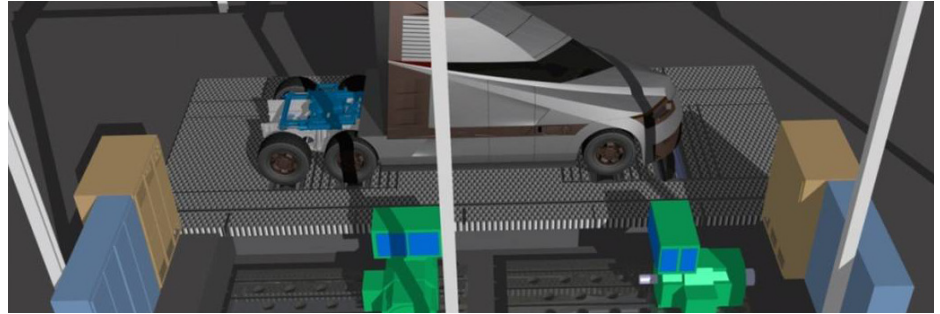


Vehicle Electrification Testing and Development Services

accelerating the introduction of new electric power conversion products for the commercial vehicle market

The Ohio State University Center for Automotive Research (OSU CAR) provides the commercial and passenger vehicle industry with a complete set of R&D testing and engineering capabilities related to vehicle electrification. OSU CAR offers a range of experimental facilities supported by a technical staff with expertise in battery testing; vehicle design, conversion, and validation; and design and testing of power electronics circuits

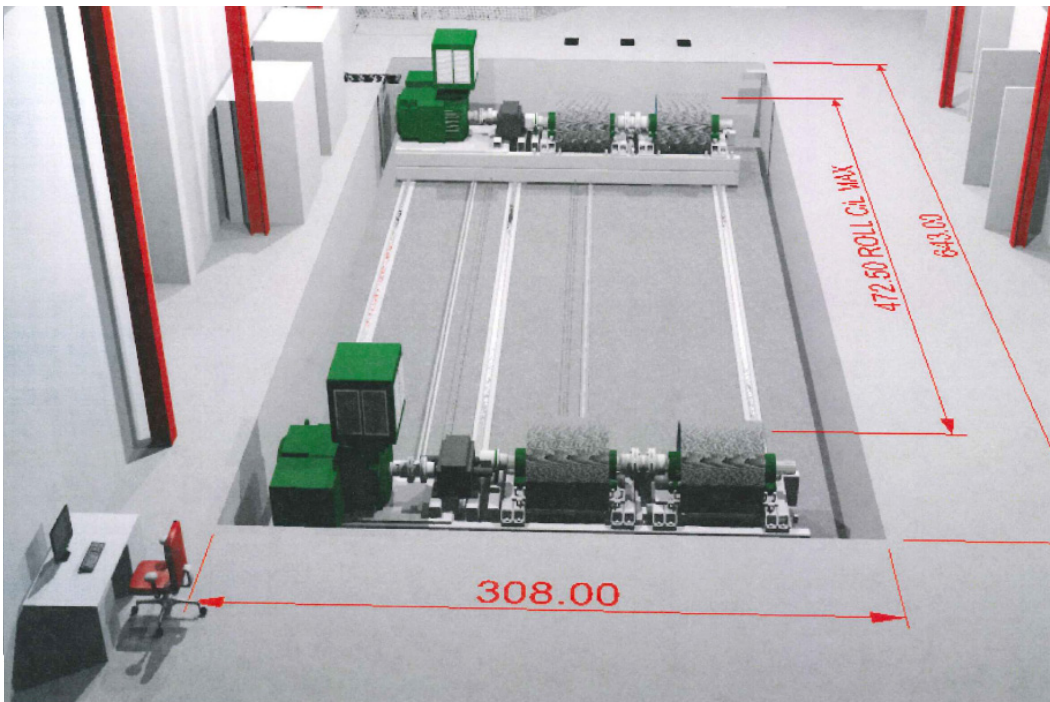


OVERALL CAPABILITIES

Vehicle electrification services can be utilized for high-voltage vehicle electrification, to support power conversion technologies, and to develop new electric vehicle power components. Fleet operators, vehicle OEMs, system integrators, and component subsystems suppliers can access vehicle electrification testing and development services. Capabilities include:

- 4WD chassis dynamometer capable of testing class 4 to class 8 trucks, with rolls movable from 1.14m - 12m (45"-39.5')
- high-voltage battery emulation and testing up to 250 kW and 900V
- battery cell, module, and pack testing and integration
- battery module and pack design
- high-voltage power electronics laboratory
- Hardware-in-the-Loop

These capabilities are complemented by Ohio State's nationally ranked engineering and research staff support, as well as access to other test facilities and R&D labs across the university campus.



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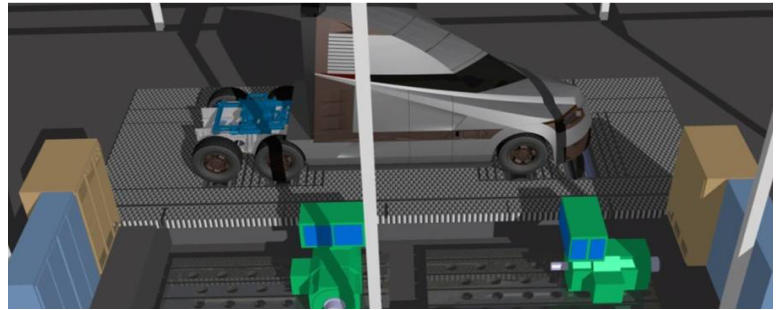
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Visit <http://car.osu.edu>
for more information

CAPABILITIES

The heavy duty chassis dynamometer, an HEV and PHEV test bed, has 2 independently controlled rolls, each capable of 1000 hp. It is compatible with existing or future conventional, hybrid, or electric medium and heavy duty vehicles with a tandem wheel base of 45" or greater. Capabilities also include 4x4 vehicles with a wheel base up to 39.5'. The axle load supports up to 30,000 lbs per axle or 60,000 lbs per tandem with a maximum speed of 70mph.



CAPABILITIES

Battery testing and services available with the chassis dynamometer include well developed cell characterization and testing as well as module and pack level capabilities. Cell testing can be leveraged to assist in cell selection and to develop battery management system algorithms. Module testing allows for design and validation of large packs at a module level before to pack level testing. Specifically paired with the heavy-duty chassis dynamometer is the AV-900 battery test system. Capable of up to 900 VDC and 250kW, the AV-900 offers two independent channels for battery testing or emulation, either in conjunction with a vehicle or as a stand alone operation.

CAPABILITIES

The high-voltage power electronics lab at CAR is dedicated to the design and testing of power electronics circuits in automotive applications. Major equipment includes:

- WT3000 High Accuracy Power Analyzer
- DL7480 Eight Channel 500 MHz oscilloscope
- DL850 V Eight input units ScopeCorder
- two portable oscilloscopes
- high-voltage and high-current probes
- TI DSP development kits
- two 25 kW variac powered work stations
- HX300A 10 kW chiller with integrated heater
- three 600 A inductive loads.

Access is also available to the 3600 square foot high-voltage hall and distributed real-time simulation platform, located in the Department of Electrical and Computer Engineering. High-voltage power electronics features and capabilities are further increased by a dedicated Hardware-in-the-Loop lab. Included are dSPACE mid-sized Hardware-in-the-Loop with quad-processor unit, high-speed I/O cards for emulation of power electronics, general purpose I/O card for conventional powertrain emulation, and a MicroAutobox for implementation of control algorithms.

