

A Matter of Survival

Simulation and statistical methods help manufacturers achieve high product quality now essential in competing on the world market.



Products designed using sound principles often fail once they are built and in use. That's one of the frustrating puzzles of engineering: defective products based on designs that passed quality checks, engineering analysis and prototype testing with flying colors. In many cases, such failures are caused by the unforeseen interaction of multiple variables in production, materials, shipping and customer use — and manufacturers pay a steep price for these failures.

The key to evaluating these kinds of interactions is an approach called Design of Experiments (DOE), in which numerous random analyses are run on different combinations of changing variables. Probabilistic and statistical methods compare all the different results and study the sensitivity of product behavior to these variations. The tools are at the heart of Design for Six Sigma (DFSS) methods in arriving at optimal near-defect-free “robust” designs that work properly — even in the face of wide variations of product parameters.

For years, teams of statisticians, analysts, designers and experts have had to spend months plowing through thousands of simulations and mountains of data for such studies. Consequently, the DOE approaches were used

mostly by large companies with hefty resources. The emergence of specialized technology such as ANSYS DesignXplorer software changed all this with automated features for quickly and easily performing many of these repetitive tasks, often completing projects involving 10,000 or more parametric analyses in a matter of hours. These capabilities enable design engineers to apply the same Six Sigma quality principles that, for years, have been such an important focus in manufacturing operations and a topic of strong interest among the ranks of corporate management.

Functionality for such processes is outlined in Pierre Thieffry's article “Parametric Design Analysis for Evaluating a Range of Variables,” which describes tools for assessing the influence of all relative parameters on design objectives and system performance.

The ramifications are profound and potentially far-reaching for a broad range of manufacturing companies, including mid-sized and even small job shops, where engineers can use these methods to achieve high product quality — which is not a luxury anymore but increasingly a matter of survival in the competitive world market. ■

John Krouse, Senior Editor and Industry Analyst

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About the Cover

Appliance manufacturers are increasingly turning to simulation to gain a competitive edge. Whirlpool Corporation describes how refrigerator cabinets can be optimized on page 11.
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