technology FOCUS

POWER TRANSMISSION AND MOTION CONTROL

SERVOMOTORS SHAKE IT UP

To validate the designs of new products, many manufacturers need to simulate actual operating conditions through vibration and shock testing. Such testing, however, can be expensive. A new vibration tester uses cost-saving electric servomotors to simulate vibration along three axes.

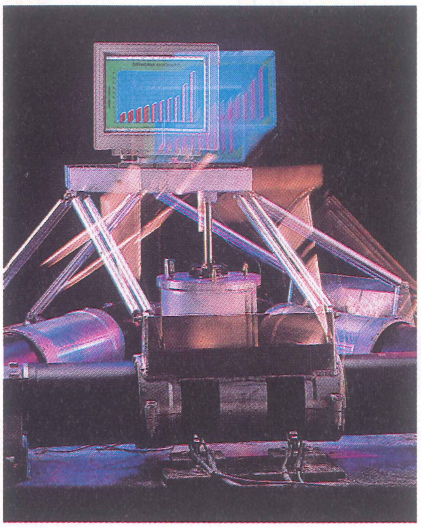
ANCO Engineers Inc in Boulder, Colo., has developed an alternative to servo-hydraulic shake tables. Instead of a hydraulic system, the company combined electric direct-drive servomotors from Parker Hannifin Corp. in Rohnert Park, Calif., with a personal-computer-based control and data-acquisition system, which provides additional testing benefits.

The electric shake tables eliminate or reduce the environmental, safety, maintenance, and power requirements associated with hydraulic systems. However, while a direct-drive servomotor shake table can handle a payload of less than 1 ton and accelerations up to a few **g**'s, anything greater would require a hydraulic system.

Scientific Applications International Corp (SAIC) in Huntsville, Ala., which acquired one of the company's shake tables last year, subjects nuclear power products to a series of acceptance tests to verify that they will perform as intended in a power plant. One procedure determines the test product's behavior during an earthquake, which can be done through either analysis or direct testing. Many seismic-sensitive products require shake-table simulation, where the equipment vibrates in the three rectilinear directions simultaneously.

SAIC's job is to create statistically independent motions in the three directions. This motion is intended to subject equipment to a predictable event, based on the dynamic environment that a piece of equipment could experience in the plant.

The company reported that the servomotor system is better able to envelop the required seismic response spectrum. With a hydraulic system, testing personnel would have to induce excessive high-frequency components or low-frequency operations to achieve acceptable response at mid-level frequencies, which can lead to an overtest condition. "We're finding that with the servomotor simulation, we get good frequency content and good control of that content, without having the higher acceleration levels at low or higher frequencies," said Johnny Jenkins, division manager at SAIC's test facility.



ANCO's shake table uses direct-drive servomotors and a PC-based control system to simulate an earthquake in a nuclear power plant.

This section was written by Greg Paula, Associate Editor

EGGS IN SPACE

Any object that is sent up in the space shuttle needs to be as small and light as possible. In one experiment that studied the development of eggs in space, which was designed by Space Hardware Optimization Technology Inc. in Floyd Knobs, Ind., a carousel with a container for eggs turned continuously at 72 rpm to simulate Earth's gravity. At various points in its revolutions, the carousel had to stop precisely at the right spot to allow experimenters access to the eggs. Besides accuracy, the motor needed to have smoothness of motion and low vibration.

The solution was found in a five-phase hybrid stepping motor from Oriental Motor USA Corp. in Torrance, Calif. The new motor is said to be the world's smallest at 1.10 inches square by 1.22 inches long. The PMU series combines the motor with what the company calls the world's smallest 115-volt ac input five-phase driver, with an onboard power supply and drive and control electronics in a 1.38- by 4.34- by 5.32-inch box. The PMC, which was used in the shuttle application, replaces this driver with an even smaller, specially designed 24-volt dc board-level driver the size of a credit card, but it requires a separate power supply.

The PMU33AH motor produces a constant 3.3 ounce-inches over a range of 100 to 40,000 pps (4,800 rpm) when combined with the company's gear heads, which have speed ratios from 3.6:1 to 30:1. The motor achieves maximum motor-shaft holding torques from 11.3 to 72.2 ounce-inches, with gear-head backlash values of 1.5 degrees. HENRY BAUMGARTNER

HOLDING UP THE STAGE

A new type of positioning stage that features a linear motor in place of the conventional ball screw drive has been developed by Aerotech Inc. in Pittsburgh. The stages, designated the ALS20000 series, use a "U-channel" design center drive linear motor from the company's BLM series of rare-earth linear brushless servomotors.

Positioning stages are used to position an object, such as a sensor or an imager, with great accuracy. The Aerotech devices move the object in a straight line, with only one degree of