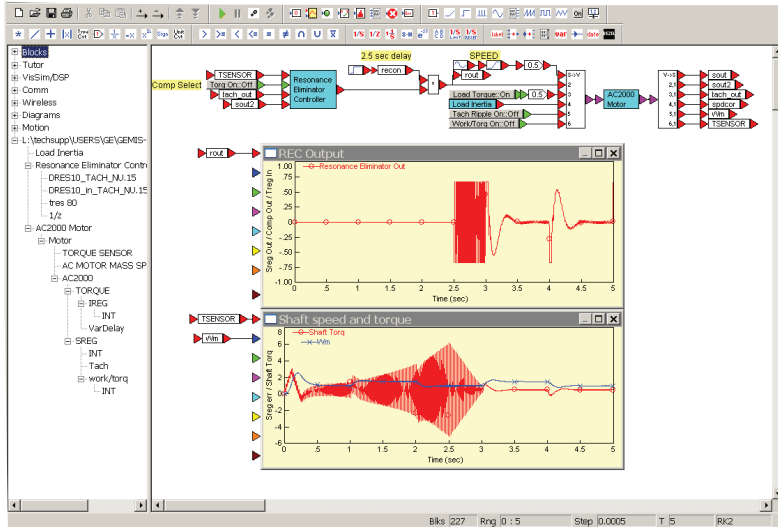# General Electric Motor and Drive Systems Division

Test and Implement REC Controller with Embed SE

ALTAIR Embed

Embed model of GE industrial drive system with REC. The upper plot shows the amount of correction applied to the motor torque. The lower plot shows the drive torque and speed. Resonance eliminator is turned on at 2.5s.

"[Using Embed SE, I could focus exclusively on proving the viability of the design.] If incorrectly designed and not thoroughly tested, it can cause motor, shaft, and coupling failure, resulting in a process outage costing millions of dollars."

Emil Kuelz
System Engineer
GEMIS

The Motor and Drive Systems Division of General Electric (GEMIS), based out of Salem, Virginia, is one of the largest manufacturers of electrical drive systems worldwide. Using Embed SE (formerly called VisSim), engineers recently completed prototyping a Resonance Eliminator Controller (REC) for industrial drive systems used in metal rolling applications. The goal of the controller, according to Emil Kuelz and Sandy Gurian, system engineers for GEMIS, is to reduce resonance vibrations in the shafts and rolls of the mechanical system. Kuelz and Gurian modeled the motor and mechanical system in Embed SE, and then incorporated the REC into the model. The REC computes a motor torque correction signal from shaft torque measurement, which in turn is applied to the mechanical system at a specific resonant frequency.

Initial Design and Testing

To test the design, Kuelz and Gurian used two PCs, each running Embed SE. One PC contained the motor and mechanical system simulation; the other, the REC. Embed SE's A-D/D-A real-time interface allowed the two models to exchange information. This configuration verified that controller performance would not be degraded by either time delays introduced by the A-D/D-A conversions or the precision of the 12-bit DAC. "The simulation results assured us that the REC would function properly when attached to the actual motor and mechanical system," said Kuelz.

INDUSTRY
Electrical Drive Systems

CHALLENGE
Prototype a Resonance Eliminator Controller (REC) for industrial drive systems in metal rolling applications

SOLUTION
Use Embed SE to implement the motor and mechanical system simulation, and communicate with the REC on a separate computer through an A-D/D-A real-time interface

BENEFITS
- Controller performance flaws detected in the simulation are less costly to correct
- Tuned controllers result in reduction of wasted stock and product defects

After verification, Kuelz and Gurian disconnected the PC with the REC from the PC with the motor and mechanical system simulation, and reconnected it to the real motor and mechanical system in GEMIS's in-house laboratory. The first time the REC was turned ON, it totally eliminated the mechanical system resonance.

Robust Software

By developing and testing the REC in Embed SE, Kuelz and Gurian focused exclusively on proving the viability of the design. "The risks of connecting an unproved design to a large horse power electrical drive and mechanical system are great," said Kuelz. "If incorrectly designed and not thoroughly tested, it can cause motor, shaft, and coupling failure, resulting in a process outage costing millions of dollars."
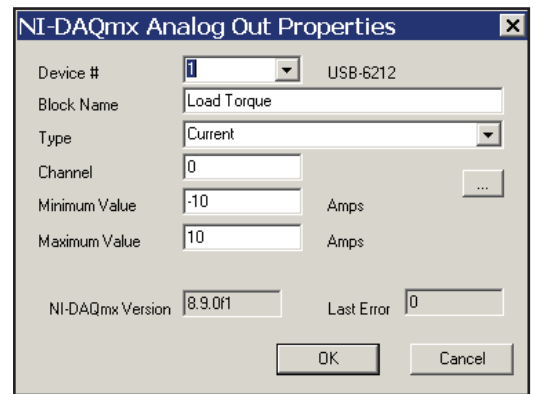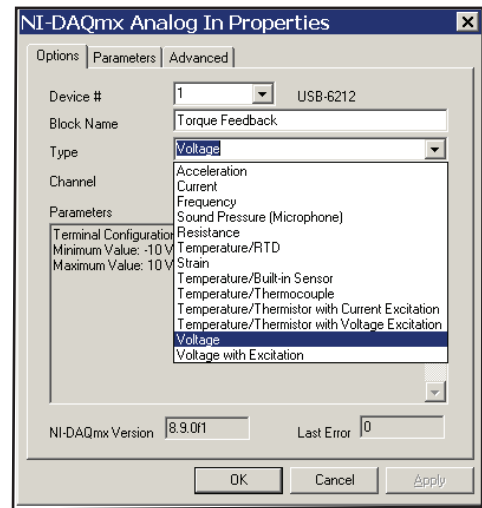
Real-time I/O cards and data channels can be configured directly from Embed SE via intuitive dialog boxes (shown above). These dialog boxes provide an interface to National Instruments and Measurement Computing boards.