

HUSCO
Automotive



**Leaders in Hydraulics,
Electro-Hydraulics, Electro-Magnetic
Actuation and Controls**

A Wide Range of Products and Applications



3-way directional valve used for cam profile switching.



Cylinder deactivation valve assembly mounted internally to the engine.



Gasoline Direct Injection (GDI) pump control valve featuring zero leak and response time of < 1msec.



Custom packaging and performance of solenoid valves used in advanced suspension systems.



Proportional flow control valves for engine cam phasing.



Zero leak and proportional control valves used in advanced suspensions.

At HUSCO Automotive, we engineer and manufacture custom products for OEMs worldwide. Our range of products include a wide spectrum of electro-hydraulic solenoid valves and solenoids that are used as actuators. We produce solenoid valves in both low and high pressure configurations ranging up to 7,000 psi (480 bar).



Production of individual products that exceed several million units annually.

We have experience with a wide range of flows and fluids including engine oil, damper fluid, power steering, ATE, gasoline and others. HUSCO valve products include on/off, proportional flow control and proportional pressure control valves. We offer combinations of these valves in manifolds with filtration for complete system solutions.



Solenoid assembly.

Advanced Suspension Technology

One application of this technology is the Mercedes S-Class, CL and SL Active Body Control System (ABC) where we supply a manifold with filtration and a combination of proportional 3-way and zero leak on/off valves.

Suspension was the initial automotive application at HUSCO. Since then, HUSCO has developed products for several advanced suspensions including regenerative, variable damping and active roll control systems.



Fully automated assembly line producing 2 million parts per year confirms a "passed" assembly with in-process part presence camera.

HUSCO Powertrain and Other Applications

To meet the increasing demands for improved fuel economy, increased performance and reduced emissions, we are a high volume producer of electro-hydraulic control valves used in powertrains and other applications including:

- Cam phasing
- Cylinder deactivation
- Cam profile switching
- Variable turbochargers
- Fuel delivery for direct injection
- Transmissions and other drive train applications
- Safety systems
- Steering

Solenoids used as actuators are another family of products that HUSCO provides for these applications. Our expertise in electro-magnetics allows us to provide optimal solutions for both on/off and proportional solenoids.



HUSCO products receive a functional test prior to shipment.

HUSCO

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**Registered Firm
Certificate FM 57785
ISO 9001
QS-9000**

Concept Through Production

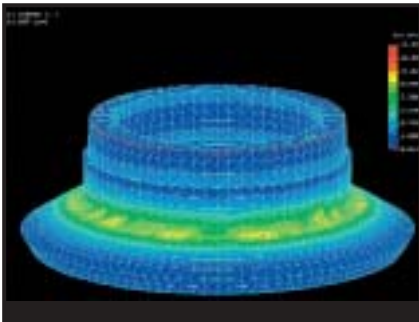
HUSCO is a company focused on providing cutting-edge technology and engineering expertise from product development through production. We are always looking for new applications where we can leverage our extensive design and manufacturing engineering expertise and resources to provide the best possible solutions.

Our modeling and simulation expertise provides initial insight into product performance capabilities and allows us to optimize designs for unique performance requirements. Using these tools, we are able to work closely with the customer on “what if” scenarios as they develop their systems.

For initial prototypes, our simulation capabilities allow us to reduce lead time and provide samples that meet performance requirements in the shortest possible time. Reducing lead times allows us to keep development costs to a minimum.

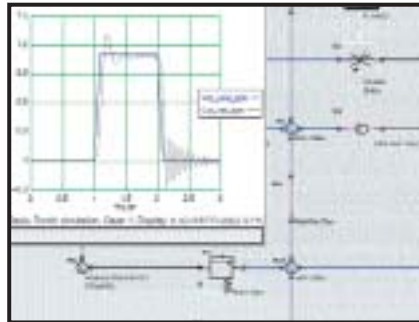
Our modeling capabilities, in conjunction with our test labs, allow us to develop and evaluate solutions that are robust and meet the increasing demands of this industry. Our on-site testing capabilities include a wide range of performance and durability stands, data acquisition equipment, contamination testing and environmental chambers.

STRUCTURAL FINITE ELEMENT ANALYSIS (FEA)



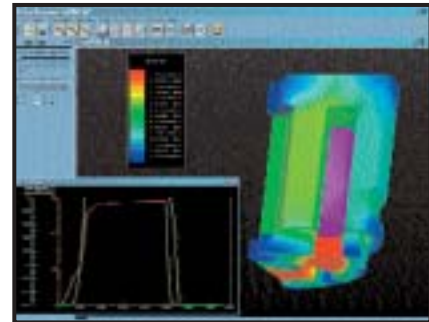
Both 2D and 3D structural analysis is used to predict static and dynamic loading in addition to any deformation due to forces, pressures and assembly processes.

DYNAMIC SYSTEM SIMULATION



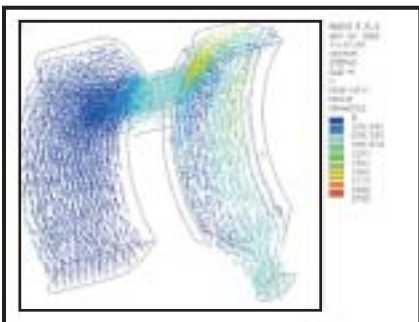
Dynamic simulation is used to verify performance, conduct sensitivity analysis, determine frequency response, analyze stability and evaluate “what if” scenarios. The simulation is a function of dynamic, hydraulic, thermal and electrical inputs. It can also be used to develop and test control algorithms.

MAGNETIC FINITE ELEMENT ANALYSIS (FEA)



To predict and optimize solenoid performance, 2D and 3D modeling is used. The analysis provides valuable information on eddy currents, temperature effects, frequency response, static forces and magnetic material effects.

COMPUTATIONAL FLUID DYNAMICS (CFD)



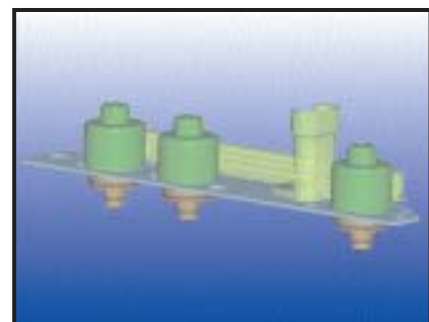
CFD is used to predict microscopic hydraulic behavior of components and systems including flow forces, pressure drops, flow rates and effective series restrictions. Used in both 2D and 3D, it allows us to validate analytical analysis and optimize designs.

MULTI-BODY DYNAMICS



Predicting 3D motion of multi-body systems and mechanisms, this software is used in conjunction with dynamic system models to evaluate the entire system performance. In complex systems, it replaces time-consuming analytical analysis techniques.

SOLID MODELING



Solid modeling is used for 3D spatial design and assembly. It also serves as a geometry generator for FEA, CFD and multi-body dynamic analysis.

Global Production



Automated wash line feeding multiple production cells.

HUSCO continues to expand its production facilities around the world. We are located in North America, Europe and the Pacific Rim. We also have partners in South America, Korea, Australia and Japan.

In addition to providing production on various continents, we also utilize these facilities as shipping points to provide our customers just-in-time delivery. Since these plants are fully staffed with supplier development resources, they have been focal points for global sourcing efforts which have made HUSCO globally competitive and less sensitive to exchange rate fluctuations.



High volume automated production processes.



HUSCO produces a variety of products in a wide range of production volumes.

Our production facilities mirror the unique requirements of specific product applications. Production methods are driven by a wide range of program annual quantities which vary from low volume to several million units annually.

Beyond maintaining the latest quality ISO and QS certifications, HUSCO begins the quality processes in the Advanced Product Planning phase. In production, HUSCO, a metrics driven company, monitors quality data to drive continuous improvement.

Manufacturing processes through final test are monitored and controlled on-line using automated testing and Statistical Process Control (SPC). We also maintain extensive quality labs for inspection and analysis.



The stereo microscope shown here is particularly useful in contamination testing to identify its origin.



Borescope being used for internal inspection of a manifold which HUSCO supplies with four valves and a filter as a complete assembly.



Quality technician using a Talyrond to precisely measure roundness, straightness and cylindricity at incoming inspection.



Regularly scheduled cleanliness testing performed in a clean room environment. Analysis for contamination size, weight and material are performed in-house.

HUSCO Operations

Founded in 1946, HUSCO International, Inc. is a company focused on highly engineered solutions using hydraulic and electro-magnetic actuation controls. In 1985, **Gus Ramirez**, HUSCO's Chairman and Chief Executive



HUSCO has worked with numerous advanced suspension programs including being the tier 1 supplier for the highly acclaimed Mercedes Active Body Control system.

Officer, led the management buyout of the HUSCO Division of AMCA International. Since the buyout, HUSCO has grown over 800% and is one of the largest minority owned companies in the United States.

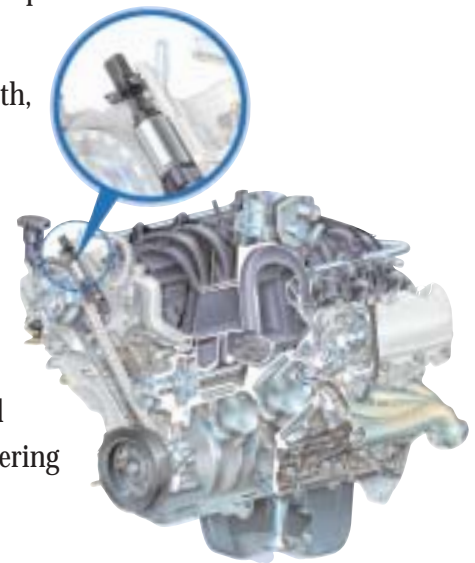
Today, HUSCO is composed of distinct divisions to service off-highway equipment

and automotive applications. Measured by the National Fluid Power Association, HUSCO is an industry leader in virtually all measures of productivity, quality, R&D, investment intensity, market share and growth. HUSCO engineering, sales, supply management and manufacturing resources are located around the world to service international customers which represent nearly half of HUSCO's sales.

In spite of its exceptional growth, HUSCO's uncompromising dedication to providing the highest value products and exceptional customer service has not changed. HUSCO continues to be a global manufacturer obsessed with offering superior engineering solutions cost effectively.



Cam phasing valves are just one of a wide variety of applications.



HUSCO is a high volume producer of solenoid valves used in a variety of engine applications such as providing the oil control valves for the cam phasing system used on the Ford 5.4 liter V8.



Gus Ramirez
Chairman and Chief Executive Officer