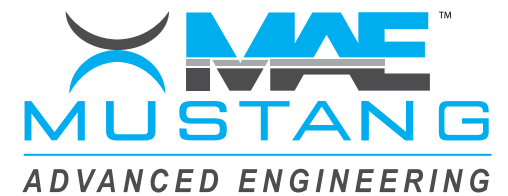


Advanced Engineering

Testing Solutions



www.mustangae.com


MUSTANG
ADVANCED ENGINEERING



Our Mission

Our mission is to achieve the highest possible level of customer satisfaction by providing innovative technical solutions and product designs and by striving to achieve perfection in product quality, delivery and service.

At Mustang, our customers are our highest priority - We do everything in our power to satisfy our customers. Our entire organization understands that the customer comes first and nothing else is more important.

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Engine Test Cell - Eddy Current



Powertrain Test Cell - AC Motor



Transmission Dynamometer



NVH Chassis Dynamometer Test Cell

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.

Global Market Leaders





Mustang Advanced Engineering (MAE)

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 engineering and design support, industry leading technical expertise – all backed by a dedicated factory customer service team – has positioned MAE among the global leaders in providing advanced testing solutions.

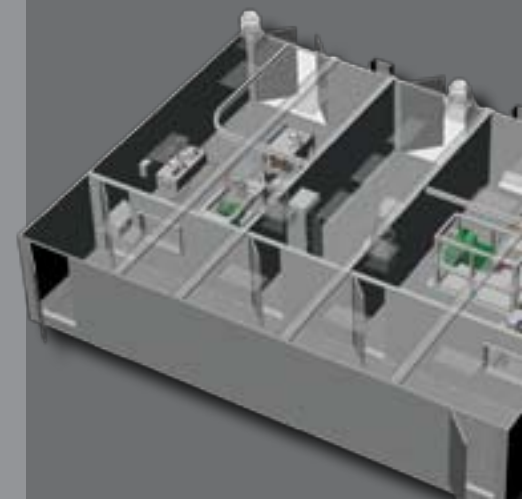
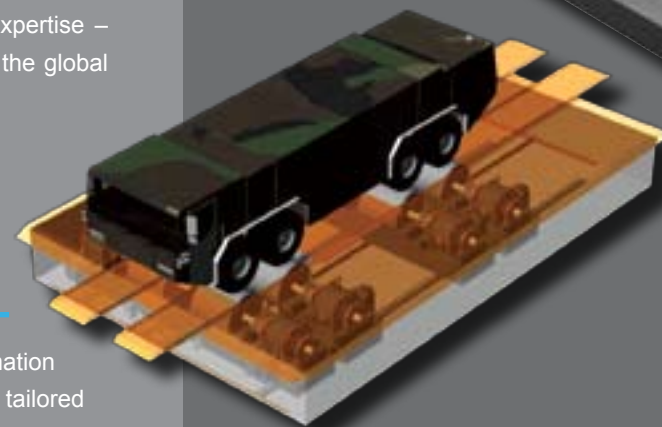
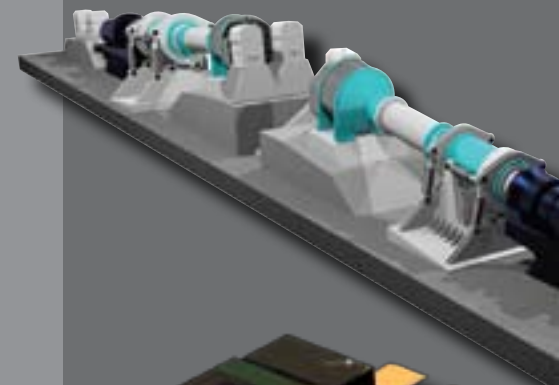
“Custom Solutions” Approach

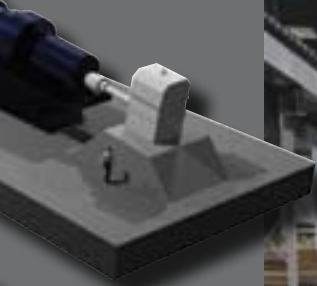
MAE’s “custom solutions” approach focuses all of our product, application and automation experience on your specific measurement and testing requirements. Our goal is to provide tailored solutions that optimize our customers’ testing and development operations by providing intelligent system designs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

MAE provides specialized testing systems designed for the customers’ specific application – from engine, transmission, powertrain, hybrid, racing, to 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, Mustang’s capabilities are virtually limitless.

Design & Engineering Support

As a full-service supplier/partner, MAE offers a wide array of services to customers all over the world. Working with your staff, our experienced team of engineers uses the latest solid modeling CAD and Solidworks software, and offers a comprehensive resource for your test cell design and development needs. Our engineers specialize in finding the most practical and economical solutions for new or unusual testing applications. Whether your application is fully conceived or you need a design partner, the engineers at Mustang Advanced Engineering invite you to tap into their decades of experience in testing and measurement systems design and development.







Industries Served

Automotive OEM

Mustang has been serving the needs of the automotive OEM for over 30 years – from R&D test systems engineered to meet the unique needs of the prototype engineer, to custom end of line multi-function test stands for testing product as it comes off the assembly line, Mustang offers a wide range of testing solutions to accommodate the needs of automotive OEMs.

Aftermarket & Dealers

Mustang offers dynamometers for road testing, performance tuning, emissions research, emissions repair, race simulation, and high performance aftermarket product development. Countless big names in the performance aftermarket have purchased Mustang equipment to develop some of today's most popular superchargers, chips and various other aftermarket performance products.

Military / Government

Mustang routinely supplies equipment to the Federal Government for testing government-owned fleets as well as equipment to branches of the military for testing tactical vehicles, weaponry, and various components, such as transmissions and gearboxes.

Educational Institutions

Whether it be supporting a school's SAE Team with a state-of-the-art chassis dyno, supplying an advanced hybrid powertrain test stand for hardware-in-the-loop testing, or supplying a universal transmission dynamometer, Mustang has advanced testing solutions that assist schools in developing world-class curriculums to attract the best and the brightest students.

Heavy-Duty Industries

Mustang's clients in the Heavy-Duty Industry include Komatsu, John Deere, NACCO Material Handling, Kubota and Caterpillar to name a few – all highly visible OEM Companies in the business of making construction vehicles and off-road utility vehicles. Mustang offers equipment to test completely assembled vehicles or individual components, for either R&D or EOL production validation testing.

Recreational Vehicles

Mustang has an extensive history of working with many of the world's finest companies in the recreational vehicle and lawn and garden industries. A partial list of previous clients includes companies such as Club Car, Polaris Industries, Honda of America, Kubota, Harley Davidson, Big Dog Motorcycles, Bombardier and Arctic Cat, just to name a few.

Aerospace, Wind & Hybrid Development

The Aerospace, Wind and Hybrid Development industries constitute a significant portion of Mustang's core business. Mustang continues to focus its attention on the growing needs for advanced hybrid vehicle development solutions, wind turbine gearbox testing, military and aerospace development test stands and advanced testing systems for tomorrow's future technologies.





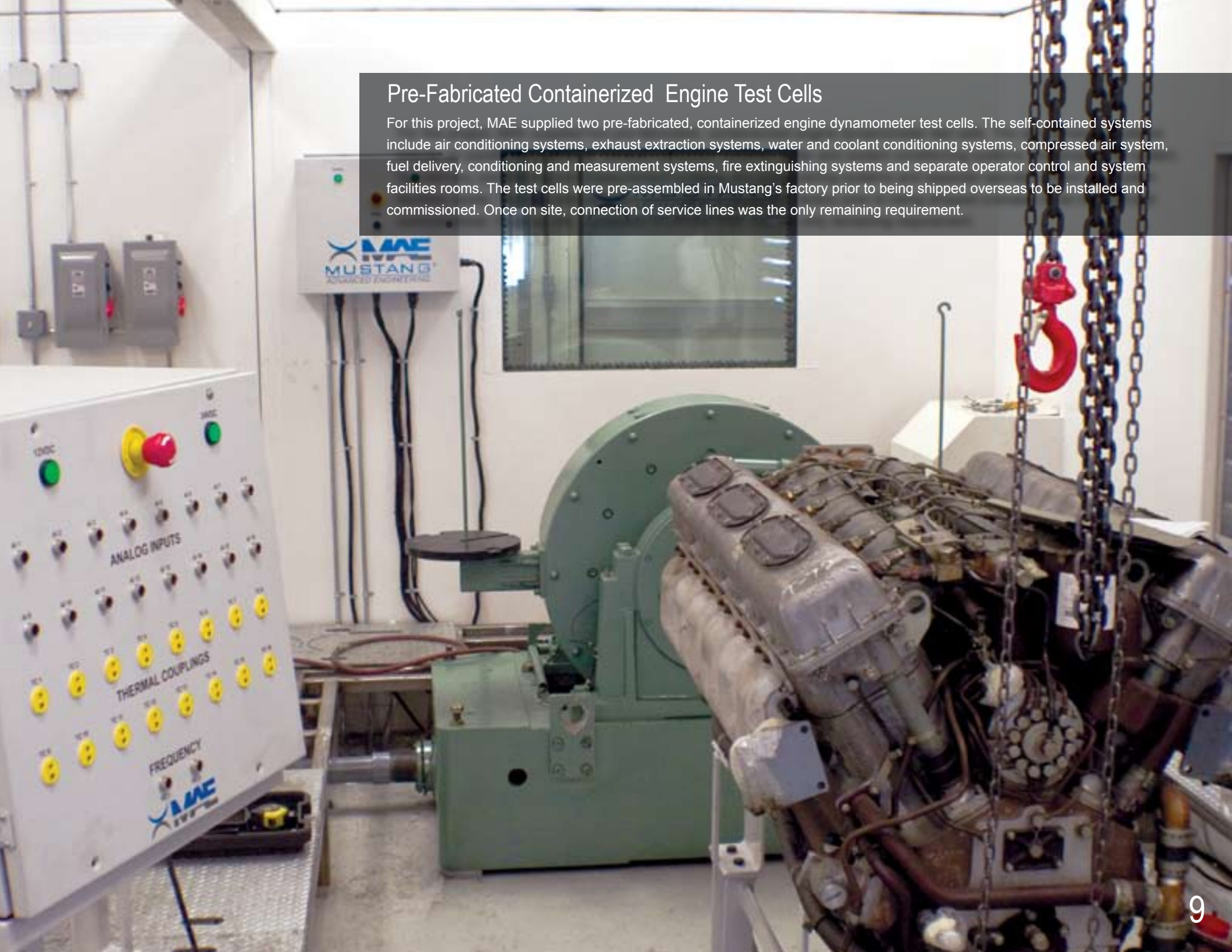
Engine Test Cells

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.



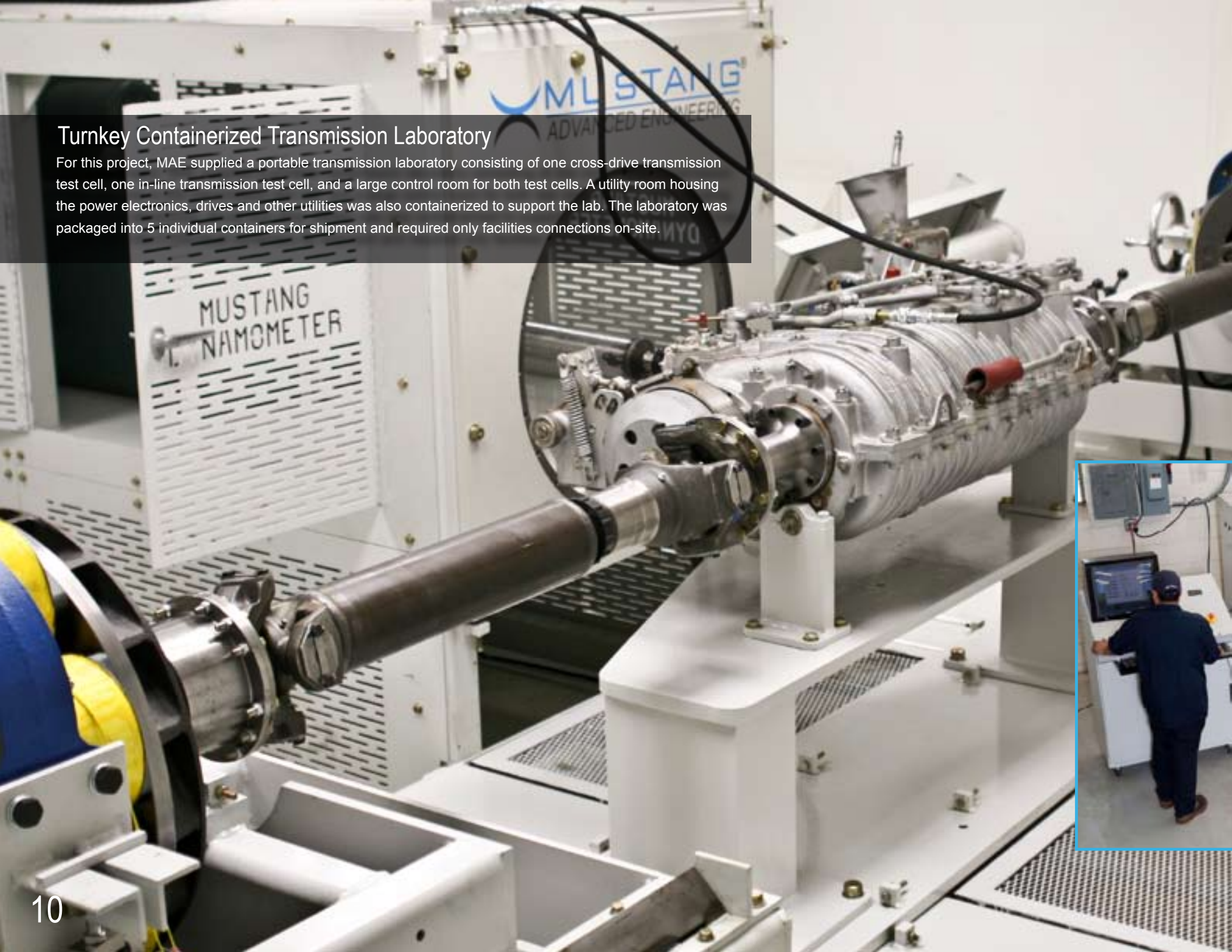
Pre-Fabricated Containerized Engine Test Cells

For this project, MAE supplied two pre-fabricated, containerized engine dynamometer test cells. The self-contained systems include air conditioning systems, exhaust extraction systems, water and coolant conditioning systems, compressed air system, fuel delivery, conditioning and measurement systems, fire extinguishing systems and separate operator control and system facilities rooms. The test cells were pre-assembled in Mustang's factory prior to being shipped overseas to be installed and commissioned. Once on site, connection of service lines was the only remaining requirement.



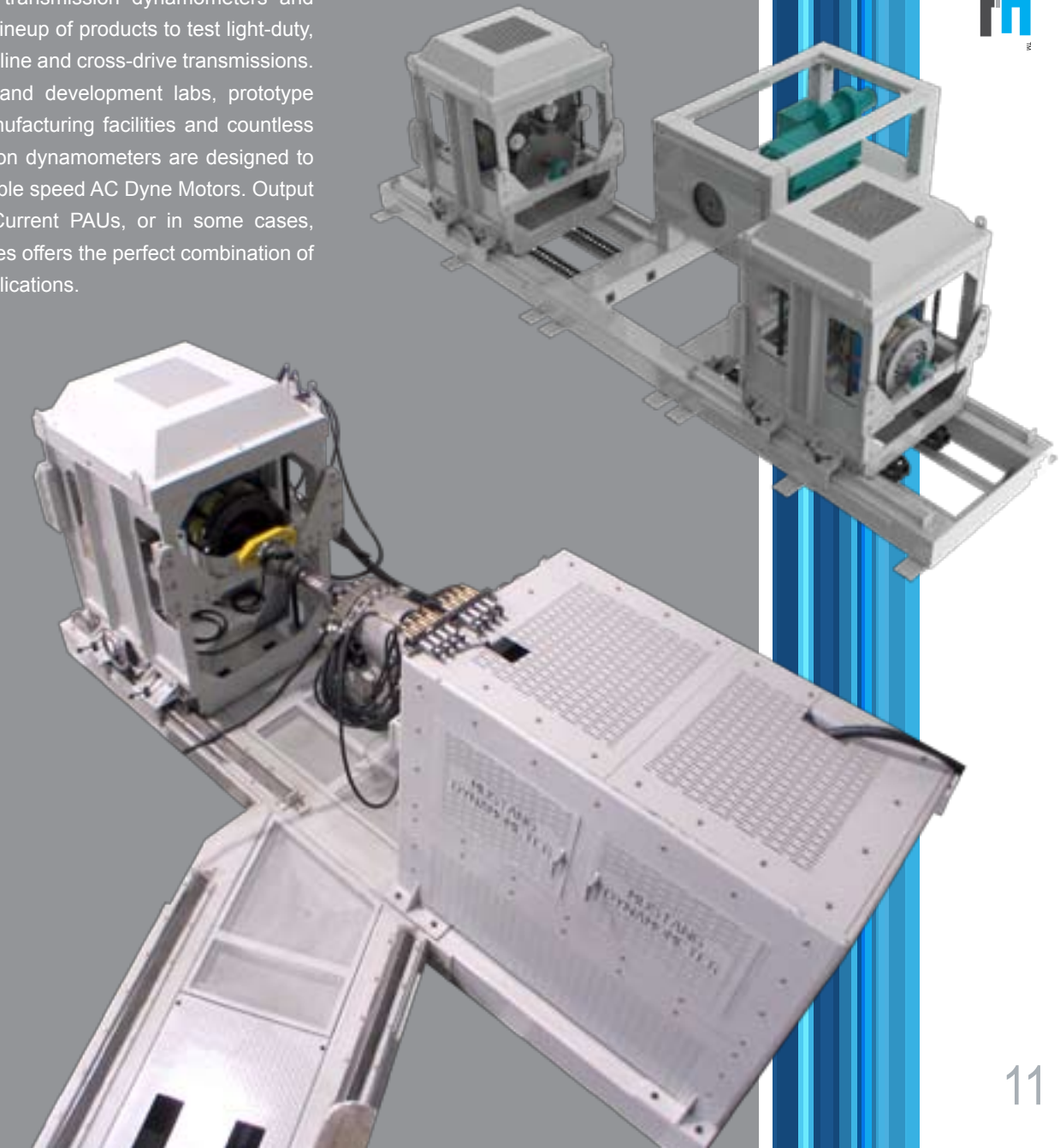
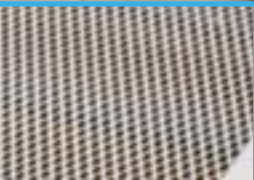
Turnkey Containerized Transmission Laboratory

For this project, MAE supplied a portable transmission laboratory consisting of one cross-drive transmission test cell, one in-line transmission test cell, and a large control room for both test cells. A utility room housing the power electronics, drives and other utilities was also containerized to support the lab. The laboratory was packaged into 5 individual containers for shipment and required only facilities connections on-site.



Transmission Test Cells

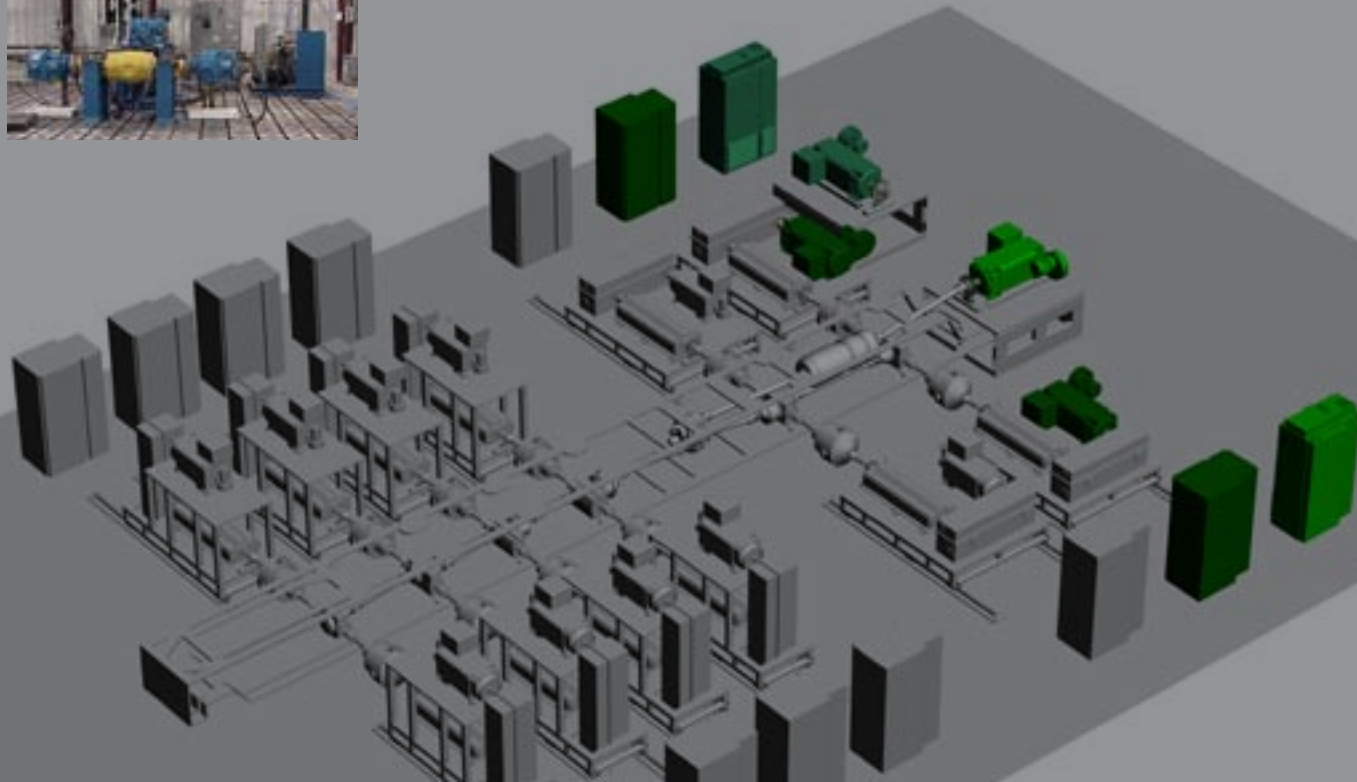
MAE is far and away the industry leader for transmission dynamometers and transmission testing components. We offer a full lineup of products to test light-duty, medium-duty, heavy-duty, extreme heavy-duty, in-line and cross-drive transmissions. Our products are used in advanced research and development 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's Universal Series offers the perfect combination of flexibility and affordability for both LD and HD applications.

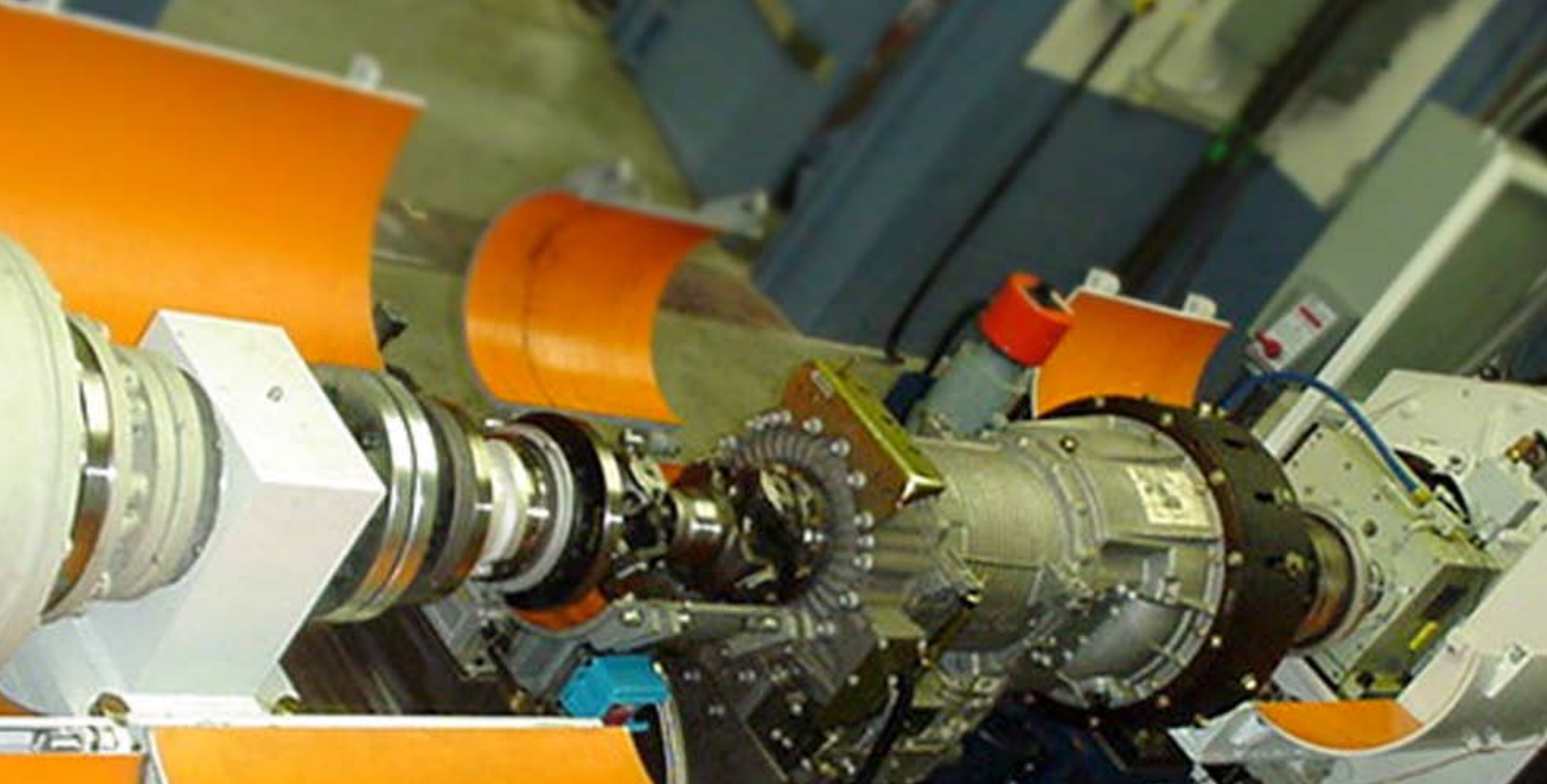




Powertrain Test Cells


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).





Hybrid Electric Drive Test Cells

For this project MAE supplied two high-speed R&D dynamometers for hybrid electric transmission development. 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.

A large, tan-colored MRAP vehicle is positioned on a white metal test stand in a large industrial facility. The vehicle is equipped with various sensors and equipment on its roof. A large, flexible, silver-colored hose is connected to the vehicle and runs across the floor. The test stand features two large blue electric motors. The background shows the high ceiling and structural beams of the facility.

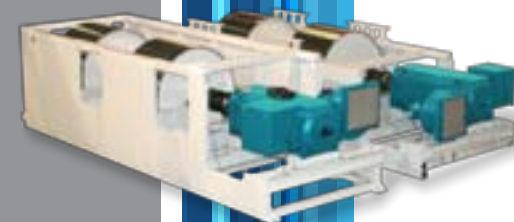
Multi-Function End-of-Line Test Stand for MRAP Vehicles

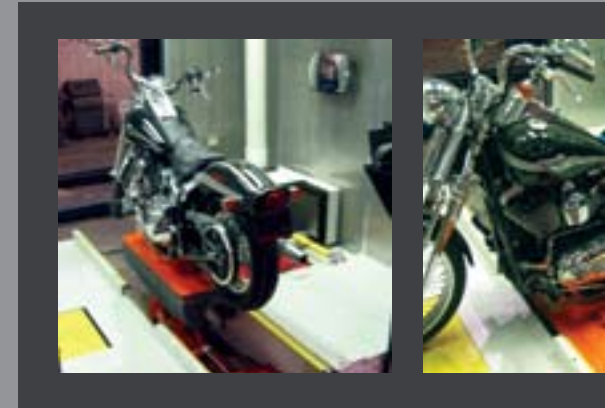
This EOL system performs an entire series of EOL functionality tests including vehicle performance tests, driving course test, exhaust brake testing, retarder testing, functional and visual test, ECU test and DTC evaluations via the dynamometer portion of the multi-function tester. The brake portion of the multi-function tester performs a complete interactive function braking system test of the foundation brakes and the ABS braking system. The comprehensive series of vehicle functional testing is designed to be performed with the vehicle remaining in a single position on the multi-function tester.



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.



Self-Contained End-Of-Line (EOL) Test Cells

For this project, MAE supplied all of the equipment, software and engineering requirements, including system design, installation, start-up and training for three self-contained end-of-line test cells. Each of the three test cells contained a multi-function chassis dynamometer capable of variable wheelbase adjustment, dynamic vehicle load testing, brake testing, road simulation and function testing. A front and rear wheel restraint system limits the motorcycle's movement while under test. All of these tests are performed in a single position while the motorcycle is on the assembly cart.



MDT-170KN High-Load, Low-Speed Tow Dynamometer

The tow dynamometer MAE supplied for this project was designed for testing heavy-duty wheeled and tracked military vehicles. The heavy-duty tow dyne utilized Mustang's field proven design and control technology and consisted of multiple air-cooled eddy current power absorbers connected to a 2-speed transfer case and 4-speed gearbox and tandem axle set. MAE determined that the customer's requirements would require approximately 120,000N maximum draw bar force and total maximum power of 300 kW. In order to meet these requirements, the system was equipped with four PAUs, a 4-speed transmission, 6.14:1 axle and 11R/24.5 tires.



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 – to name a few.

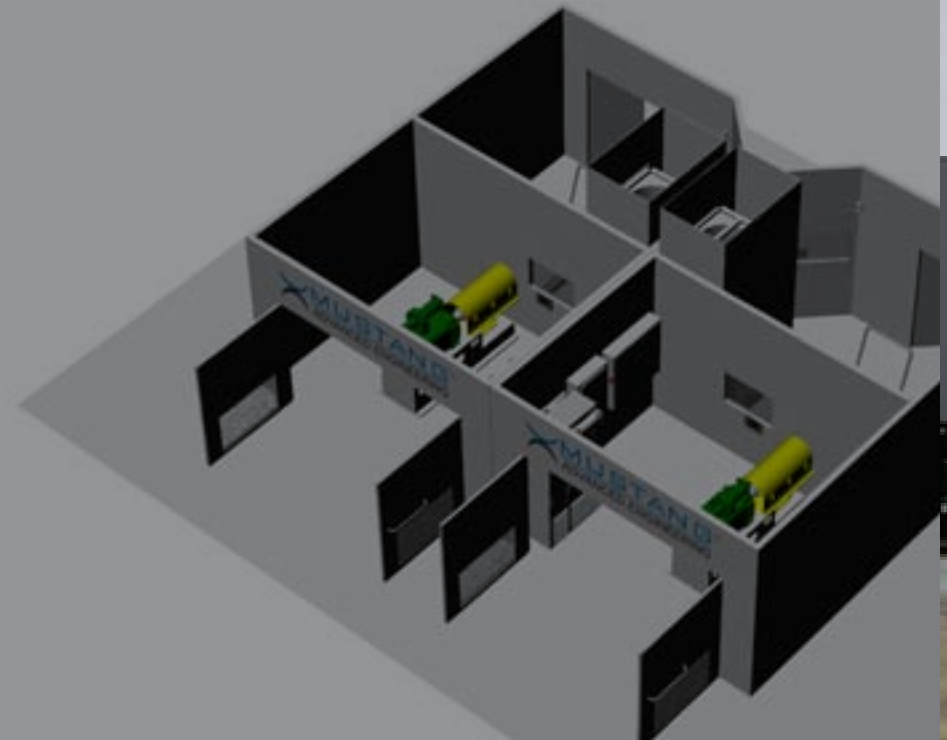
As the industry leader in tow dynamometer technology, MAE was the first company to offer a heavy-duty, Class 8, 5th-wheel-style tow dynamometer with auto-shift capability. MAE's auto-shift technology allows you to "shift on the fly"! With MAE's auto-shift, the operator does not have to stop the vehicle and tow dynamometer to shift gears in order to allow the tow dynamometers to achieve the next speed range.



Pre-Fabricated 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.





Pre-Fabricated Multi-Cell Test Facilities

For this project, MAE supplied all of the equipment, software and engineering requirements, including system design, manufacturing, start-up and training for a completely self-contained multi-cell engine and transmission laboratory facility. The laboratory was packaged into five individual containers. Once on site, the containers were bolted together and facility connections completed to create a completely self-contained portable laboratory.





Quality & Value



For over 30 years, creative thinking, strategic planning and capitalizing on opportunities have been the driving forces behind Mustang's tremendous growth and continued success. Since the very beginning, in 1975, Mustang has keenly focused on anticipating, identifying and following the key industrial market trends that shape its businesses. While predicting and reacting to constant changes in government regulations, safety and emissions standards, technological advancements and the ever-present demand for increased performance is not an easy business, it is precisely what has propelled Mustang to become a global leader in the development and delivery of today's most sophisticated dynamometer technologies and advanced engineering capabilities.

Starting from humble beginnings, Mustang has steadily grown over the years, adding capabilities and product lines year after year to get where it stands today – as one of the world's premiere manufacturers of automotive, industrial and aerospace testing and simulation systems and a leader in dynamometers and testing technologies.

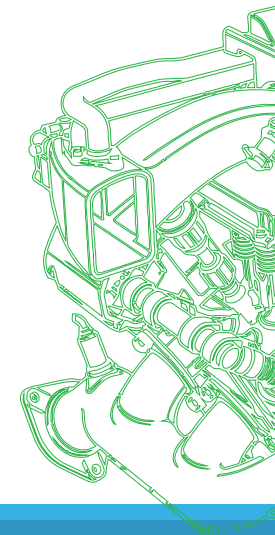
Much more than the typical dynamometer manufacturer, Mustang has slowly and steadily grown into a highly-diversified, technology-based engineering firm with world-class design, manufacturing, software and controls, and integration capabilities that position Mustang as a very unique supplier to the industry. In addition to a team of experienced software engineers, mechanical engineers, and electrical engineers who develop all of the company's products and systems in-house, Mustang's versatility and speed are its best strengths. A relatively small, privately-owned company, Mustang has the ability to react quickly to customer demands and the ever-present changes in market conditions.

Core to the Company's values are the principles of world-class quality and continuous improvement. At Mustang, our customers are our highest priority – we do everything in our power to satisfy our customers. Our entire organization understands that the customer comes first and nothing else is more important.



"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



advanced engineered testing solutions

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