

Force Control Industries

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Low-speed high-torque dyno

An innovative dynamometer load brake has cut testing time from 62 to 20 days, bringing substantial savings in costs and manpower

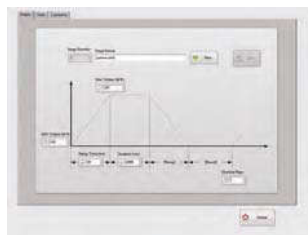
Force Control Industries was approached by a customer with an unusual requirement – to furnish a dyno load brake and control in the 150hp range, continuous torque up to 750Nm (554 lb-ft), momentary torque up to 1,127Nm (831 lb-ft) and maximum static lock-up torque to 1,502Nm (1,108 lb-ft). The system needed to cycle from minimum to maximum torque within 100ms at a cycle rate of up to 500 cycles per minute. Acceleration rate, deceleration rate and cycle rate all needed to be adjustable. Additional tests could require continuous torque load or stair step loads.

Verification of design and reliability was originally carried out by means of field testing. This typically required a minimum of 500 hours of testing. If issues showed up, another 500 hours of field testing were required after corrections had been made. Running continuously, eight hours a day, it took more than 62 days to complete one test. Field testing involved transporting a large machine to remote locations, which is expensive, and required two operators.

The purpose of the new dyno was to simulate the required testing. Crucially, by being able to operate 24 hours a day, it could reduce the test time to 20 days. This would eliminate the considerable time and cost required to transport the machine and operators, and



ABOVE: A new on-screen setup enables the saving of all parameters for use in subsequent tests
LEFT: The new dyno means that costly, time-consuming field testing is no longer necessary



could also ensure a quick turnaround if issues were exposed. A short field test could then be done to confirm the validity of the tests.

The original requirement was a dynamometer load brake that could meet the specifications for a variety of machine sizes, run continuously at full torque, cycle at high rate, and include a programmable control to set up various test parameters with data acquisition and graphical output.

As time went on, a request to supply the complete structure was issued. Force Control engineers worked up a basic design, then joined a video conference with the customer's engineers, where they discussed how to tweak the structure to come up with the ideal solution.

An easy-to-use programming system was developed by Force Control data engineers to provide an on-screen setup for all the parameters – acceleration rate,

deceleration rate, time at maximum torque, time at minimum torque, number of cycles per sequence and number of sequences. All parameters could be saved so that tests could be repeated at a later date. All data was available to be shown live on the screen, or collected to be reviewed later.

The Positorq load brake features oil shear technology that enables it to provide smooth, controlled, high-torque loads down to 0rpm. It can also absorb full horsepower continuously for as long as the test requires.

Oil shear technology is a system design that flows transmission fluid through a friction stack. The pressure applied to the stack produces a linear torque by squeezing the fluid film flowing between the discs and plates, putting the fluid in viscous shear. The fluid transmits torque while absorbing the heat of engagement. It then flows to a forced lube cooling unit to be cooled, filtered and recirculated. Since the friction discs and drive plates are separated by the fluid film, negligible wear occurs to the discs, providing years of maintenance-free operation.

The Positorq load brake chosen for this application has two load absorbing stacks that can be controlled independently. This provides controllability and resolution for both the large higher torque machines (using both stacks together) and the smaller low-torque machines (using one stack). ◀

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