

Testing Solutions



MMETM
MUSTANG
ADVANCED ENGINEERING
*Fearless Innovation*TM



EV Production Test Cells



Software Development



Electric Motor Testing



Transmission Dynamometers



Global Leaders in Test Solutions

As a global leader in the design, manufacturing, and integration of advanced testing and measurement systems, MAE supplies component and complete turnkey test systems for leading automotive and industrial manufacturers, OEM's, tier one suppliers, fleet operators, R&D labs, race teams, centralized and decentralized emissions inspection programs and many other leading companies throughout the world. MAE has delivered and continually supports literally thousands of test systems to virtually every corner of the globe.

Mustang Advanced Engineering has been a leading provider of comprehensive testing solutions for the development and testing of engines, powertrain systems and complete vehicles since its founding in 1975. A division of Mustang International, MAE has long been known as a trusted source of expertise in measurement and testing technologies for the global industrial market. World-class product offerings, custom design support and technical assistance, backed by a dedicated factory customer service team has positioned MAE among the global leaders in providing advanced testing solutions.

"This was my first time dealing with Mustang, but I will say I hope it will not be the last. Speaking for myself, I would not hesitate to recommend Mustang for any future contract."

- Troy Morris

*Deputy QA / Commissioner
Taji National Maintenance Depot,
Camp Taji Iraq*

"Custom Solutions" Approach

MAE's "custom solutions" approach focuses all of our product, application and automation experience on your specific measurement and testing requirements. Our goal is to provide tailored solutions that optimize our customers testing and development operations by providing intelligent system designs coupled with outstanding technical expertise

and world-class customer support.

MAE provides specialized testing systems designed for the customer's specific application - from engine, transmission, powertrain, hybrid, racing, and component testing applications. MAE's modular design concept allows for a high degree of scalability, from simple durability testing to highly sophisticated and complex powertrain development test cells.

- Design & engineering Support
- Global full service supplier/partner
- CAD and CAE software and offers a comprehensive resource
- Specialize in finding the most practical and economical solutions
- Test cell integration



Water-cooled
Engine Dynamometer

Mustang Advanced Engineering serves many industries, more than what is mentioned here. Contact MAE and ask how they can help you!

- Electric vehicle testing and BEV, PHEV, HEV Testing
- Hydrogen FCEV Testing
- Racing & Performance Tuning
- Manufacturing & Production
- Emissions Testing
- Motorsports, Recreational & UTV
- Commercial & Transportation
- Construction, Gas & Mining
- Aviation, Aerospace, VTOL, Electric & Hybrid Aircraft
- Marine & Naval
- Agricultural & Forestry
- Lawn & Garden, Groundskeeping & Landscaping
- Educational
- Material Handling
- Military & Government



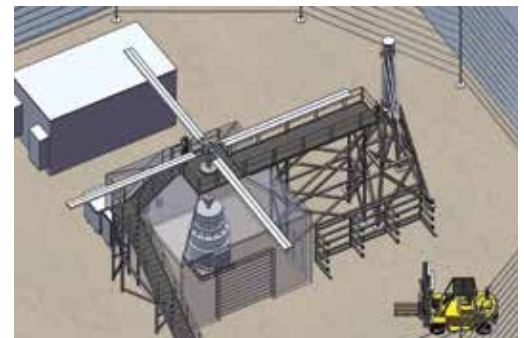
Chassis Dynamometer for Automotive OEM



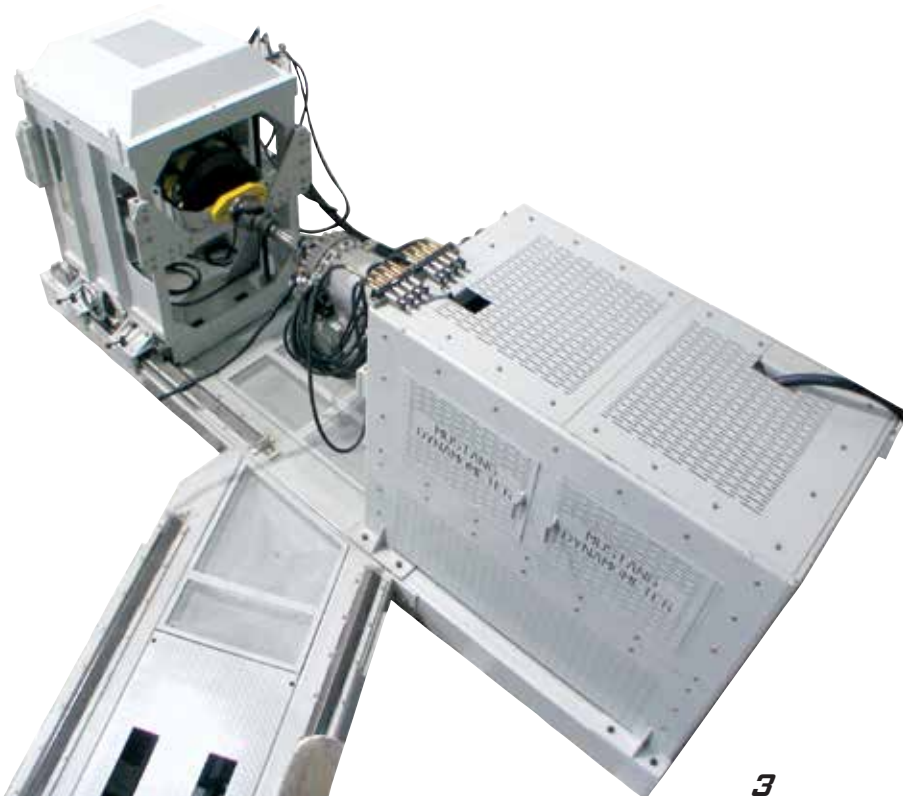
Military and Heavy-Duty Industry Dynamometers



Electric Powertrain, EV, FCEV Test Systems



Aviation and Aerospace Market





Engine Test Cells

Engine Test Cells

MAE provides an extensive product offering of dynamometers and engine test cell products for a variety of engine testing applications. MAE's product offering is designed to meet fractional to 25,000+ hp and speeds up to 100,000 rpm, with a complete line of dynamometer controls, data acquisition, engine electronic interface and conditioning modules. MAE offers customers products from a single engine test cell component to complete custom tailored systems or test labs. MAE's extensive range of standard product offerings includes AC, permanent magnet, DC, servo, water-cooled eddy current, air cooled eddy currents, hybrid AC/EC, water brake, hydraulic clutch plate brakes and other sophisticated engine loading devices.



Turnkey Containerized Transmission Labs

Transmission Test Cells

MAE is far and away the industry leader for transmission dynamometers and transmission testing components. We offer a full lineup of products to test light-duty, medium-duty, heavy-duty, extreme heavy-duty, in-line and cross-drive transmissions. Our products are used in advanced research and development labs, prototype labs, production environments, repair and remanufacturing facilities and countless universities around the world. MAE's transmission dynamometers are designed to accurately simulate engine input speeds via variable speed AC Dyne Motors. Output loading is typically accomplished using Eddy Current PAUs, or in some cases, additional AC Dyne Motors. MAE also has experience with producing containerized transmission labs, which are portable as well.



Turnkey Containerized Transmission Labs



Electric Motor Test Cell

Powertrain Test Cells

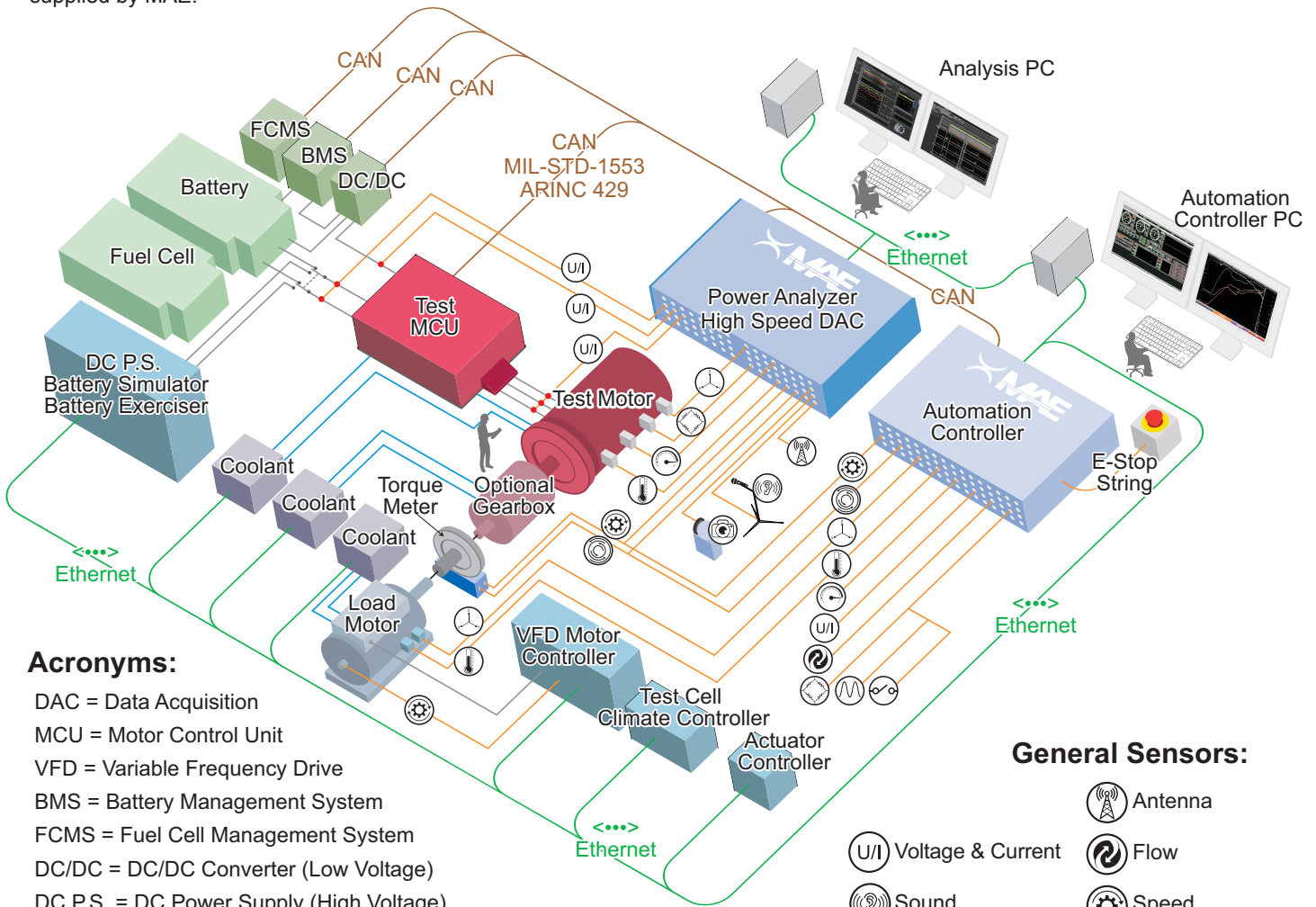
MAE offers a comprehensive lineup of powertrain test systems for component to complete powertrain testing requirements. Our powertrain testing product line has developed over the past 35 years from testing single components such as clutches, to testing complex 6x6 vehicles with independent wheel control using independent wheel-loading electric AC dynamometers and hybrid dual power plants. Control of sub-systems and powertrain test articles are independently controlled, such as shifting the axles, shifting the transmission, shifting the transfer case, and controlling the input motor (Engine).



Electric Powertrain, EV, FCEV Test Systems

Hybrid Electric Drive Test Cells

For hybrid electric transmission development, MAE has produced a high-speed R&D dynamometer for several clients. Each system incorporated a 315-hp liquid-cooled AC input dyne motor and 635-hp output dyne motors with integrated oil reservoirs, cooling columns and pumps for motor cooling. Additionally, ModBus and CAN interfaces were supplied by MAE.



Acronyms:

- DAC = Data Acquisition
- MCU = Motor Control Unit
- VFD = Variable Frequency Drive
- BMS = Battery Management System
- FCMS = Fuel Cell Management System
- DC/DC = DC/DC Converter (Low Voltage)
- DC P.S. = DC Power Supply (High Voltage)

General Sensors:

- Antenna
- Flow
- Speed
- Force
- Frequency
- Digital Switch
- Camera
- Voltage & Current
- Sound
- Torque
- Pressure
- Temperature
- Vibration



Automatic Chassis Dynamometer for EV applications



End-of-Line Test Stations



High-Load, Low-Speed Tow Dynamometer

Chassis Dynamometers

MAE was built on the tradition of world-class chassis dynamometer technology. Our engineers have designed and manufactured chassis dynamometer test systems for virtually all types of vehicles and applications ranging from independent all-wheel-drive military vehicles to fractional-powered wheeled vehicles and everything in-between. MAE has a chassis dynamometer solution for virtually every testing application, including emissions, NVH, durability, EMC/RFI, wind tunnel, environmental chambers, mileage accumulation and racing performance, to name a few.

End-of-Line Testing

MAE has extensive experience in the field of end-of-line (EOL) testing and offers a variety of products and services to support your production testing requirements. MAE has developed systems to handle multi-function vehicle testing, production electronic & wire harness testing, chassis sensor and electronic testing, production engine and transmission testing and many other applications. MAE can upgrade your existing production line hardware and software, interface with existing databases or supply a complete turnkey production testing solution.

Tow Dynamometers

MAE offers the largest and most complete lineup of tow dynamometers available for test engineers in the industry. Using advanced controls and air-cooled eddy current power absorbers, tow dynamometers are capable of testing vehicles and simulating road profiles taken from pre-recorded data of road grades, hills and mountains without ever having to leave the safe and controlled confines of the flat test track. MAE's advanced control system allows for grade control, speed control, drawbar control, manual control, polynomial drawbar control as a function of velocity, mountain climbing test as a function of distance, cycle testing as function of distance or time and engine speed control. MAE was the first company to offer a heavy-duty, Class 8, 5th-wheel-style tow dynamometer with auto-shift capability.



Tow Dynamometers



Pre-Fab Containerized Test Cells

For many years now, the engineers at MAE have been working with test engineers all around the world. We understand the challenges they face when they are forced to relocate a test facility or modify a test cell to meet revised testing requirement. For years we have been working with these engineers to develop containerized solutions to address these specific challenges. As a result, today MAE offers a number of standard modular containerized test cells, from single containerized engine or transmission test cells, to containerized end-of-line multi-function production validation testers, to complete containerized multi-cell R&D test facilities. MAE's containerized test cells are self-contained and fully equipped with all the supply, monitoring and measurement units of a standard test cell facility in an easily transportable and modular containerized package.

MAE's containerized test cells have many distinct advantages including fast and cost-effective relocation of testing facilities, minimized building modification requirements and related expense, quicker up-and-running times, and highly flexible designs.

Self-Contained End-Of-Line Test Cells

MAE supplies all of the equipment, software and engineering required, including system design, installation, start-up and training. Self-contained end-of-line test cells incorporate a multi-function chassis dynamometer capable of variable wheelbase adjustment, dynamic vehicle load testing, brake testing, road simulation and function testing. Such test cells MAE has developed for motorcycles, electric vehicles, tow motors, and several other different market applications.



Pre-fabricated Containerized Test Cells



Self-Contained End-Of-Line Test Cells

Software and Controls

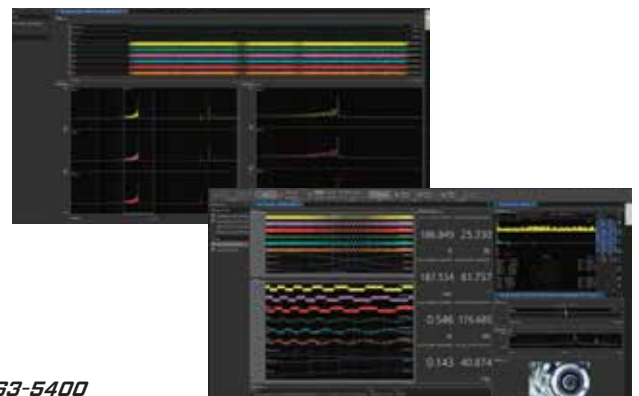
MAE has a vast software library operating many different testing, production and monitoring applications. Mustang Advanced Engineering's software group is able to configure or develop a software application for your requirements: Software & Controls Packages and/or Data Acquisition

TESTCell™ Software Suit: is able to handle most test cell, production stand, and standalone applications.

PowerDyne® Software Suit: is primarily developed for Chassis Dynamometer Applications with Emission Analyzers, Battery Simulation, Robotic Drivers, Vehicle Cooling Fans, Facility Management Systems, Large Scale Data Acquisition System, PLC Controllers, Embedded Controllers, 3rd Party Controllers, Custom Controllers and more.

ProductionPro™ Software Suit: is primarily developed for Production Process Flow Applications into existing environments

Tow Dynamometer Software: This product is used with our pull only and our push/pull style tow dynamometers and ancillary interfaces

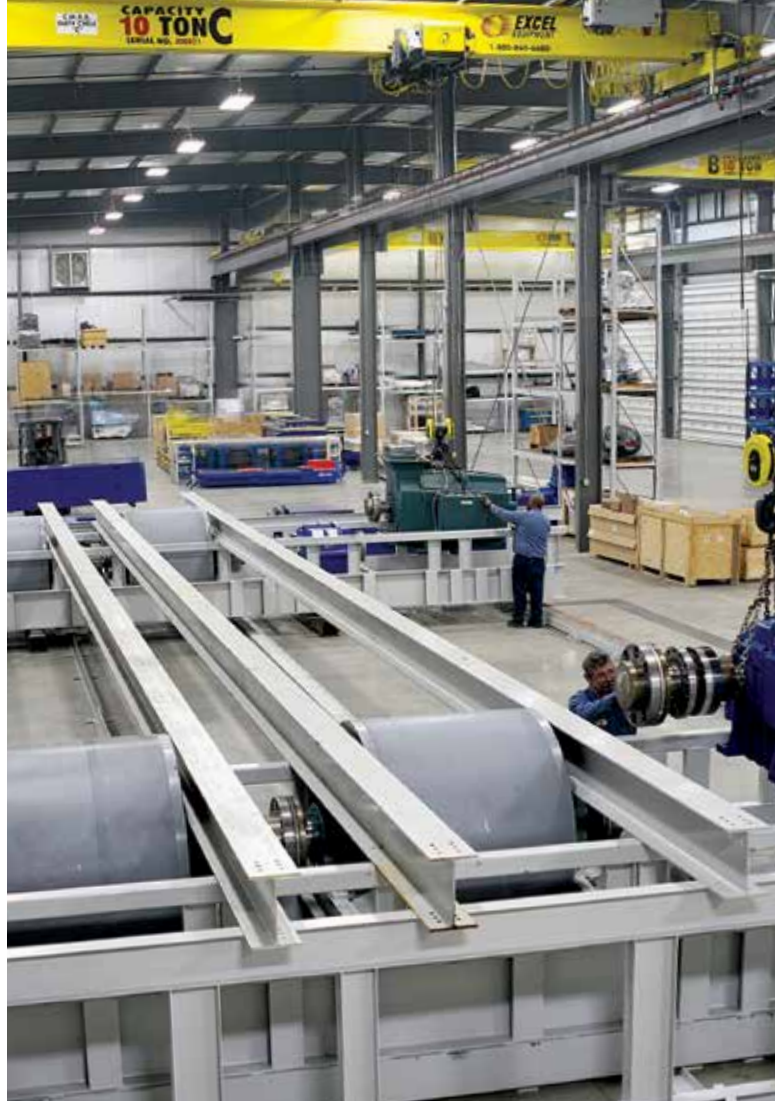


Mustang Advanced Engineering



About MAE

Mustang Advanced Engineering is a leading supplier of advanced, custom engineered testing and measurement systems. Located in Twinsburg, Ohio since 1986, MAE delivers world-class testing solutions, custom design support, technical assistance, backed by a dedicated factory service team, making them a trusted source of expertise for the global industrial market. Visit MustangAE.com for more information. Follow them on Facebook, Twitter, LinkedIn, and Instagram



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