Simulation Day Agenda:

8:30 – Registration and Coffee

9:00
Computer Aided Innovation Tools

This presentation will describe and demonstrate a practical set of computer aided innovation CAI tools that assist engineers and manufacturers in increasing their innovation skills. Tools that use the "Theory of Inventive Problem Solving" (TRIZ) to generate innovative ideas for the most difficult engineering and manufacturing challenges will be presented. A Mechanism Synthesis tool that generates in seconds several concept mechanisms that follow a given path while its supports remain within a given domain will be demonstrated. Interactive Multi-Physics Topology Optimization tools that generate the optimum topology / shape of a component for a given structural, thermal or fluid requirement will be presented. Tools that generate Programmable Materials (meta-materials with predefined properties) will also be discussed.

10:00
Design Optimization Process for 3D Printed Designs

Additive Layer Manufacturing (ALM) also known as 3D Printing is the forthcoming advanced manufacturing technique. In this fabrication process the shape complexity is free. An overview of ALM techniques with several examples will be presented. The enormous potential of light weight designs and the barriers of commercialization will be discussed. A work flow that utilizes topology optimization, sub divisional surface modeling, lattice structure features and Behavioral Modeling will be presented.

Learn how to:
Use CREO 4 to generate and validate lattice structures
Use Behavioral Modeling to Optimize Slender parts with lattice structures
Identify Design Optimization Process for 3D Printed Designs that utilizes topology optimization and CREO freestyle.

11:00

Basics of GD&T, Tolerance Analysis and 3D Model-Based Definition

- Review of fundamentals concepts and definitions of GD&T.
- Overview of basic tools for tolerance analyses within the CREO environment
- Guided Geometric Dimensioning & Tolerancing for effective MBD within CREO with *GD&T Advisor*
- Perform a worst case tolerance stack-up analysis with Dimension Boundaries
- Perform 1D tolerance stack-up analysis and optimize the tolerance allocation with Creo Tolerance Analysis Extension
- Perform sensitivity analyses of individual dimensions and identify their impact in specific metrics
- Perform 3D statistical tolerance analyses using CREO's Behavioral Modeling Extension

12:00 - Lunch

13:00

Engineering Quality into Designs Using Behavioral Modeling

Strategies for working with analysis features, sensitivity, feasibility & optimization studies will be demonstrated with real world examples.

Module 1: Introduction to Robust Design

- The status of the current design and simulation process
- Overview of the tools and techniques for traditional and robust design
- Introduction to Design of Experiments and Behavioral Modeling (BMX)

Demonstration activity:

- Identification of the most influential Pro/E parameters on response attributes

Module 2: Analysis Features & BMX Sensitivity Analysis

- Overview of analysis features based on measurements
- Creating parameters based on analyses of the model (TAE, MathCAD, Creo Simulate, MDO, etc.)
- Using BMX field points and persistent display
- Performing sensitivity studies to find the effect of design variables on response attributes

Demonstration activities:

- Identification of structural discontinuities

Module 3: Design Synthesis & BMX Optimization Analysis

- Automatically determining the design variable values that achieve a desired model behavior
- Performing optimization studies to find the optimum set of design variables that maximize the response attributes
- Creating optimization study feature for automatic & associative optimization studies
- Linking BMX and Excel for graphing and associative data exchange

Demonstration activities:

- Minimum weight section that meets strength, stability and manufacturing requirements

Module 4: Multi-objective Design Studies

- Use simple graphical techniques to analyze multi-objective study data
- Identifying optimum experiments using Constraints and Pareto methods
- Using response surface techniques in multi-objective design studies

Demonstration activities:

- Pareto Optimization, Minimum weight structure subjected to strength constraints
- Packaging optimization of metal stamped parts to minimize scrap

Module 5: Engineering Quality into the Design and Knowledge Capture

- Review of the cost of poor quality and how improved quality reduces total cost
- Identifying noise and control parameters
- Statistical performance - shift (mean) and squeeze (variability)
- Reliability based design with BMX external analysis
- Tolerance analyses with BMX statistical design studies
- Designing for Six-sigma quality levels with BMX

Demonstration activities:

- Reliability based design within CREO

Module 6: Strategies for Best Practice BMX Implementation

- Overview of BMX implementation challenges
- Organizational and technical inhibitors to achieve best practice BMX implementation
- Solution strategies to overcome organizational and technical inhibitors
- Baldrige National Quality Program as a framework for organizational improvement

Demonstration activities:

- Equilibrium positions during submarine deployment

17:00 End of the class