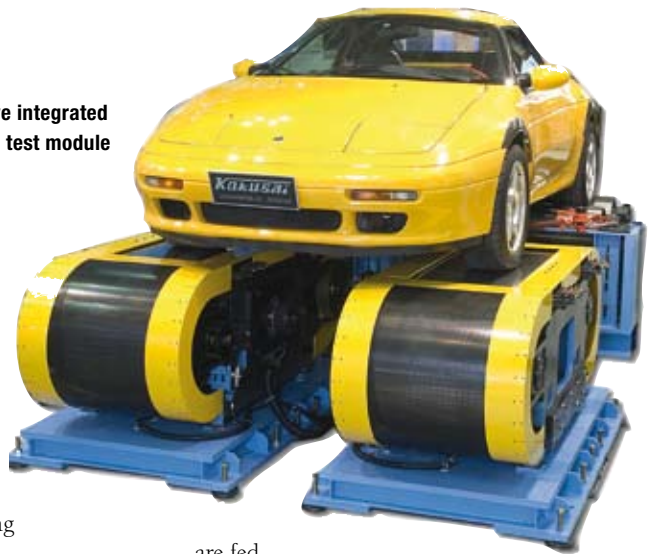


Dynamic development

DynaDrive integrated into road test module



The requirements for effective vehicle suspension and tire testing continue to expand into many areas. Simulation of the tire to actual driving conditions including slip angle, camber angle, horizontal slip, load, and speed is crucial for product evaluation. Various components including tires, wheels, hubs, brakes, and suspension systems are required to be analyzed; however, test courses are expensive and have a complicated set of uncontrolled conditions such as road surface, temperature, humidity, and wind. Integration of flat-belt technology into the testing apparatus is important, especially for measurement of shimmy vibrations, steering pulls, and other vibrations.

The Kokusai DynaDrive Flat Belt Dynamic Ride Simulator has the capability of measuring multiple forces under a wide variety of combinations of angles, speeds, and loads. It can test the tire and wheel assembly (TWA) with different suspensions in wet or dry conditions. The DynaDrive product grew from the requirements of automotive and tire companies that wanted a more cost-conscious solution to their extensive, road-simulated testing



Illustration of the complete DynaDrive test module

needs. This system was first exhibited at the Automotive Engineering Exposition 2006 in Japan.

The Kokusai DynaDrive is a multi-angle, multiloading, multispeed tester that allows the user to quickly change the TWA on various suspension systems. The main frame integrates Kokusai's patented flat-belt module. The module's base can be equipped with four tri-axial load cells measuring three force and three moment data. Alternatively, the sensors can be mounted on the tire side spindle or even as an integral part of the suspension system, depending on the user's requirements. In other cases, users may want to mount sensors inside the TWA.

The seamless stainless steel belts are driven by an AC servo motor ranging in size from 22kw to 37kw, depending on tangential load requirements; it is capable of speeds ranging from 80 to 250km/h (50 to 155mph). The module is mounted on circular slide rails, allowing the entire mechanism to rotate for differing slip angles, capable of +/-15°. The module is also mounted on a rotating carriage that allows the camber angle to be changed from -5 to 5°. Tests can combine slip and camber angles, allowing for a full range of testing parameters. Side forces can range from 1-5kN, with traction forces of 10kN and moment forces of 1kNm.

The TWA is lowered onto the flat belt module with a force of up to 10kN. This force can be changed for each test or even varied during a test cycle. With the suspension testing feature, a fourth axis is added to allow for horizontal movement (across the tire tread). All motions can be oscillated. Slip angle, camber angle, and slide motion can oscillate at 5Hz, while loading can oscillate as high as 30Hz, well within most suspensions' natural frequency of 15-20Hz.

The tri-axial load cell's analog signals

are fed back through a Kokusai KOMS filtering and analysis instrumentation system. Radial, lateral, and tangential forces can be measured along with rolling resistance moment, overturning moment, and self-aligning torque. This data is associated with the speed at the time of the test. Plysteer and conicity can be calculated and recorded.

Measuring these forces at highway speeds with different loads and varying angles allows suppliers to effectively test their products under realistic conditions to see the effects of these changes. Prototype products as well as existing parts with quality problems can be analyzed separately as changeover times are quick. The testing sequences, test plans, and durations are virtually limitless and easily made through the operator interface. All data is available for viewing as well as exporting for further analysis. Special data creation and optional features are available for review and integration.

The flat belt module is integral to the Kokusai DynaDrive, but can be designed into other applications such as wind tunnel testers, tire uniformity machines, fuel consumption testers, chassis dynamometers, emissions testers, and roll-brake testers. The DynaDrive is a complete servo-based system with no messy hydraulic systems or pneumatic power modules. ■

FURTHER INFORMATION

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