KOLLMORGEN

Because Motion Matters™

Model Based Design

Bill West, Global Application Engineering Director
Kollmorgen
540-633-3545
support@kollmorgen.com
www.kollmorgen.com

Mechatronics is the marriage of the mechanical, electrical, software and systems engineering disciplines into one complete system solution. Modeling is a fundamental component of mechatronics. The purpose of model-based simulation is to evaluate a design quickly and cost effectively, so to be effective, useful and not a waste of time, the model must accurately represent the actual system.

Model-based designed provides the motion system designer an innovative and cost effective methodology for motion control system design. Viewed from the top down, performance requirements for the motion system are specified and driven by the process or performance that the machinery has to achieve. A systems-based design approach requires the subsystem design start and stop at the same time, such that subsystem interactions can be optimized to ensure optimum system performance.

Model-based design allows various system solutions to be evaluated, without the time consuming and often costly investment in system prototyping. If a machine design can be narrowed down to two or three legitimate ideas before metal is cut, software is written and printed circuit boards are designed, the chances of keeping a project on schedule and under budget are significantly increased.

Sample requirements that can be evaluated with today's simulation and modeling tools:

- Settling time and velocity regulation
- In multi axis systems - the interaction of and coordination of the individual axes
- In an industrial robot application – the precise coordination of multiple axes to move the robot is a simple straight line
- In a typical master slave geared application - determining whether electronic gearing or mechanical gearing should be used

Accurate modeling allows the systems designer to select components that will best support the application. For example, model-based design allows the design engineer to quickly and cost-effectively determine the optimum motor frame size, rotor inertia or required velocity loop bandwidth to meet performance requirements.

Model-based design is a powerful tool, provided it is used properly. To maximize its effectiveness, system designers should:

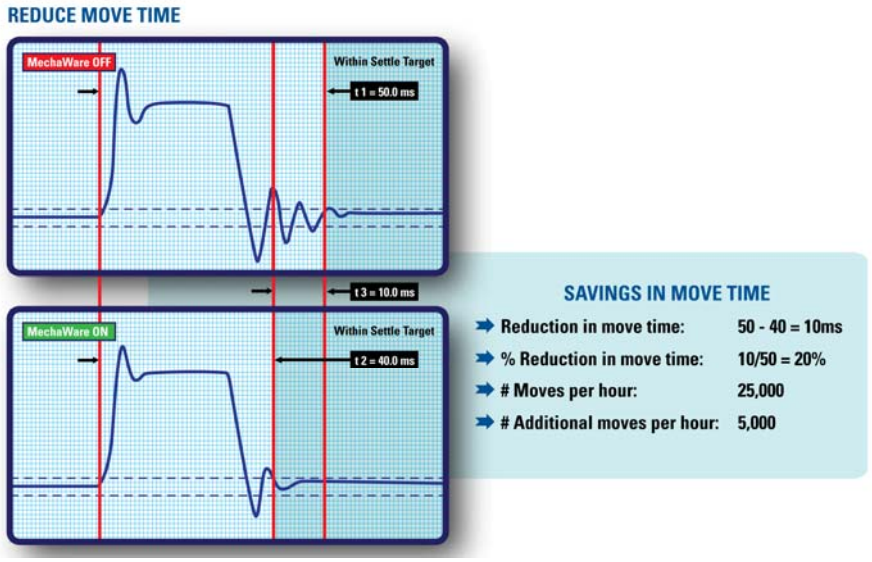
- Incorporate model-based design from the beginning of the project
- Understand the expectations and limitations of the modeling process
- Be sure to precisely match model performance parameters and requirements with system performance parameters and requirements

Today's project managers are faced with reduced budgets, smaller resources pools and shrinking time lines, so making the most limited resources is key. Systems modeling can highlight strengths and weakness of each specific subsystem. This provides insight into what needs to be redesigned and what does NOT need to be redesigned in order to meet performance requirements.

The systems designer who understands the power of modeling, and perhaps more importantly, its limitations, will have a competitive advantage over one who does not. The designer needs to understand specifically where the model is accurate and where it is not. System models vary in complexity. When a model is created the designer has to have a clear understanding of what features they will be modeling. Making a model more complex than required can be both costly and time consuming, with little or no benefit.

The iterative process of modeling and measuring must be followed until the outputs of model and system match on the parameters of interest. The performance of the model must always be monitored and compared to the actual mechanical system, and if the results do not correlate either the system or the model must be changed in pursuit of a match. In most cases the model changes, but often an assumption or simplification in the model will lead to a design enhancement in the actual system.

Design tools such as MechaWare™ are available which enable designers to include modeling and simulation in their standard work, Additionally, simulation software now includes embedded code generators for software development, while standard mechanical CAD programs provide the ability to export designs to the modeling and simulation software.



ABOUT KOLLMORGEN

Kollmorgen is a leading provider of motion systems and components for machine builders around the globe, with over 70 years of motion control design and application expertise.

Through world-class knowledge in motion, industry-leading quality and deep expertise in linking and integrating standard and custom products, Kollmorgen delivers breakthrough solutions unmatched in performance, reliability and ease-of-use, giving machine builders an irrefutable marketplace advantage.

For more information visit www.kollmorgen.com, email support@kollmorgen.com or call 1-540-633-3545.