

Product and Process Design Improvement Using The Taguchi Approach

(3-day application oriented seminar)

Design of Experiment (DOE) is a powerful statistical technique for improving the performance of product and process designs. A simpler and much standardized form of this technique, as prescribed by Dr. Genichi Taguchi, allows one to easily learn and apply it in engineering and scientific designs & development projects. Classroom instructions in this course will focus on teaching the application techniques through actual case studies. Experiment PLANNING, analysis and EVALUATION methodologies, ROBUST DESIGN strategy and LOSS FUNCTION will be discussed in detail. Theories and statistical computations are kept to a minimum. Much of the class discussions are devoted to learning how to apply the technique in real-world application projects. Engineering and scientific professionals engaged in research, product design, and process development, will have the opportunity to apply the technique in projects of their choice. They will learn how to plan, design and analyze the results of industrial experiments.

Instructor:

Ranjit K. Roy, Ph.D., P.E., PMP is an engineering consultant specializing in Taguchi approach of quality improvement. Dr. Roy has achieved international recognition as a consultant and trainer for his down-to-earth teaching style of the Taguchi experimental design technique. Dr. Roy began his career as senior design engineer with Burroughs Corporation following completion of graduate studies in engineering at the University of Missouri-Rolla in 1972. He then worked for General Motors Corp. (1976-1987) assuming various engineering responsibilities with his last position as that of reliability manager. Dr. Roy is a *fellow* of the American Society of Quality. He is the author of two text books: *Design of Experiments Using the Taguchi Approach: 16 Steps to Product and Process Improvement* & *A Primer on the Taguchi Method*, and of Qualitek-4 software. He is an adjunct professor (since 1976) with Oakland University, Rochester, Michigan.

Course Contents (3-day Seminar)

DAY 1

- Overview of the Taguchi concepts of quality engineering
 - New philosophy and Definition of Quality
 - Loss to the society from poor quality
 - Standardized technique
- Measuring cost of quality by Loss Function
- Review basic concepts in experimental design
 - Types of factors and levels
 - Common experiment designs
 - Orthogonal array vs. one-factor-at-a-time Experiments
- Project objective and Overall Evaluation Criteria
 - Quantifying project objective
 - Need for combining multiple evaluation criteria into a single index
 - An objective way to combine subjective and objective evaluations
- Experiments designed using orthogonal arrays
 - Experiments with all factors at the same level
 - Experiments involving factors at mixed levels

DAY 2

- Experiments to study interaction
 - Trade off between factors and interactions
 - Test for presence of interactions without sacrificing columns
 - Test for relative influence of interaction
 - Necessary condition for test of significance
 - Influence of interaction on experimental strategy
- Basic analysis and strategy for experimentation
- Experiments with mixed level factors
 - Upgrading 2-level columns into a 4-level array
 - Downgrading (dummy treatment) columns
 - 15 different experiments using an L-8 array
- Combination Design (special design tool)

DAY 3

- Experiments with mixed level factors
 - Upgrading 2-level columns into a 4-level array
 - Downgrading (dummy treatment) columns
 - 15 different experiments using an L-8 array
- Combination Design (special design tool)
- Strategy for Robust Designs
 - New attitude toward uncontrollable factors
 - Outer array for robust design
- Group exercise #
- Analysis of Results
 - Main effect study for influence of factors
 - ANOVA for relative influence of factors
 - Performance at optimum condition
 - Confidence level and interval (C.I.)
 - Transformation of S/N data
- Brainstorming for experimental design
 - TEAM - the new disciplines in the workplace
 - Order of discussions in the planning session
 - Participants and facilitation of planning
- Computation of cost/ LOSS FUNCTION
- Reference and Application assistance
 - Project application guidelines
- Group reviews and exercise
- Class Evaluation and Adjournment