



Mechanical Testing

Mechanical test benches round off dSPACE's test system portfolio

Completely validating a complex control system often also includes putting the mechanical components to the test. Matthias Deter, responsible for the setup of mechanical test benches at dSPACE, illustrates the key role that dSPACE test benches play for testing mechatronic systems.



3-D platform for electronic stability control (ESC) tests.



Mr. Deter, dSPACE is well-known as a provider of rapid control prototyping (RCP) systems and hardware-in-the-loop (HIL) simulators for ECU development. Why does dSPACE also provide test benches?

Completely validating an electronic control unit (ECU) under laboratory conditions is often possible only if the test system completely simulates the real ECU environment. More and more ECUs also need a stimulus to their mechanical interfaces and sensors in order to be completely integrated in the test environment. One example is an ECU for ESC, with an integrated yaw rate sensor. Since the goal of dSPACE has always been to offer its customers turn-key HIL test systems, from our point of view it is natural that we also provide test benches, offering complete systems that are optimally adapted to our customers' needs. When we set up these test benches, our experience and products in rapid control prototyping (RCP) are a great help, because the RCP systems drive the necessary load machines.

Are test benches a new dSPACE business field?

dSPACE already has a lot of experience in this field. In the past 7 years, we have set up more than 50 test benches and delivered them as turn-key systems to our customers. Test benches are one of our fastest-growing fields.

What are typical applications?

Most of the typical applications are electric power steering systems, and also brake boosters, 3-D motion platforms for vehicle dynamics control systems, and mechanical loads for real pump motors. We also cover smaller automotive applications, such as seat controls, fans, belt tensioners, and electric tank caps. We are not afraid of any application.

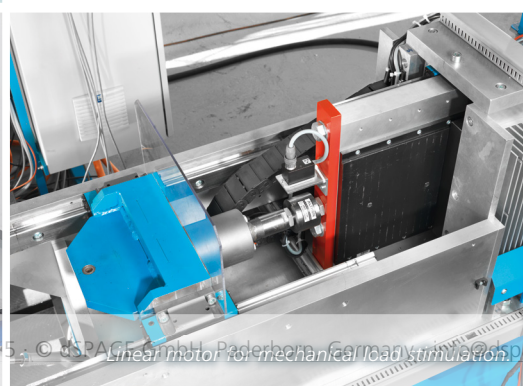
How does dSPACE stand out from its market competitors in the field of test benches?

First of all, it is important to know that at dSPACE, customers get all their components from a single source. With other providers, this is

Turn-key simulators for mechatronic systems from a single source.



Test bench for steering systems (single-sided linear motor).



Linear motor for mechanical load simulation.



Test bench for a steering wheel.



usually not the case. dSPACE offers a comprehensive portfolio of real-time hardware and simulation models for HIL applications. We also provide customized engineering services for test bench design, construction and commissioning. We plan the mechanical components ourselves and have them manufactured by local specialized companies. Our customers always have exactly one contact: dSPACE. And then there is one test bench characteristic that really stands out: Dynamics! Customers tell us that dSPACE test benches surpass their expectations influenced by experience with other providers regarding control dynamics and accuracy. We rely on the open TWINsync protocol from the company LTI. With this protocol, our real-time hardware offers decisive advantages such as low-latency control with 8 kHz and synchronicity for pulse width modulation of the drive motors. And we naturally are also experienced with other protocols and industrial buses.

Why does dSPACE rely on electric drives for the test benches?

Electric drives have an optimal bal-

ance of dynamics and energy efficiency. They also have a manageable, simple infrastructure and are easy to control. If we need to, we can even reach a two-digit kilonewton range for linear motor forces – representing the dynamics that act on a tie rod at high speeds and uneven surfaces, like cobblestones.

How does dSPACE make sure that the test benches also cover the customer's needs?

The test benches are implemented in customer projects. This means that we work closely with our customers to meet and understand their specific requirements in detail. The customer's requirements go directly into the concept of the test bench so that a customized, optimal solution is always the result. In turn, new challenges naturally lead to innovations in our hardware and software. So dSPACE always has an optimal mix of innovative products and customer-specific engineering units.

What measures has dSPACE taken to position itself for processing such projects?

Our internal expertise, tools and processes have been expanded to include the development of mechanical setups. In particular, adequately handling 3-D construction data brings new demands. We also have processes for production release, safety requirements, and quality assurance. Because we are highly experienced in these elementary topics, we can provide test benches that operate safely and efficiently for the system users. Of course we are happy that our customers appreciate our efforts, which the following statement from a premium manufacturer confirms: "I've never experienced this on-schedule delivery and accurate implementation of such a complex project when other companies were involved."

Mr. Deter, thank you for talking to us!

Matthias Deter is Group Manager Engineering, responsible for customer projects with mechanical test benches, at dSPACE in Paderborn, Germany.

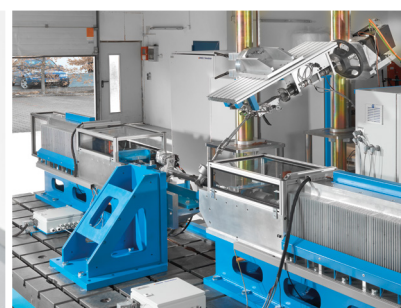
■ Dynamics is the prime discipline of dSPACE's test benches.



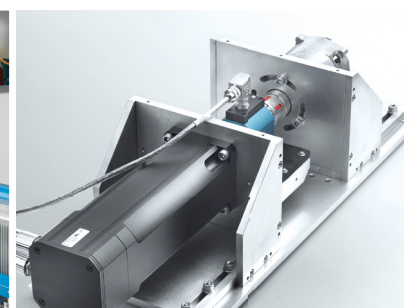
Driving simulator cockpit.



Test bench for electromechanical brakes.



Test bench for steering systems (double-sided linear motor).



Load machine.