SIEMENS

Siemens PLM Software

Tecnomatix Variation Analysis (VSA) in the medical devices industry

Predict performance, validate compliance and reduce time-to-market

Benefits

- Increase production and reduce time-to-market
- Reduce the cost of manufacturing
- Reduce the risk of product recalls
- Reduce the need for engineering changes
- Satisfy regulatory compliance requirements with full and complete traceability
- Validate design with real-world production data
- Ensure the high quality of your products

Summary

Tecnomatix® Variation Analysis software is a powerful tolerance analysis tool that simulates the effects of assembly processes and product tolerances to predict and understand the sources of variation. The Variation Analysis solution provides upfront design-side corrective actions, eliminating expensive errors in product design and dramatically reducing time-to-market.

In the marketplace of highly regulated industries, medical devices share a common denominator across product development, design and production...failure is not an option. Critical requirements are validated, documented and tracked, increasing the time it takes to bring these products to market. As a result, manufacturers place a high value on solutions that improve product quality and efficiency, reduce failure rates and improve time-to-market.

The Variation Analysis solution from Siemens PLM Software provides the medical devices industry with a competitive advantage through a CAD-neutral solution that simulates and predicts the key contributors to variation, uncovering costly errors well before production. In addition, manufacturing costs can be reduced by maximizing allowable part tolerances, while still controlling critical assembly specifications. Controlling these dimensional characteristics helps improve yield rates and minimize warranty defects. Using Variation Analysis enables you to derive significant improvement for the products your company creates and produces.

Predict build quality before it becomes a costly mistake

With Variation Analysis, a 3D representation of product geometry, tolerances, assembly processes and tooling can predict if problems exist well before physical

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Features

- Add-on to Teamcenter software's lifecycle visualization mockup solution – visualize assemblies regardless of size and run analysis on data from multiple CAD systems simultaneously – all in one standard interface
- Perform comprehensive statistical or simulated worst-case dimensional analyses
- Identify tolerances and assembly processes that contribute to variation and perform quick "what-if" analyses to optimize tolerances, design and the assembly processes
- Leaverage feature fabrication and variation based on geometric dimensioning and tolerancing (GD&T)
- Leaverage powerful ConJoin assembly solver for comprehension of over- and under-constrained assembly processes
- Incorporate component flexibility through linking with finite element analysis results
- Leaverage a variety of graphical reports tied to 3D geometry for an individual measurement or a group of measurements
- Manage model and results in Teamcenter
- Represent tolerances with different types of statistical distributions

prototypes or expensive tooling investments are made. Knowing which contributing factors have the biggest impact allows the optimization of design, tolerance and assembly processes very early in the product development process.

Identify and track critical dimensions for regulatory compliance

Engineering and manufacturing teams have distinct yet intricately connected roles throughout the regulatory compliance process. The most critical aspect requires the entire process to be transparent and tracked throughout the product's entire lifecycle.

Variation Analysis fully documents all dimensional variation contributors in the design and manufacturing process.

Standardize on best practices across the enterprise

The medical device product lifecycle exists with a tight integration to compliance submittal and approval processes. Each step has a specific purpose that exists to satisfy these processes. When companies identify best practices to complete these steps more efficiently, they need to document and incorporate them across the entire enterprise.

Features *(continued)*

- Extend the analysis to support user-defined equations such as gear backlash, pressure and imbalance etc. that are required for many applications
- Capture knowledge and re-use models; morph features to new geometry
- Add actual manufacturing capability data into Tecnomatix Variation Analysis for real-time root cause analysis of production build problems
- Create comprehensive tolerance libraries that can be used to represent manufacturing processes from any industry
- Substitute design intent quantities with real-world measurement data

Our solution is built on an open architecture; it provides a platform for multi-CAD integration, common process documentation formats and integration to virtually any product lifecycle management solution. This allows companies to easily integrate this solution into their existing landscape and effectively propagate and re-use intellectual property across the enterprise.

Technical solution overview

Teamcenter lifecycle visualization

Teamcenter® software's CAD-neutral, lightweight lifecycle visualization environment allows the geometry from multiple sources to be included in the analysis. In addition, this enables the analysis of large or small assemblies and leverages many of the digital mockup capabilities, such as cross section, 3D clearance, markup and measure.

Geometric tolerancing capability

Tecnomatix Variation Analysis supports feature-based modeling with the features varied based on the geometric dimensioning and tolerancing (GD&T). Key tolerancing aspects supported include maximum material condition, composite position and profile, multiple datum reference frames, unilateral/unequal bilateral surface profile.

ConJoin assembly constraint engine

ConJoin is an equation-based, generic assembly solver for over- and under-constrained static and kinematic assembly constraints using a single common user interface.

Flexible component capability

Through integrating with many FEA solvers, Tecnomatix Variation Analysis is able to comprehend component flexibility due to clamping, fastening and springback.

The competitive advantage

The Variation Analysis solution easily integrates with other dimensional analysis solutions on the market:

- Works in a CAD-neutral, graphically rich digital prototyping environment
- Is feature-based using tolerances based on GD&T
- Supports over- and under-constrained static and kinematic assembly operations
- Links to FEA solvers for comprehension of component flexibility

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