



Tolerance Stack Analysis

COURSE DESCRIPTION

Tolerance Analysis is an information packed course that will provide participants with the analytical tools needed to:

- Set up a tolerance problem
- Determine the 100% tolerance stack-up in an assembly
- Analyze fixed and floating fastener assemblies
- Use statistical tolerancing

SUGGESTED PARTICIPANTS

- Mechanical Engineers
- Design Engineers
- Manufacturing Engineers
- Anyone who is required to determine assembly tolerances.

Course Outline

A. Introduction

I. The Basics

1. Identify factors pertinent to stack-up analysis
2. Designate positive and negative routes
3. Position each part for a worst-case analysis
4. Calculate mean dimensions and equal bilateral tolerances
5. Calculate virtual and resultant condition boundaries

II. Box Assembly

1. Apply basic stack-up analysis to a box assembly
2. Draw loop analysis diagram for the box assembly
3. Designate positive and negative routes
4. Calculate mean dimensions and equal bilateral tolerances
5. Calculate MAX and MIN GAP

III. Tolerance Stack-Up Analysis for Feature of Size

1. Perform a loop analysis
2. Determine the start and end points
3. Graph values on a loop diagram

IV. Tolerance Stack-Up Analysis for Assemblies with Plus and Minus Tolerancing

1. Calculate airspaces and interferences
2. Alternative method of Analysis

V. Tolerance Stack-Up Analysis for a Floating Fastener Assembly

1. Calculate resultant and virtual conditions
2. Convert all dimensions to equal bilateral tolerances
3. Mix widths and diameters in a numbers chart
4. Graph the numbers into a tolerance stack-up diagram
5. Determine all unknown gaps in a five-part assembly

VI. Tolerance Stack-Up Analysis for a Fixed Fastener Assembly

1. Calculate overall housing requirements
2. Calculate MIN and MAX GAPS within the assembly

XI. The Theory of Statistical Probability

1. Convert an arithmetical to a statistical tolerance
2. Use the Root Sum Squares (RSS) formula
3. Determine the tolerance statistically likely to be consumed
4. Compare the statistical tolerance to the arithmetical tolerance
5. Calculate the percentage each tolerance may be increased
6. Use a correction factor as a multiplier
7. Reintegrate the Statistical Tolerance into the assembly