

Appeared in Worldwide Projects Magazine
September, 2002



Asarco's Ray Complex: GPS Brings Big Productivity Gains

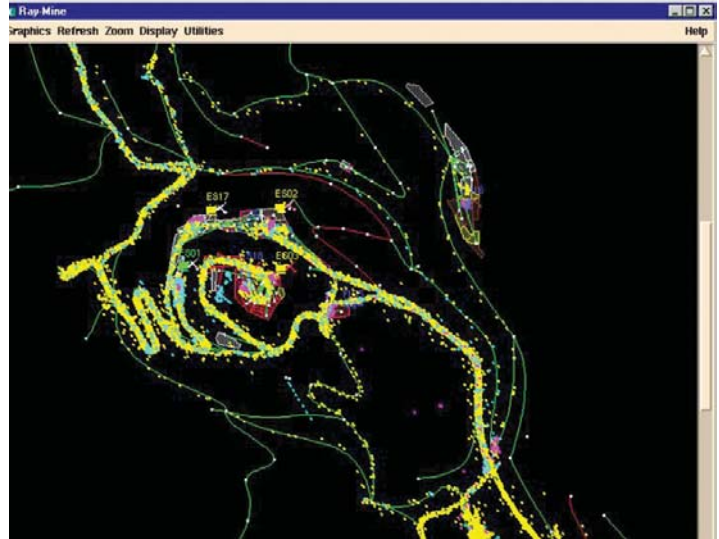
An aerial view of the open-pit mine at Asarco's Ray Complex in central Arizona is an impressive sight. Dozens of pieces of heavy equipment – shovels, dozers, drills and haul trucks – all in search of or transporting copper and other ore material – are hard at work on the roads and hills and valleys that criss-cross the 53,000-acre expanse. It's an enormously complex operation that requires meticulous organization, and Thales Navigation's professional GPS solutions are playing an important role.

The operation itself stretches the imagination. It's a 250,000-ton-per-day operation with 2001 production of 250 million lbs. of copper in concentrate, 100 million lbs. of copper in cathodes, and 440 million lbs. of copper in anodes. The operation also includes a 30,000-ton-per-day concentrator, a 103-million-pound-per-year solvent extraction-electrowinning operation and associated maintenance and administrative facilities.

The mine itself, which extends over roughly a 10-square-mile area, is managed by a comprehensive mine management system from Modular Mining Systems. The system has recently incorporated GPS technology from Thales Navigation to "choreograph the big dance," according to Les Zoschke, Modular Mining's VP for product development.

"GPS gives mine managers and operators constant real-time data that gives everyone the ability to know exactly where ore is, what type it is and exactly where every piece of equipment is at any given time," he says. "It's an absolute must for a mine like this one."

Modular Mining chose the Thales Navigation receiver because, unlike other receivers, it covers both GPS and the Russian Global Navigation Satellite System (GLONASS) satellites, assuring continuous coverage and more reliable operation. "The brand name was important as well," said Zoschke. "With multiple new, untested GPS vendors coming into the business, we are confident that the Thales Navigation name will be around for the long haul."



A GPS truck trace shows where haul trucks have been during a full shift (8 hours) at the ASARCO Ray Complex.

The system comprises a central control tower, similar in appearance to an air-traffic control facility, with telemetry links to all the mobile equipment operating in the pit. Each piece of mobile equipment – shovels, haul trucks, drills and dozers – is equipped with either a high-precision Thales Navigation GG24™ RTK GPS receiver, or a low-precision GPS receiver, that transmits real-time positioning data to the central tower. Each shovel is also equipped with an electronic console on which the equipment operator can see a graphic representation of his location and color shading to indicate the type of material he's about to dig or haul.

MAPPING THE ORE

In setting up the system, surveyors and geologists begin the process by going out and taking soil samples. Based on the samples, technicians map the polygons of the various material types. From there they plot the materials in the complex's mining information management (MIM) system, which is then configured to communicate the information to the equipment operators.

“In the case of shovels, for example, the operator’s screen will display an accurate image of the immediate area along with a moving icon of the shovel at the scene,” said Barye Herndon, Asarco’s systems engineer at the Ray Complex. “By reading the data and the color-coded images of ore locations, the shovel operators can precisely pinpoint within a few centimeters where the equipment should dig. That’s productivity, and it prevents the time-wasting reworking of ore locations.”

GPS SPEEDS MATERIAL TRANSPORT

The GPS receivers have an important impact on transporting the material as well. Different types of ore are scheduled for different destinations -- leaching areas, crushers or dumps -- depending on content. By pinpointing the precise position of those materials, managers can avoid the problem of too many haul trucks transporting too many loads of one material, thus creating truck backups at a destination. GPS also lets truck operators and the tower know exactly where loads are dumped, based on when the operator pulls the dump lever. This helps identify misdirected loads and gives operators needed information about material content on leach pads.

GPS is also used to help guide dozers to cut-and-fill positions throughout the pit, according to Herndon. “Marking those locations is typically the job of surveyors who mark them manually with stakes,” he said. “High-precision GPS also helps dozers with road- and ramp-building. It’s a way for operators to see graphically where they are and what the elevation is relative to the designated pad, road or ramp.”

The same holds true for the drills that are assigned to make blast holes within the pit. Again, equipment operators are better able to work with real-time map locations than with the stakes that are traditionally used to mark the blasting locations.

It’s all about cost savings. One important application is the control of acid consumption on the acre-wide leach fields used to separate ore from its surrounding material. “Depending on the type of material being leached, we know exactly how much acid is needed to leach a specific batch of ore,” Herndon said. “Controlling that cost adds up to big numbers over time.”

The Ray mine has been operating continuously since 1952, according to Asarco, with increasingly sophisticated technology adding dramatically to the mine’s productivity over time. “GPS has been a big next step in that process,” Herndon said. “We expect it to be an important part of the Ray team for years to come.”

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