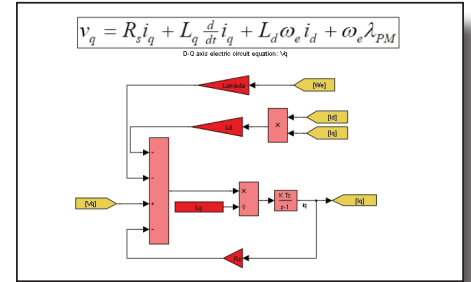


A key factor contributing to the success of modern driveline systems is the ability of the control system to maximize the potential of the system. We achieve this by applying the knowledge gained in the development of the physical system directly into the modeling and calibration of our control software.



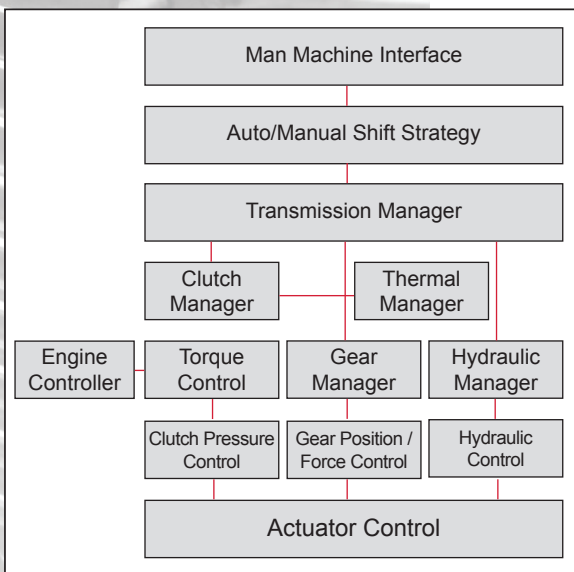
Model Based Design

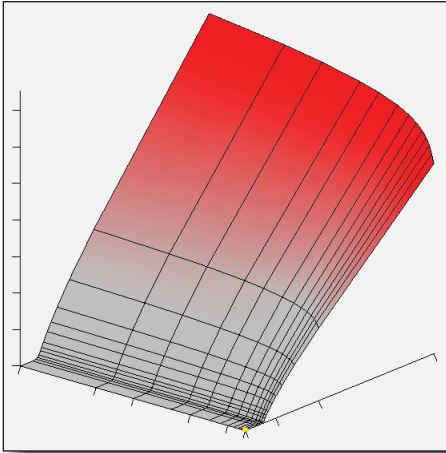
Our design and development activities are based on system-wide integration of knowledge from the areas of mechanics, hydraulics, electronics, and control software throughout the life cycle of the product development.

TREMEC offers a wide range of software solutions as an integrated part of a complete torque transfer system, or as a separate service for specific customer requirements. An overview of these solutions include:

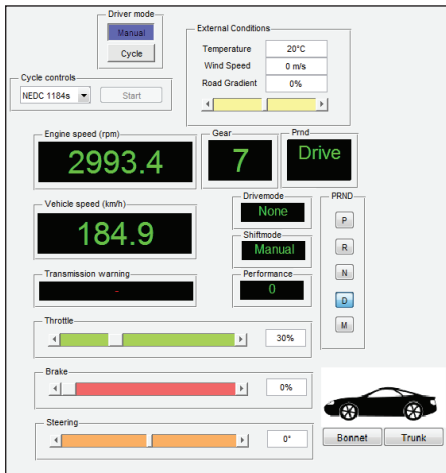
Software Capabilities and Expertise

- Low Level and Base Software
- Complete AMT/DCT Application Software
 - Driver interface and mode selection
 - Automatic shift strategy
 - Clutch and gear management
 - Sporty and comfortable shifts
 - Performance optimized launch
 - Integrated engine and clutch control
 - Reactive and predictive thermal management
 - Fast and accurate torque control
 - Model-based pressure control
 - Fast and smooth synchronizer control
 - Hydraulic pump and system pressure control
 - Adaptive routines
- Software Solutions for Powertrain Systems
 - Powerpacks (e.g. with BLDC motor)
 - Auxiliary drive units
 - Differentials
 - Hybrid modules
- Software Modules for Components
 - Clutch torque control
 - Clutch thermal control

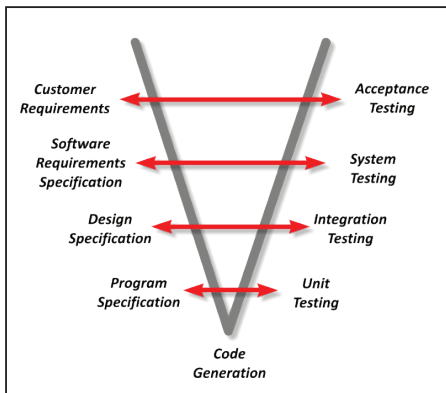




3D Calibration Map



Vehicle Simulation Interface



V-Cycle

Software Integration Activities

- Integration of customer and TREMEC software components
- Integration of third party software modules

Software Calibration

- Calibration of low and mid-level software components
 - Pressure control
 - Clutch filling
 - Gear force and position control
 - And more
- Calibration of high level software components
 - Different launch modes
 - Comfort and sporty shifting
 - Automatic shift strategy

Simulation Capabilities and Expertise

- Our simulation expertise covers:
 - High fidelity component simulations
 - Used in early stages of hardware design
 - Simulation of complete systems
 - Optimized system behavior
 - Vehicle plant modeling
 - Validation of application software

Software Methodology and Tooling

- Compliant to IEC 61508
- Compliant to ISO 26262
- AUTOSAR compliant
- dSpace Systemdesk software integration
- Matlab Simulink development environment
- dSpace TargetLink auto code generator
- MIL-SIL-PIL-HIL testing
- CCP/XCP measurement and calibration tooling