

Automated Actuator Inspection Device

ECE 480 Spring 2009 - Design Team 6

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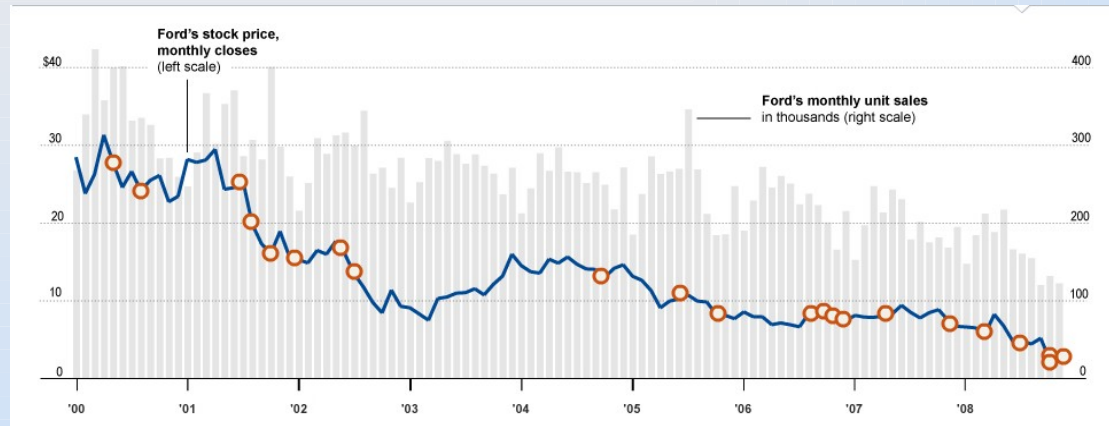
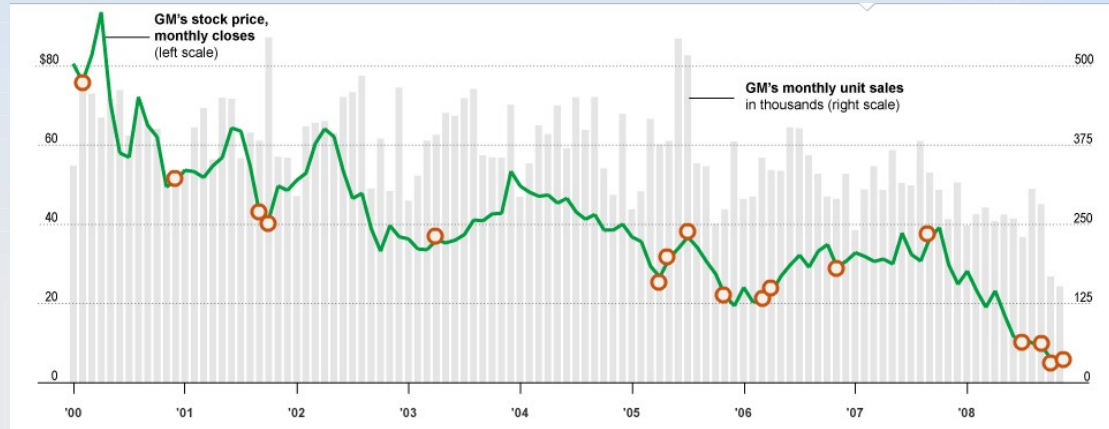
Facilitator: Dr. Virginia Ayres



Outline

- Current trends in the automobile industry (project motivation)
- About BorgWarner, Inc. (what they do)
- What our design team will accomplish (how we can help)
- Individual slides

Current Auto Trends



Current Auto Trends

- Rise in gas prices causes a loss in truck/SUV sales (main market of the Big Three).
- Foreign automobile quality perceived to be superior (by some).
- Global financial crisis and the “credit crunch” causes all vehicle sales to slide further.

Current Auto Trends

- Automakers need to make more efficient vehicles with fewer defects, now more than ever.
- GM spokeswoman Carolyn Marky regarding product defects: "... internal tools allow us to be more responsive to issues that are of concern..."
- Acting administrator of the U.S. NHTSA David Kelly: "...we're getting information earlier if there is a problem..."
- Between 2007 and 2008, recalls decreased by 30%, the lowest number since 1994.



BorgWarner, Inc.

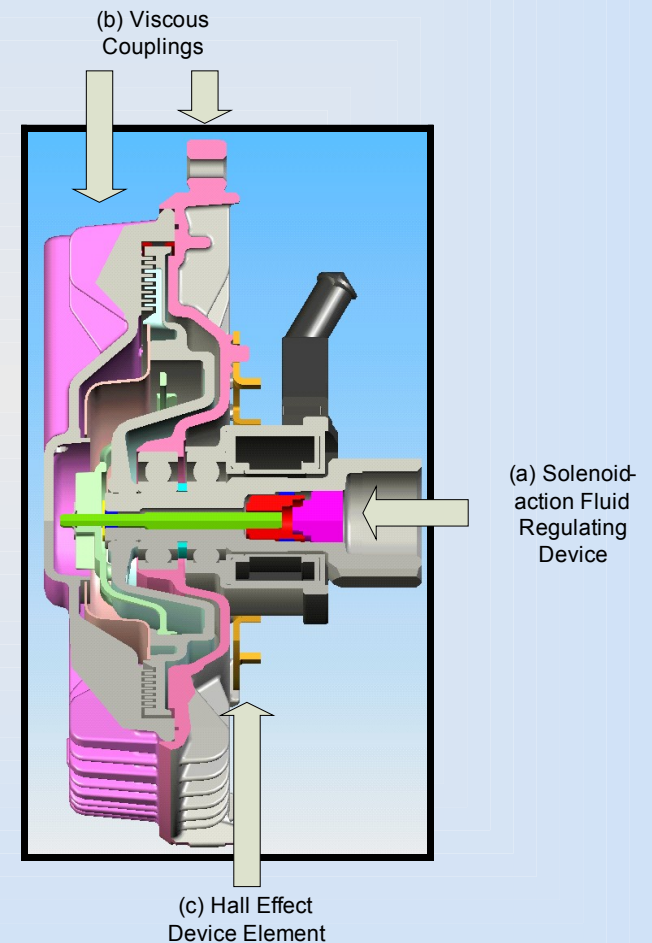
- Develops strategies and products to manage engines for fuel efficiency, reduced emissions and enhanced performance.
- Recognized leader in advanced products and technologies that satisfy customer needs.

	
Engine timing system Secondary air systems (SAS) -Fan drives- Turbochargers Fluid pumps	Clutches Solenoids/Valves Sensors FWD/AWD systems Synchronizers Friction products



BorgWarner, Inc.

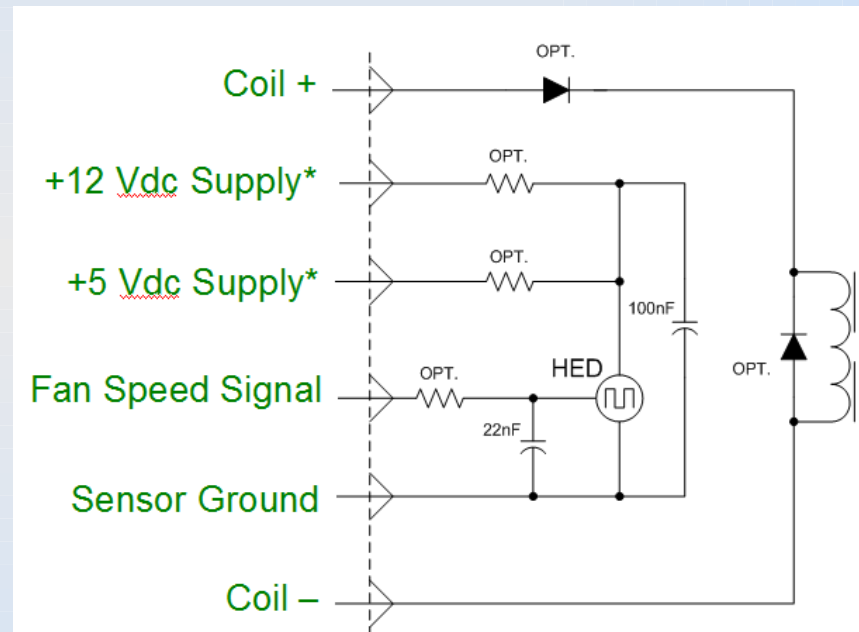
- Radiator cooling fan used to decrease temperature of engine coolant fluid
- When enabled, viscous fluid is released into couplings, solidifies under heat
- Couplings connect engine drive to radiator fan, begins cooling process





BorgWarner, Inc.

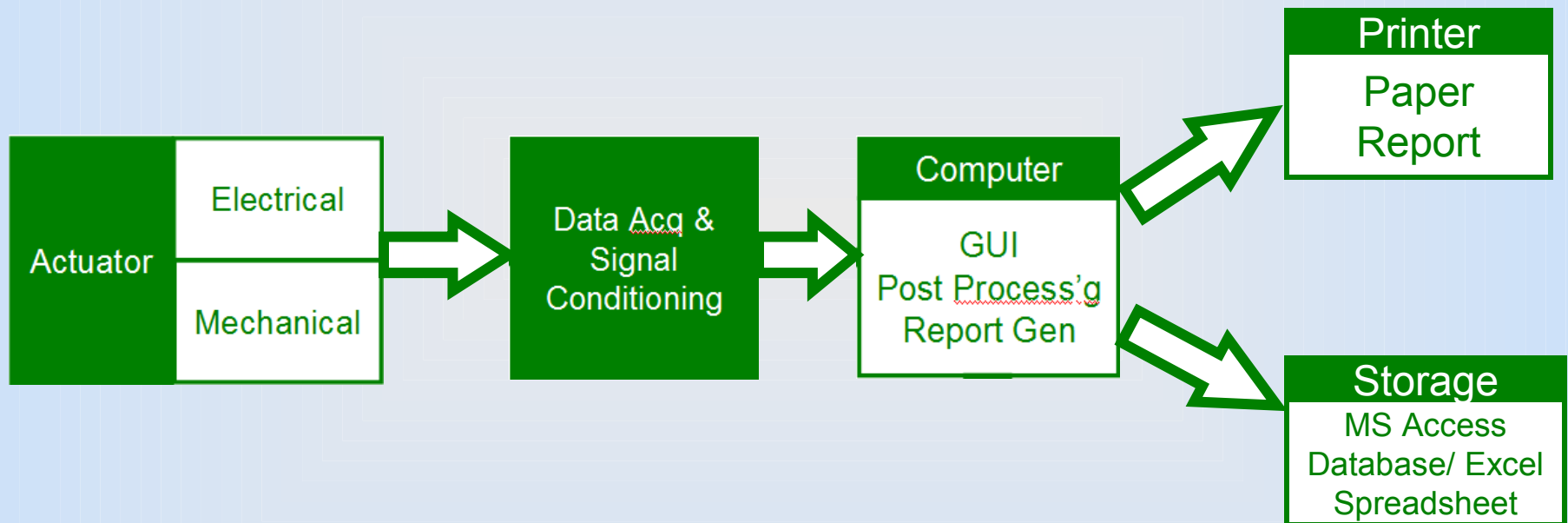
- In Fall 2007, Design Team 9 worked with BW to create an electronic fan clutch actuator.
- New design provides more accurate temperature readings and faster cooling system response.



Team 6: Moving on to Inspection

- Challenge to improve on old design
- Work with BW to create an automated inspection device for the electronic actuator.
- Tests have to measure current, voltage, capacitance, and resistance
- Why? Faster prototype builds, faster inspection/diagnosis, and improved statistics

Team 6 Will Build Automated Inspection Device



Team 6: Joshua

Power Generation

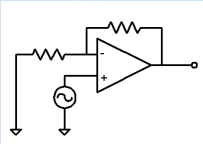
- Power for preconditioning circuits and measurement displays
- Rotating base powered by drill motor
- Research and develop a method for testing actuator under high voltage conditions



Team 6: Codie

Signal Conditioning

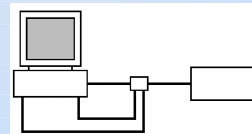
- Design of circuits to convert capacitance/resistance values into analog signals useable by the DAQ module
- Condition and scale all signals sent to the module to fall within its limits
- Use module digital output signals to switch on/off the separate conditioning circuits



Team 6: Jacob

PC Interfacing

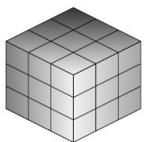
- LabVIEW takes input from DAQ module, scales as needed
- Performs waveform analysis to calculate voltage, capacitance, etc.
- Uses ActiveX to interface with MS Office
 - Generates Excel report, sends to printer for hard copy
 - Stores data in Access database for archive/comparison purposes



Team 6: Stephen

Fan Housing/Physical Design

- Integration of all components into a single meter box
 - Level for each component
- Mechanics of the fan auto-rotate function that uses a drill motor
- Implementation of safety features on the rotating enclosure
- Temperature sensor for reading fan temperature



Benefits to BorgWarner and the Auto Industry

- Smaller, more portable and user-friendly (GUI)
- Expandable design for future tests (Gen-III actuators)
- Faster, more reliable data acquisition
- Faster device inspection/diagnosis
- Utilizes a database rather than paper for data storage
- Statistics easily created from a selectable set of tests (future enhancement now possible using database)

Questions?



BorgWarner Trophy, presented to the winner of the Indianapolis 500