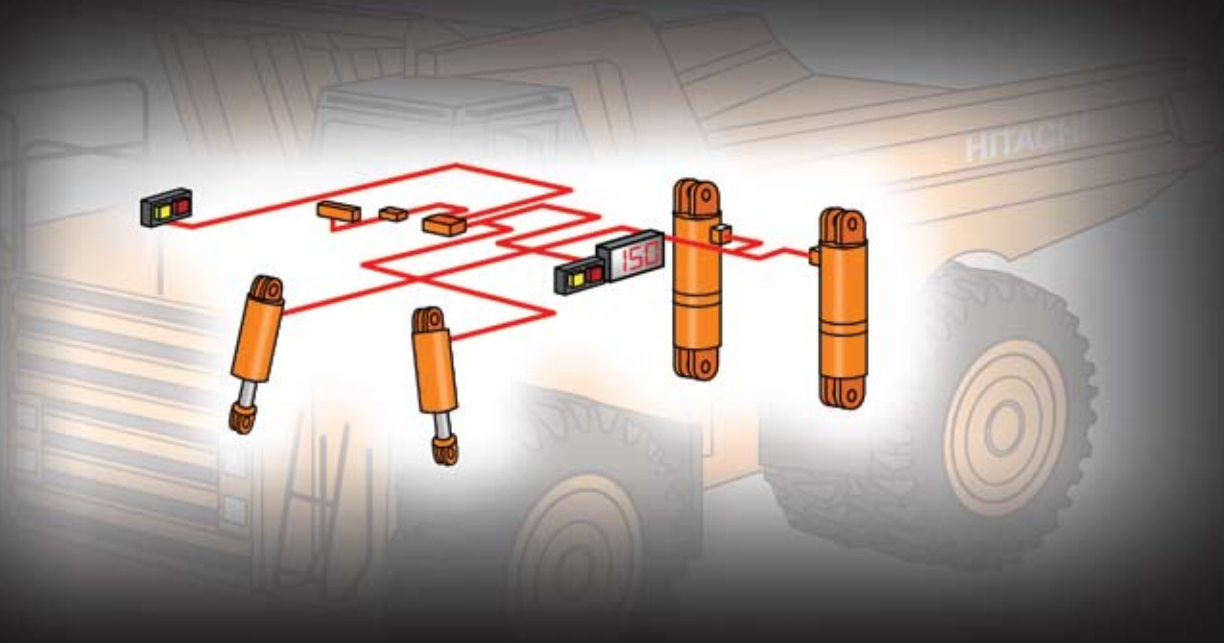
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burned. Therefore, by reducing fuel consumption, engine life is extended.

With trolley assist, grade speed is increased 90 percent. Higher speeds on the trolley mean a shorter cycle time and higher productivity — 32 trucks can do the work of 40. Mines with longer uphill hauls can often realize a payback within a few years of operation.

Hitachi ACII Mining Trucks feature AC-traction drives that produce more torque at low speeds, improved speed retardation, and better overall performance than DC drives. Much like a diesel-electric locomotive, the truck's diesel engine drives an AC alternator. Constant-voltage DC from this alternator is transformed by an inverter to variable-frequency AC to supply the two AC motors installed in the rear axle of the truck. The trolley assist shortcuts the diesel engine and alternator, supplying more DC power directly to the inverter than is possible from the engine alone.

For more information about Hitachi ACII Trucks and trolley assist, contact your local Hitachi dealer.



King of the pit.

From Arctic cold to Australian heat, the Hitachi EX8000-6 is proving to be the hardest-working, most dependable mining excavator available today. 40-m³ (52.3-cu.-yd.) bucket. Twin QSK60C Cummins engines. Excellent numbers: Low operating and ownership costs per ton, 30-second passes, 5,500 tons per hour, average 115 gallons of fuel per hour.*

Each Hitachi sold is backed throughout the world with excellent product support. You can count on a local dealer who is well-versed in the assembly, maintenance, and troubleshooting of your hydraulic excavator, and is backed by the engineering expertise, parts inventory, and strength of Hitachi, one of the world's largest companies.

**Each operator and mine application will have varying results.*

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