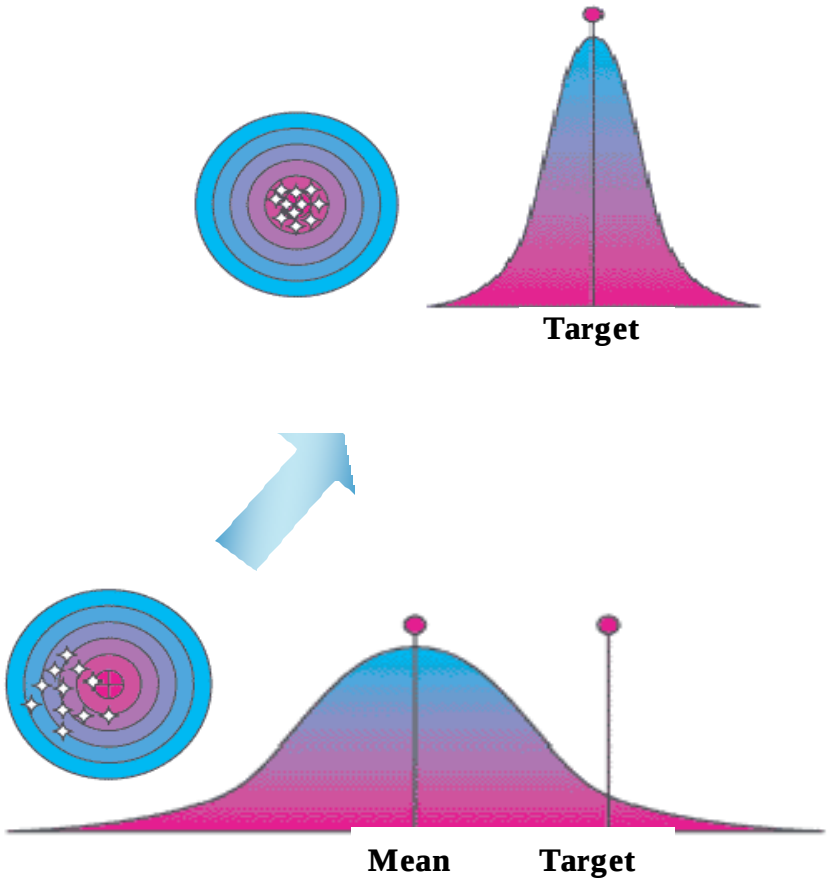
DOE-I Basic Design of Experiments



Nutek, Inc.
Quality Engineering Seminar and Software
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DOE-I Basic **Design of Experiments**

Presented
By

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Course Overview

Design of Experiment (DOE) is a powerful statistical technique for improving product/process designs and solving production problems. A standardized version of the DOE, as forwarded by Dr. Genichi Taguchi**,** allows one to easily learn and apply the technique product design optimization and production problem investigation. Since its introduction in the U.S.A. in early 1980's, the Taguchi approach of DOE has been the popular product and process improvement tool in the hands of the engineering and scientific professionals.

This seminar will cover topics such as: *Orthogonal arrays, Main effects, Interactions, Mixed levels, Experiment planning,* etc. Participants in this seminar learn concepts with practice problems and hands-on exercise. The goal of the seminar discussion will be to prepare the attendees for immediate application of the experimental design principles to solving production problems and optimizing existing product and process designs. The afternoon of the third day of the class will be dedicated to demonstrating how Qualitek-4 software may be used to easily accomplish experiment design and analysis tasks.

Outline

- Overviews

Standard Experiment Designs

- Basic principles of DOE and orthogonal arrays experiments
- Simple example showing experiment planning, design, and analysis of results
- Experiment planning steps

Interaction Studies

- Understanding interactions
- Scopes of interaction studies and its effect on experiment design
- Designing experiment to study interaction & Effect of interaction on the conduct of experiment
- Analyses for presence and significance of interaction
- Corrective actions for significant interactions

Mixed Level Factor Design

- Upgrading & Downgrading column levels
- Scopes of array modifications
- Factor level compatibility requirements & Combination designs

Design and Analysis Tasks using Software

- Experiment designs
- Analysis tasks

Principal Instructor's Background

Ranjit K. Roy, Ph.D., P.E. (Mechanical Engineering, president of NUTEK, INC.), is an internationally known consultant and trainer specializing in the Taguchi approach of quality improvement. Dr. Roy has achieved recognition for his down-to-earth style of teaching of the Taguchi experimental design technique to industrial practitioners. Based on his experience with a large number of application case studies, Dr. Roy teaches several application-oriented training seminars on quality engineering topics.

Dr. Roy began his career with The Burroughs Corporation following the 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, his last position being that of reliability manager. While at GM, he consulted on a large number of documented Taguchi case studies of significant cost savings.

Dr. Roy established his own consulting company, Nutek, Inc. in 1987 and currently offers consulting, training, and application workshops in the use of design of experiments using the Taguchi approach. He is the author of A PRIMER ON THE TAGUCHI METHOD - published by the Society of Manufacturing Engineers in Dearborn, Michigan and of Design of Experiments Using the Taguchi Approach: 16 Steps to Product and Process Improvement published (January 2001) by John Wiley & Sons, New York. He is a fellow of the American Society for Quality and an adjunct professor at Oakland University, Rochester, Michigan.

SEMINAR SCHEDULE

Design of Experiments Using Taguchi Approach

DOE- I

- **Introduction**
  - The Taguchi Approach to Quality Engineering
  - Concept of Loss Function
  - Basic Experimental Designs
- **Designs with Interactions**
  - Application Examples
  - Basic Analysis
- **Designs with Mixed Levels and Interactions**
  - Column Upgrading
  - Column Degrading
  - Combination Design

DOE-II

- **Robust Design Principles**
  - Noise Factors and Outer Array Designs
  - S/N Ratio Analysis
- **Learning ANOVA through Solved Problems**
  - Computation of Cost Benefits Using LOSS FUNCTION
  - Manufacturer and Supplier Tolerances
  - Brainstorming for Taguchi Case Studies
- Design and Analysis Using Computer Software
- Group Reviews
- Computer Software (Qualitek-4) Capabilities

- **Dynamic Systems**
- Class Project Applications
- Project Presentations

General Reference

Taguchi, Genichi: *System of Experimental Design*, UNIPUB Kraus Intl. Publications, White Plains, New York, 1987

Roy, Ranjit: *Design of Experiments Using the Taguchi Approach: 16 Steps to Product and Process Improvement*, John Wiley & Sons; ISBN: 0471361011

INTERNET: For general subject references (Taguchi + Seminar + Software + Consulting + Case Studies + Application Tips), try search engines like **Yahoo, Lycos, Google**, etc. For Nutek products, services, and application examples, visit:

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