

# Robust Product and Process Designs

Attend this 4-day skill-building seminar with hands-on application workshop and learn how to guide your project team with the proven skills they need to design robust products and processes and tackle technical problems on the production floor. The attendees to this session will learn how to apply the Taguchi experimental design technique to (1) Optimize product/process designs, (2) Solve technical production problems, (3) Plan performance validation tests, (4) Increase return from advertisement, and (5) Optimize landing page designs.

## Where and when?

Dates: Held several times a year at Somerset Inn, 2601 West Big Beaver Road, Troy, MI 48084, Tel: 248-643-7800. (visit [www.Nutek-us.com/wp-s4d.html](http://www.Nutek-us.com/wp-s4d.html) for schedule)

## WHO SHOULD ATTEND?

These sessions are intended to prepare the attendees for immediate applications. Attend if you wish to learn how to apply the technique confidently, become a specialist within your organization, and teach other the effective steps in the application. Attend alone or as a group if you are a:

- Product/Process Design Engineer, R&D Scientists, or QA Personnel and have immediate applications in product optimization or production problem solving
- Manufacturing Manager, Director or Senior Engineer who wish to lead, teach, and introduce this technique within your organization.
- Marketing executives and project managers involved in improving response from advertisements and increased sales revenue.
- Instructor in academic institution looking toward sharpening the application considerations that make the technique more attractive to students and effective in industrial projects.
- Consultant and Trainer who wish to help their clients work with interdisciplinary

teams and optimize product designs and solve production problems.

There is no minimum educational background requirement for this seminar. However, two or more years of college education in any field of science or engineering is helpful. The course is taught at a level easily understood by the practicing engineers, scientists and managers without any background in statistics.

## WHY YOU SHOULD ATTEND?

Our seminar is about helping you build application expertise. Our goal is to make participants ready for immediate performance improvement and variation reduction applications. You will know how to plan, and lay out experiments. You would also be able to interpret and analyze results.

Managers & executives, the products you manufacture are much improved when you build quality into the designs. Your project applications await leadership from a few skillful specialists. Register the potential mentors within your organization to be trained by us. Our session will make them ready for applying the technique right away.

Engineering and quality specialists, as you well know, learning real life application steps is a challenge, and routine number crunching is a drag. We help you in both these areas. Our training is devoted mostly to discussing application methodologies. You will also learn how to use the software that relieves you from all experimental design and analysis tasks. Even if you do not have immediate applications, you need not worry. The reference textbook you receive would allow you to quickly brush up the methods in times of needs long after the seminar.

## AREAS OF APPLICATIONS

When quality issues are addressed in the design phases of products and processes, the return on investment is much greater. Therefore, all designs should be optimized before they are released for production. For products already in production, a vast majority suffers from problems related to the lack of consistency of performance. Variation in performance, which causes higher rejects, reworks, and warranty, can be reduced from studies utilizing this experimental technique.

## COURSE DESCRIPTION

Robustness is an essential characteristic for dependable performance. Robust products and processes perform reliably with minimum variation due to uncontrollable factors. Naturally, to assure consistent performance, the designs must be robust.

Dollar for dollar, the return on investment is the most when design improvement efforts are directed toward the development activities. One of the effective ways to reduce variation in performance that potentially results in reduced rework and rejects downstream is to use the standardized version the Design of Experiment (DOE) technique proposed by Dr. Genechi Taguchi. This approach allows scientific professional to easily learn and apply the DOE technique in their own development and production projects.

Major emphasis is placed on how to apply the method. Practical application steps, including brainstorming, team approach, and consensus decisions, are demonstrated through example project applications. Discussions of theory and mathematical treatments are kept to a minimum. Concepts covered in class lectures are practiced and tested using numerous class exercises. A large number of review questions in the reference handout provide opportunities to test what is learned in the class.

**Workshop:** Attendees learn hands-on, how to accomplish design and analysis tasks using Qualitek-4 computer software. All attendees are requested to bring their own laptop computer for the last two days of the class.

## TOPICS OF DISCUSSIONS

### 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
  - Need for combining multiple evaluation criteria into a single index
- Experiments designed using orthogonal arrays
  - Experiments with all factors at the same level
  - Experiments involving factors at mixed levels
- Experiments to study interaction
  - Trade off between factors and interactions
  - Test for presence of interactions
  - Test for relative influence of interaction
- Basic analysis and strategy for experimentation

### DAY 2

- 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

### DAY 3

- An overview of Systems with Dynamic Response
  - Understanding dynamic systems
- 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
- Design and analysis using computer software

### DAY 4

- Group reviews and exercise
- Computer Software (Qualitek-4)
- Class project & presentation by the groups
- Class Evaluation and Adjournment



## ATTENDEES EVALUATION



*"This would be a great discipline to structure our experimental studies related to vinyl siding fabrication line."*

- Tom Gates, Certainteed Corp.  
Jackson, MI.



*"My application is in product testing and validations. This session gave me the ability to confidently dispel some of the misunderstandings and most economically layout my product performance & durability tests."* - John Wajenski,  
Sr. engineer, Lockheed Martin, Owego, NY.



*"DOE is expected to be an excellent technique for controlling variables in wood drying process. This seminar covered the background necessary for proceeding with the applications."* - Dr. David Barrett, Professor of Wood Science, The University of British Columbia, Vancouver, Canada.



*"By completing this seminar, I feel self-confident to use DOE in real environment such as manufacturing, design, and development."* - Tadej Sircelj, Grosuplje, Slovenia



*"This has been an excellent experience for me. Use of the software to take care of all design situations and calculations of results, is most helpful"*  
- Quality Manager, Pretium Packaging LLC.  
Muscatine, IA..

*"The instructor maintained an excellent and understandable pace of instruction throughout the course."* - Quality Engineer, Valeo Climate Control, Auburn Hills, MI..



*"Instructor is very knowledgeable in the subject and was able to relate to uses as well as theoretical bases for analysis"* - Vince Chacon, NASA Flight Research, Edward, CA.



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Dryden

*"I have an immediate need to apply the technique to my projects, and this seminar helped me learn how to apply right it away."* - Amir Jiwani, Application Engineer, Industrial Tools Inc., Oxnard, CA.



*"Dr. Roy is an excellent instructor and can explain difficult concepts in an understandable manner. I feel I learned a great deal."* - Rick Bauer, Cardinal FG, Menomonie, WI.



*"The program is very informative and the instructor provided good examples to help us understand ideas by explaining it different ways."* - Scott Oldani, Belleville Shoe Manufacturing Co. Belleville, IL.



*"The structured discussions in experiment planning will be most helpful to my activities. Also the ability to translate improvement into dollars using the Loss Function is something very attractive."* - Barbara Schiller, Eagle Ottawa, Rochester Hills, MI.



*"The instructor is very knowledgeable and makes use of simpler examples to clarify finer concepts of the technique. I hope to use the technique for trouble shooting and problem investigation."* - Solvey Advance Polymers, Apharetta, GA.



### Workshop and Class Exercises (Participants work in teams and learn from each other. )



## ATTENDEES EVALUATION (Contd.)

“Excellent presentation and approach to all with or without Taguchi background.”

“Dr. Roy has a unique way delivering complex information in a common sense language.”

“It’s a great relief to know that there are software packages available to do all of the number crunching and prepare the reports.”

## COURSE 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 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 *Design of Experiments Using the Taguchi Approach: 16 Steps to Product and Process Improvement* published (January 2001) by John Wiley & Sons, New York. Dr. Roy is a fellow of the American Society for Quality and an adjunct professor (1977 - 1999) at Oakland University, Rochester, Michigan

## COST & WHAT YOU WILL RECEIVE

The cost for this 4-day seminar is 2,450/attendee.

As an attendee you will receive:

- ◆ Our seminar handout materials (over 200 pages)
- ◆ Single user copy of our Qualitek-4 (\$1,195 value)
- ◆ Design of Experiments Using the Taguchi Approach: 16 Steps to Product and Process Improvement by Ranjit Roy text (textbook, list price \$130).
- ◆ Certificate of completion (2.4 CEU)
- ◆ Lunch (all four days)

You will receive 10% discount when registering two or more attendees.

## WHAT YOU WILL NEED TO BRING WITH YOU

1. One scientific calculator
2. A laptop computer (for last two days only)
3. One or more design optimization or problem solving ideas

## REGISTRATION AND CONTACTS

Class size is **limited to 15**. So, hurry and sign up.

To register Send (1) Company/Personal check/money, or (2) Company purchase order payable to **Nutec, Inc.**, 3829 Quarton Road, Bloomfield Hills, MI 48302, USA. (Phone: 248-540-4827) along with attendees' *Name, Address, Phone, E-mail* and dates of class. Upon receipt of your payment/P.O., we will confirm your registration approximately two weeks before the start of the seminar. [*When registering within two weeks of the seminar, please contact the instructor before doing so.*]

For more information about the content of the seminar, please write to [Support@Nutec-us.com](mailto:Support@Nutec-us.com) or call 1-248-540-4827. Visit <http://nutec-us.com/wp-s4d.html> for seminar information and online registration.



**Nutec, Inc.**

3829 Quarton Road

Bloomfield Hills, MI 48302-4059, USA. [www.Nutec-US.com](http://www.Nutec-US.com)

Tel: 248-540-4827 Email: [Support@Nutec-us.com](mailto:Support@Nutec-us.com)

