

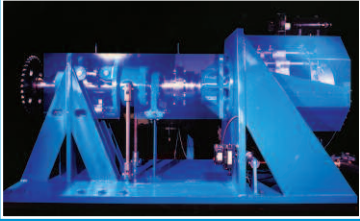
High-Torque Dynamometer



Southwest Research Institute®

San Antonio, Texas

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Southwest Research Institute

Founded in 1947 as an independent, nonprofit research and development organization, Southwest Research Institute provides significant research, engineering, and testing resources for industry and government. With 11 technical divisions and state-of-the-art laboratories, the Institute uses a multidisciplinary, integrated approach to solving complex problems in science and applied technology. Subject to the client's wishes, programs are kept confidential. As part of a long-held tradition, patent rights arising from sponsored research at the Institute are often assigned to the client. SwRI generally retains the rights to Institute-funded advancements.

High-Torque Dynamometer

For more than 60 years, Southwest Research Institute (SwRI) has provided a wide range of industries with innovative design and fabrication of engineering test stands. At SwRI, experienced engineers and scientists develop custom, computer-controlled test equipment with a wide range of capabilities.

Institute engineers have noted an increasing industry need for a cost-effective test stand to conduct high-torque, low-speed testing. Performing this type of testing can involve complex and expensive equipment not readily available in most organizations. SwRI has developed an alternative state-of-the-art testing system that assists manufacturers in the development and evaluation of equipment such as:

- Heavy construction equipment
- Farm tractors
- Mining equipment
- Heavy-duty trucks
- Drilling equipment
- Wind turbines
- Shipboard applications
- Drawbridge gearboxes

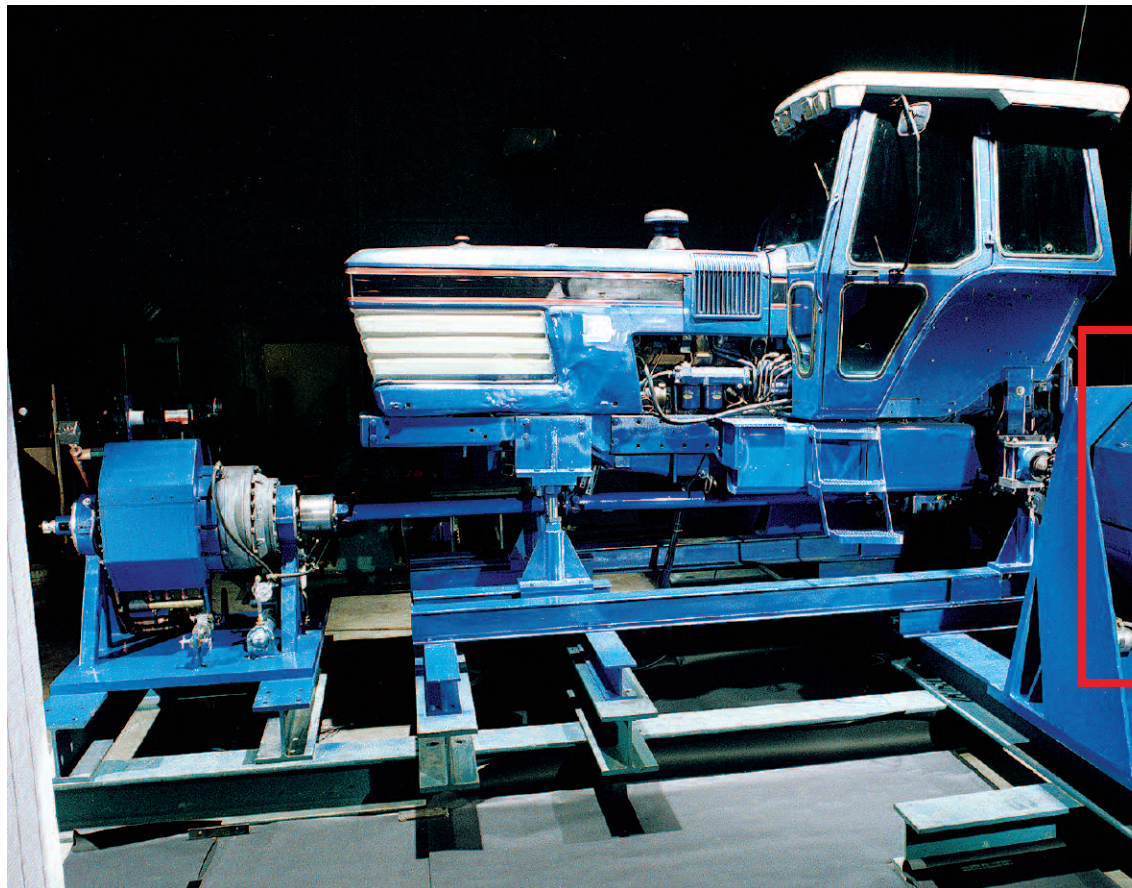
Institute engineers have developed a family of high-torque, low-speed, air-actuated, water-cooled disk brake dynamometers that generate smooth and continuous torque at low speeds. At the heart of these dynamometers is a unique friction material that reduces the stick-slip phenomenon, allowing operating speeds as low as one revolution per minute (rpm). Opposite the proprietary friction material is a copper-clad surface that efficiently transfers heat from the material interface to an array of standoff rods. The heat is then dissipated into cooling water.

Precision electronic instrumentation integrated into the test stand provides measurement, display, and control of parameters such as speed, actuation pressure, torque, thrust load, and dynamometer cooling water temperature.

About the cover: SwRI developed a dynamometer test stand to evaluate high-torque, low-speed mudmotors used by the petroleum industry in horizontal drilling.

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DE73912

Marine and Shipboard Applications

To allow testing of motors and gearboxes used in maritime applications, Institute engineers designed a 10,800-horsepower, air-actuated, water-cooled disk-brake dynamometer that can absorb up to 925,000 ft-lb torque. The stand can be operated in manual or automatic mode, with closed-loop control of speed, torque, or power. Custom features include an integral torque calibration system.

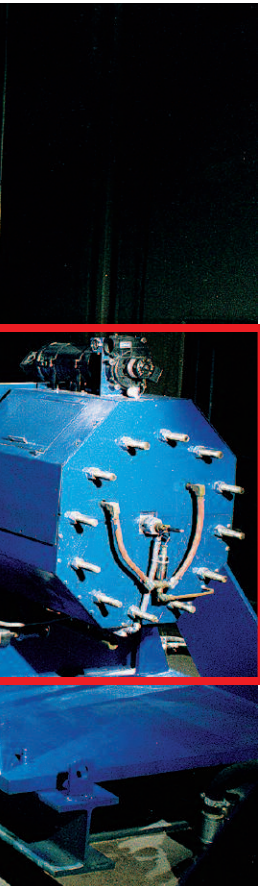
Off-Road Equipment

SwRI designed and fabricated a modular dynamometer capable of evaluating heavy-duty off-road equipment. These dynamometer systems can absorb up to 720 horsepower (hp) at torque levels to 50,000 foot-pounds (ft-lb) at near-stall speed and can operate at speeds up to 800 rpm. By incorporating an Institute-developed closed-loop feedback system, the test stand can maintain torque accuracies of ± 3 percent and speed accuracy to ± 1 rpm. The modular systems can be installed on skid-mounted platforms and mounted directly to the axles of farm tractors or to the output flanges of a chassis roll dynamometer.

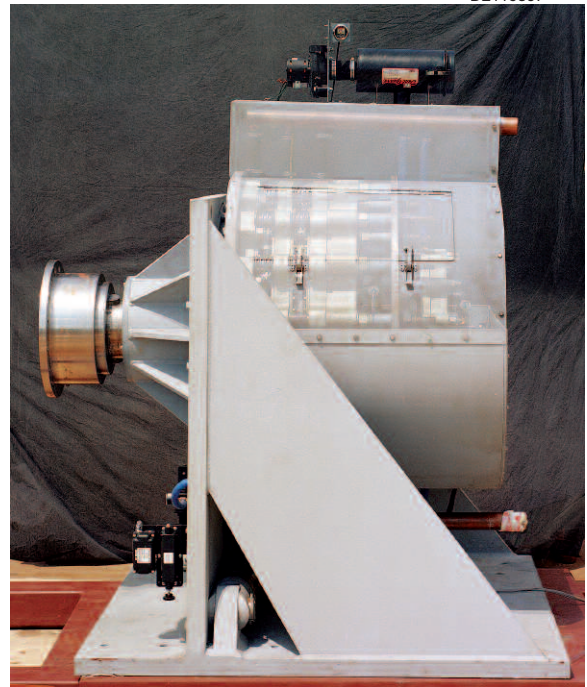
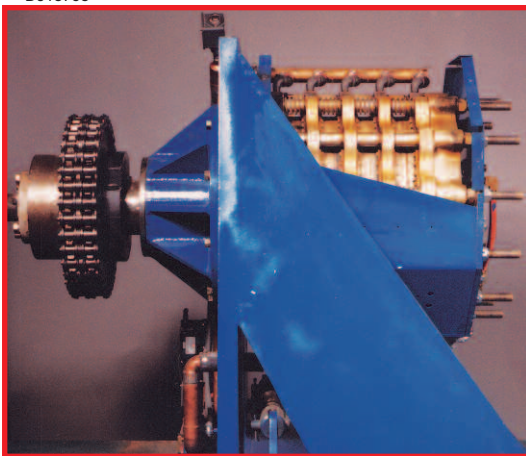
Drilling Equipment

The petroleum industry routinely uses mudmotors for horizontal oil drilling, an application that places extremely high loading on the driving mud motor. Institute engineers designed and fabricated a dynamometer test stand capable of applying 250 to 25,000 ft-lb of torque at speeds ranging from 0 to 200 rpm. The torque is absorbed into one of two different air-actuated, water-cooled disk brake dynamometers and is then reacted to ground through a load cell system. The system provides a 100-to-1 maximum-to-minimum operating range envelope.

The flexibility of these dynamometers allows additional loading features to be incorporated. One feature is the ability to absorb the oscillating thrust loads generated by a mudmotor. SwRI configured the test stand with two 120,000-pound thrust bearings. Special adjustment provisions are incorporated into the test stand to allow for three-axis precision positioning of the thrust shaft.

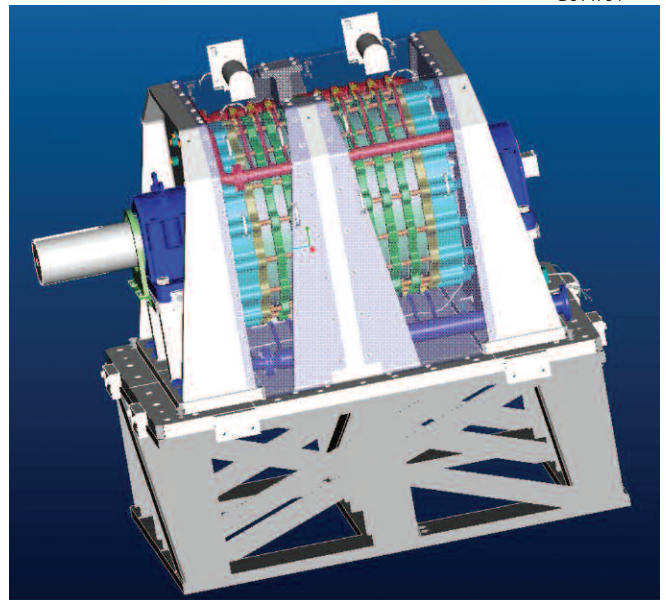


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Used to evaluate shipboard gearboxes, this 1,420-hp dynamometer can absorb one million in-lbs of torque.



D014794

Engineers developed a 10,000-hp dynamometer, riser, and torque transducer calibration system for continuous power absorption up to 10,800 hp and a maximum torque of 10,290,000 in-lb, at a maximum speed of 360 rpm.

Institute engineers developed a state-of-the-art dynamometer (inset and right) capable of absorbing 50,000 ft-lb of torque at near stall speed and 720 hp at a maximum speed of 800 rpm. Dynamometers are designed for direct coupling to the axles of various test vehicles, such as this agricultural tractor (left).



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies more than 1,200 acres and provides nearly two million square feet of laboratories, test facilities, workshops, and offices for more than 3,000 employees who perform contract work for industry and government clients.



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