Design and Fabrication of Hydraulic Test Stands

SOUTHWEST RESEARCH INSTITUTE®

Southwest Research Institute® (SwRI®) designs and fabricates unique and novel hydraulic test stands that serve a wide range of industries and are used for unusual applications. These stands provide or absorb radial and axial motion. They have pressure, flow, displacement, torque and speed control along with fluid conditioning, instrumentation and data acquisition. Extreme operating parameters of these stands have involved pressures up to 30,000 psi, flow rates up to 1,000 gpm, maximum temperatures over 325°F, and response times as fast as 25 msec. Some examples of test stands SwRI has fabricated are:

- Automatic transmission component pressure cycle test stand applying fluid at 800 psi and 325°F, with a sine wave cycle having a 25 msec ramp time and minimal overshoot or undershoot
- Hydraulic and electronic control test stand controlling a hydraulic motor with flow of 1,000 gpm at 3,000 psi providing both static and dynamic motor speed control to 0.5% of the set point
- Hydraulically regenerative torque converter test stand integrating a novel hydrostatic transmission configuration and superimposing the output from a fast-rotating, torsional actuator and hydraulic slip rings to simulate the pulses from a diesel engine
- Hydraulic impulse stand testing aircraft components using SwRI custom-designed hydraulic valving to implement advanced non-linear flow control using fuzzy logic and closed loop control, operating with fluid pressures of 20,000 psi fluid and update rates of 100 Hz
- 200 hp hydraulic pump and motor evaluation stand capable of operating to 6,000 rpm, 6,000 psi, 140 gpm and outputting up to 15,000 in-lb of torque while being able to provide charge pressures from 5 inHg to 350 psi
- Six-degree-of-freedom wind turbine test stand simulating wind loads of 20,000 lb and bending moments of 400,000 ft-lb in 1-second duty cycles, using custom cylinders and fast-acting digital servo valves

Typical test stands can contain more than 150 different sensors for pressure, flow, torque, speed, temperature, displacement, vibration, strain and acceleration. Depending on the application, various types of control strategies are used, such as gain scheduled PID, adaptive gain scheduling, fuzzy logic, H-Infinity, quantitative feedback and model-based control.

All stands are designed to maximize personnel ergonomics, with heavy emphasis on safety considerations.

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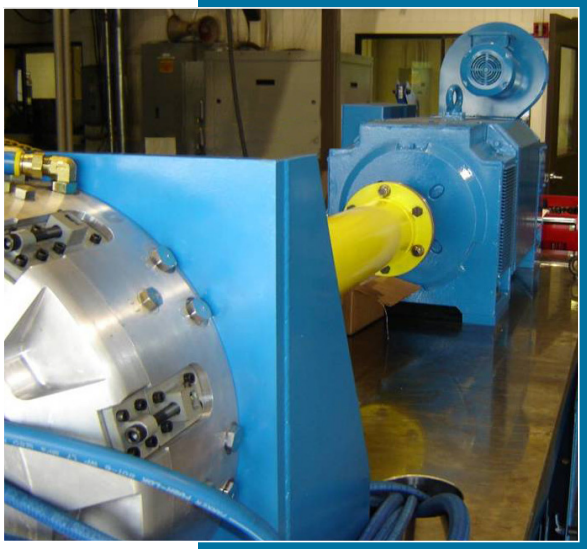
Pressure Cycle Test Bench



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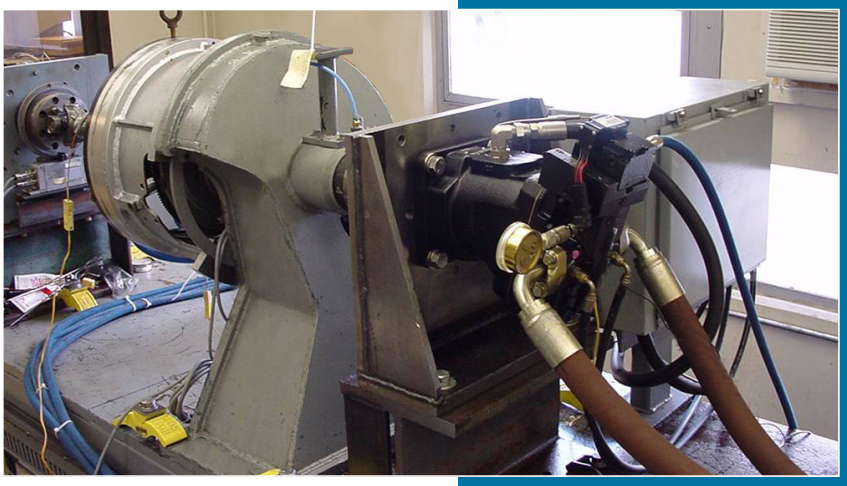
Clutch Pack Drag Test Bench



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Torque Converter Test Stand


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1000 gpm Helicopter Test Stand


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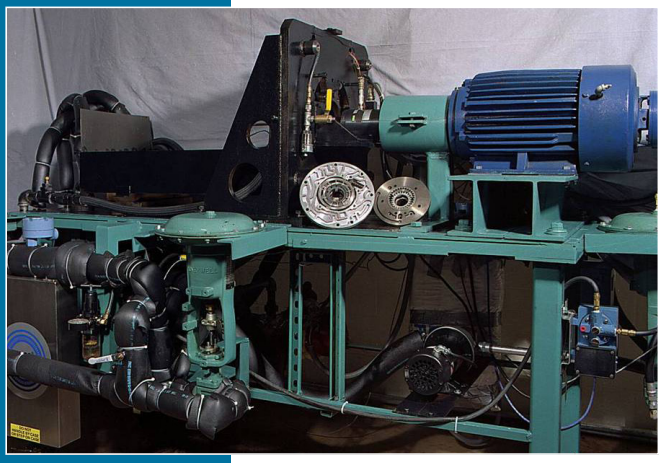
Military Tank Suspension Test Rig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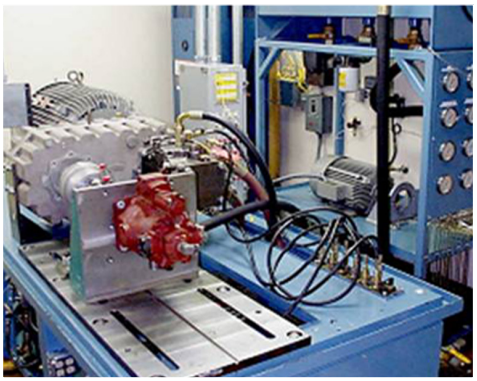
Automotive Pump Test Stand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Pump/Motor Test Stand

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 1,200 acres in San Antonio, Texas, and provides more than 2 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.

We welcome your inquiries.

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08-0711 JCN 241267 tp