DRIVING WORLDWIDE BUSINESS EXCELLENCE

Tolerance Stack-Up Analysis

Training Duration : 2 days

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Seminar Content

This two days Course participants will be trained to apply tolerance stack-up analysis techniques to a wide variety of assemblies per GD&T requirements of ASME Y14.5 - 2009, from the very simple to the more complex situations commonly faced in industry today. Both plus and minus and geometrically toleranced assemblies will be examined and stack-up analysis taught and practiced on each. Many different datum structures will be discussed and analyzed. The concepts taught in this course are: loop analysis (also known as circuit diagrams), number charting, virtual condition, resultant condition, inner and outer boundaries, minimum airspace, maximum wall thickness, maximum interference, minimum and maximum overall dimensions, fixed and floating fastener assembly conditions, projected tolerance zones, the logic of stack-up analysis, statistical tolerancing , and much more.

Who Should Attend

Design Engineer, Product Engineer, Quality and Technical Staff

Recommended Training and/or Experience

Combined abundant case studies as well as provided cases from the trainee, explain in details of the content of Tolerance of Stacking Analysis with GD&T application.

Prerequisites

- Basic GD&T knowledge. This course is directed to anyone with the professional responsibility of analyzing or applying tolerances to assemblies, or anyone seeking a more thorough understanding of tolerance analysis. Attendees should have a basic working knowledge of ASME Y14.5. A knowledge of GD&T principles is required to allow all participants to be successful in learning the techniques of tolerance stack-up analysis.
- Each course participant needs to bring a hand-held calculator

Seminar Material

Omnex Training Material with case studies as well as exercises.

Seminar Goals

- Calculate minimum and maximum wall thickness, airspaces and interferences for assemblies
- Create loop analysis/circuit diagrams for tolerance stack-up analysis for both plus and minus toleranced dimensions and geometric tolerances
- Create both simple and complex number charts for stack-up analysis using a variety of geometric tolerances, basic dimensions, resultant conditions, virtual conditions and plus and minus toleranced dimensions
- Do tolerance stack-up analysis for floating fastener situations for clearance holes, screws and shafts
- Do tolerance stack-up analysis for fixed fastener situations using screws, clearance holes, slots, tabs, overall dimensions and projected tolerance zones for threaded holes
- Calculate minimum and maximum gaps for assemblies that use a variety of datum structures
- Learn a system of logic and mathematics to analyze tolerances
- Calculate the effects of angular stack-up using trigonometry and proportions
- Calculate statistical tolerances using a variety of methods and learn how to re-integrate these tolerances back into the assembly's details
- Understand the requirements of GD&T, reduce the lead time of design, reduce the engineering change, improve the design quality
- Learn how to apply GD&T to understand the design purpose of the customer, improve the reliability of product design and process design
- Emphasize the understanding principles of verifying GD&T
- Learn the concept of MMC, LMC and RFS
- Use GD&T to improve the dimension verification and inspection, understand the ASME Y14.5-2009 requirements, such as geometric tolerance, symbols, terms, rules and application

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Seminar Outline

- The basics
- Stack-up analysis of an eleven part assembly using plus and minus tolerancing
- Vertical vs. Horizontal loop analyses for features of size
- Assemblies with plus and minus tolerances
- Floating fastener five part assembly analysis
- Fixed fastener assemblies
- A rail assembly
- Ingle-part analysis
- Five part rotating assembly analysis
- Trigonometry and proportions in tolerance stack-up analysis
- The theory of statistical probability

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