

Mining Motion Simulation Technology for Miner Training

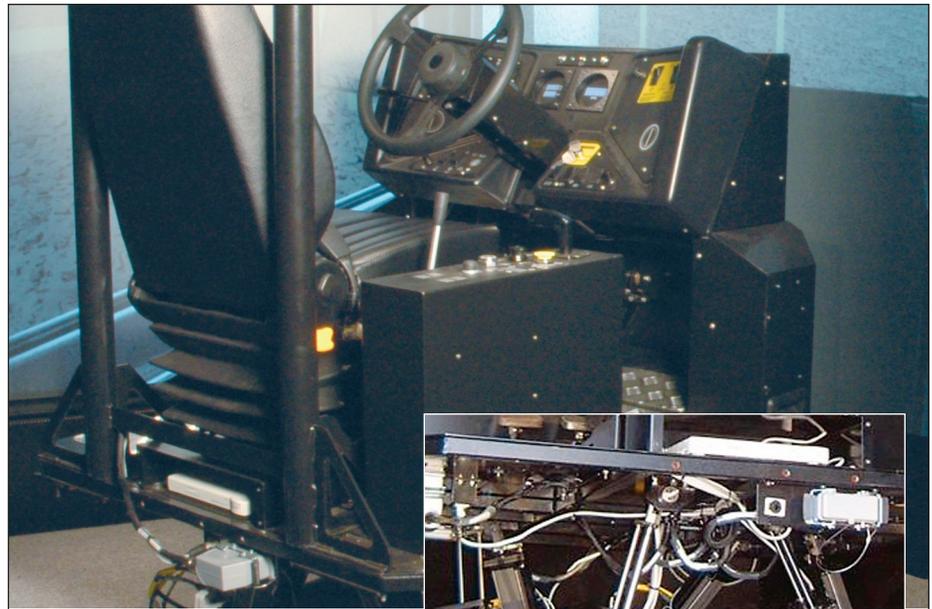
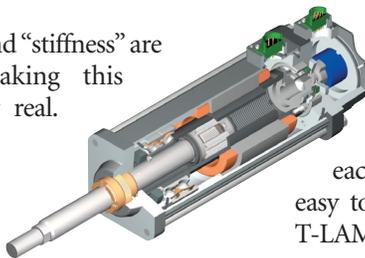
Operating the complex equipment deployed in modern mines requires judgement and skills that only can be acquired by an enormous amount of hands-on experience. Accumulating that experience in an actual mine is expensive, and not always possible.

It's also extremely hazardous for everyone involved. Therefore, simulators are used to gain this experience.

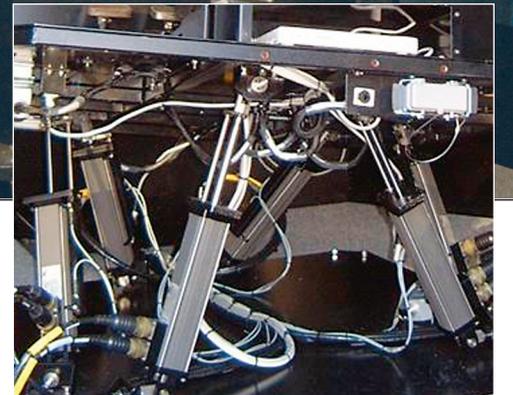
Because the responses to all control manipulations must be produced in real time, the motion-creating actuators must have a dynamic interface directly to the simulation program. Only then can they react correctly – either to the situation a trainer creates or the actions a trainee takes in response.

To achieve the most accurate responses, *CyberMINE®* simulators (built by Thoroughbred Technologies) have electro-mechanical actuators from Exlar Corporation embedded in the 6 degree-of-freedom motion platform. Together with their servo drives, these linear units produce a true, 6 d.o.f. response to whatever actions a trainee takes while in the simulator.

Acceleration and “stiffness” are the keys to making this motion feel truly real. (For more on stiffness, see “Roller vs Ball Screw Performance” on next page.) With their unique planetary roller screw drives, the Exlar units perform for 1000's of hours, even in a



Embedded under the operator's station, Exlar SR21 linear actuators create 6-axis motion that mimics what would be the real-life reaction to a trainee's actions. Note that with no external motors, the entire assembly is clean and simple.



demanding simulation environment. Since the motor itself is internal and bonded directly to the planetary roller screw in these actuators, each unit is very compact and very easy to mount in the platform. The T-LAM™ technology with which the motors are built lets them deliver a significantly higher continuous torque than is possible with traditionally wound motors in the same package size.



Environmentally Friendly Alternative to Hydraulics

Environmental consciousness is a fact of life for most companies. Those in the forest products industry are among the most sensitive to this issue. And mills that convert raw lumber into useable products often come under the closest scrutiny. In these operations, much of the equipment which positions saws or moves logs through the sawing process has traditionally been hydraulic.

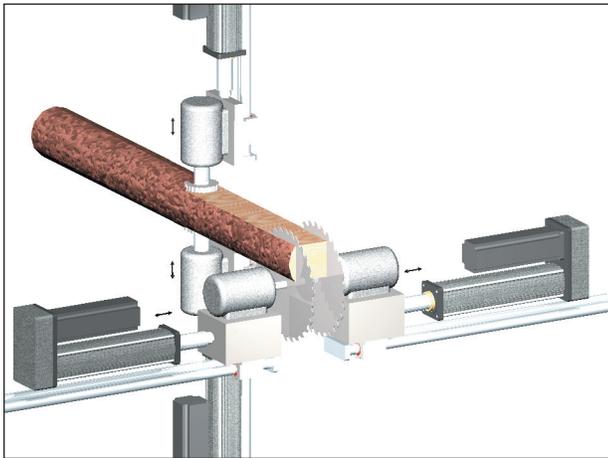
Wherever big hydraulic systems like these are used, stringent federal and local regulations only heighten the environmental concerns of those who use them.



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GREAT IDEAS THAT WORK

Technology Reporting from Exlar



For both environmental and long-term maintenance reasons, the hydraulic systems traditionally used to position massive blade and motor assemblies used in sawmills are being replaced by Exlar electro-mechanical actuators. With their planetary roller screw drives the Exlar actuators can withstand the heavy, repeated shock loads that are inherent in this application.

(Environmentally Friendly, continued)

The costs of preventing pollution during operation, disposal costs of used fluids, and potential litigation costs that might occur if things go awry are the three most obvious economic issues tied to those hydraulic systems.

Given these facts, it's not surprising that companies like Georgia-Pacific, Weyerhaeuser and others are beginning to opt for processing equipment where the hydraulic motion control components have been replaced with electro-mechanical systems from companies like Exlar.

With this equipment, canter or edging saws (with the massive motors that drive them), high-speed fences, lathes, merchandising saws, planers, log turners, and debarkers

can be positioned quickly and with precision. With stroke lengths up to eight feet and peak forces up to 40,000 lbs., they deliver all the muscle and dimensional latitude necessary to move these kinds of loads to where they need be.

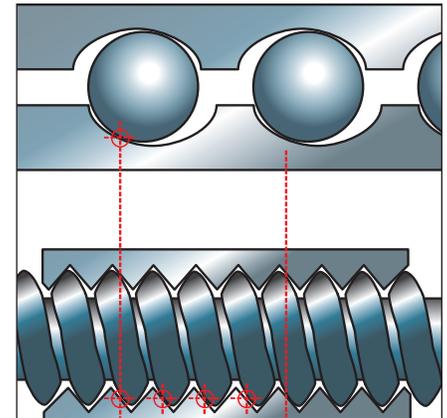
Unlike traditional ball screw actuators, Exlar units are engineered around planetary roller screw technology. This multiplies the working life of each unit many-fold, especially under the heavy shock loads common in this application.

By eliminating the need for oil, Exlar's electro-mechanical actuators are delivering an environmentally friendly solution that, in many cases, actually outperforms the traditional hydraulic systems they are replacing.



Roller vs Ball Screw Performance Comparisons:

Loads and Stiffness: Due to design factors, the number of contact points in a ball screw is limited by the ball size. Exlar's planetary roller screw designs provide many more contact points than possible on comparably sized ball screws. Because this number of contact points is greater, roller screws have higher load carrying capacities and improved stiffness. In practical terms, this means that typically an Exlar roller screw actuator requires much less space than a ball screw to meet the designer's specified load rating.



Travel Life: As you would expect, with their higher load capacities, roller screws deliver major advantages in working life. Usually measured in "Inches of Travel," the relative travel lives for roller and ball screws are displayed on the graph at the lower left. As you can see there, in a 2,000 lb. average load application applied to a 1.2 inch (approximate) screw diameter with a 0.2 inch (approx.) lead, you can predict that the roller screw will have an expected service life that is 15 X greater.



For more information on these and other unique motion control solutions, contact:

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