

Do it Right the First Time

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As the manufacturing industry has evolved, so have the solutions and processes needed to [*Do It Right the First Time*](#) [1] when it comes to quality.

Dimensional engineering and simulation-based quality management tools and processes are some of the most effective advances that can help meet this goal. They are replacing the need for physical prototypes as a speedier, less costly, and more accurate method to check if a part or assembly meets its dimensional quality goals.

How the Process Works

Suppliers and OEMs use dimensional engineering in a virtual simulation environment to view how assemblies fit together, and then adjust tolerances or properties to better achieve cost and quality goals. For example, they can use visual simulation to identify flush and gap misalignments, part interference, hole-winking and more. There is no other way engineers could predict these problems, as they cannot be seen in standard CAD/CAM views or physical prototypes.

At the beginning of a closed-loop quality management process, engineers identify key points within a design that they want to control closely. For example, key points typically exist where a door fits to a body or a hood interfaces with a headlamp or fender. All parties involved focus on holding these points precisely as the design moves into manufacturing.

Dimensional quality data reports are generated as the product enters preproduction and initial runs begin. Engineers refer to reports and check key points to ensure that measurement plans are followed and that end-products achieve the quality targets expected. The results enable them to quickly conduct root-cause analyses of quality issues as they arise. If end-products are not achieving the quality expected, engineers can “loop back” to find out where problems originated and initiate corrective actions — avoiding the need to chase problems through their build process by trial and error.

Why Today’s Manufacturers Need it

A closed-loop quality management process can predict and show through virtual simulation the variation of hundreds of features with corresponding measurement points in the design stage. But these vast amounts of data would be too cumbersome to interpret and analyze.

In today’s highly automated manufacturing environment, the number of points engineers actually have the time to check must be limited in order to meet their tight cycle-time requirements and measurement cell/tooling budget restrictions. When measurements of key points are taken through automated in-line inspection devices, the numbers of points that can be checked at each manufacturing cell are far fewer than the limits often applied in manual processes.

To meet the constraints of these ever-increasing cycle times, many engineers use technology features that compare the hundreds of focal features identified through core functions, then further sort them to identify those that have the most influence on overall product quality.

Time Savings

America’s premium truck manufacturer, Peterbilt, can speak to the value of a dimensional engineering approach to closed-loop quality management. The company has been using this approach to manage dimensional quality throughout the design process for many years. As it moves more heavily into inline automated processes, it is extending this approach more fully into the production environment to meet its shorter cycle times. They have been able to identify the key points that most affect their products’ fit, function and finish — even as the allowable number of points is reduced.

Cost Savings

Edag, a mobility design and engineering company, stated during a tolerance analysis workshop that the closed-loop approach to quality management is one of the most effective methods to reduce so-called Product Life Cycle Costs (PLCC).”

Edag engineers and quality professionals noted that, if they had *not* applied this process across their programs, their PLCC could easily increase to ten times the cost of following such a process — as a result of costly scrap, downtime and rework.

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In Summary

Those who use a dimensional engineering approach to closed-loop quality management have seen the value it has brought their bottom lines. It is clear to them that the approach enables product, manufacturing and quality engineers to *Do it Right the First Time*.

Greg Medler, Chrysler's Tolerance Analysis Manager has summed it up well: "Chrysler has realized significant cost savings.... We've applied tolerance analysis in the early design stages of our programs in order to identify potential build issues early in the product lifecycle. This has enabled us to reduce physical prototypes, minimize costly gage and tooling changes and avoid quality issues during production."

For more information, please visit www.dimensionalcontrol.com [2].

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[1] <http://www.pddnet.com/news-dcs-executive-to-share-quality-expertise-041212/>

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