New Drill Jumbo Operator Training Simulator

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Face drilling rigs, commonly called "drill jumbo's", are large, single or multi-boom machines used for production drilling in underground hard-rock mines. Booms typically have six control axes to position and orient the boom tip at the rock face, to drill long holes for blasting which follow the trajectory of the ore body. Control is via a series of single axis levers and two axis joysticks, along with various push-buttons.

Clearly, operating such equipment efficiently is a key part of maintaining the mine's productivity, but learning the necessary skills is difficult and time-consuming (up to 160 hours), requiring access to resources (machine, drift, people) dedicated to production. As a result, such training is difficult to obtain; worse, studies show that not all trainees have the necessary abilities such as motor skills to become fully proficient operators.

This is where real-time graphical simulation can play an important role, by helping mining companies better select and better prepare their trainees for seat-time. As a result, trainees reach production targets sooner underground, and the wear-and-tear associated with training on production equipment is reduced.

Since 1999, simulator products from Simlog (www.simlog.com) have helped train hundreds of heavy equipment operators already in the forestry industry. And to address training needs in the mining industry, Simlog recently completed the development of the world's first drill jumbo operator training simulator in collaboration with Atlas Copco Construction and Mining North America (CMNA). A pre-product version of this simulator was unveiled at CIM/Tradex '2000 (March 8-10, Toronto, Ontario), building upon award-winning graphical simulation technology developed by Simlog over the last five years. The product version of the simulator was then showcased for the first time at MINExpo '2000 (October 9-12, Las Vegas, Nevada).

The Simlog simulator recreates the essential components of the real drill jumbo control interface using industrial levers, joysticks and pushbuttons. The simulator also includes proprietary interface electronics, a single PC-compatible computer and video-projector to obtain a wide field of view. As shown in the figure, the simulation software features 3D models of a twin boom jumbo in an underground mining tunnel (drift).

In addition to the graphical simulation, a pedagogical framework based on "training modules" was developed to lead the trainee step by step through the basics of drill jumbo operation, from drilling single stope holes to drilling a complete round consisting of stope holes, lifters, and contour holes; the last training module is about cross-cutting. Along the way, "performance criteria" are used to measure the trainee's progress and evaluate the (simulated) work being performed e.g drilling time, horizontal error, vertical error, grade error, and back error. All of this data is then stored in the simulator database on a per trainee basis for later reference by the trainee and training staff.

In June 2000, Simlog's new simulator was put to the test in Sudbury, Ontario with the help of nine operators and management personnel from INCO and Falconbridge, under the supervision of Blaine Vatcher, Technical Service and Training Manager, Atlas Copco CMNA. Here are just a few of his comments: "The simulator was very well received by everyone who used it. I guarantee that it adds value to any training course by providing a hands-on unit to learn on. And if we look at the reports for each operator, I can see the potential areas for improving boom movement skills. The simulator was very impressive, and everyone wanted it and more. They felt that this is the best training tool they had seen." It's now anticipated that simulator-based training will soon be available from Atlas Copco CMNA, using Simlog's product.

The development of the drill jumbo simulator adds to Simlog's growing list of training products for heavy equipment operators in forestry, construction, and mining.