

Design of Experiments, DoE

We only offer this training in-house. Please contact us.

About the topic:

Today's development processes are characterized by complex products and manufacturing processes, as well as by ever more demanding time and cost targets. Design of Experiments (DoE) represents a major building block to meet this pressure to improve efficiency in the field of experimental design. Central applications are attempts to understand complex technologies and processes and, at the same time, to improve or optimize them. In practice, it is still the cases that, despite the existing knowledge about possible methods, "traditional" but mostly inefficient techniques like "One factor at a time" experiments are extensively applied in industrial practice. Negative examples also contribute to this, where the most "basic knowledge" is that DoE was useless, because no significant effects could be found. It is not enough to know only the methodology for a successful use of DoE in practice. The necessary conditions, which must be in place parallel to the actual experiment design, must also be considered. Successful DoE programs use 80% of the time on planning and securing the experimental conditions especially with regard to variance reduction, and only 20% on statistical analysis. This seminar provides both the methodological foundations of the design of experiments as well as the overall understanding of the planning and evaluation of statistically planned experiments.

Target group:

Engineers, technicians, specialists and executives from the areas of development, testing, construction, research and production quality assurance

Training content:

- **Introduction**
 - Core concept of DoE – comparison with One-factor-at-a-time plans
 - The normal distribution – necessary working hypothesis
- **Confidence intervals**
 - The confidence interval of mean values
 - Becoming acquainted with the t-distribution
 - The confidence interval of effects
 - Assessing the significance of an effect
 - Analysis of Variance (ANOVA)
- **Full factorial plans**
 - Preliminary analysis of test results: Pareto-Chart, Trends, distribution form, Residue analysis, Box-Cox Transformation
 - Main and interaction effects
 - System improvement using experimental results
- **Fractional factorial experimental designs**
 - Screening plans, Plackett-Burman plans
 - Derivation of fractional factorial experimental designs from the factorial plans
 - Benefits, risks and risk handling of fractional factorial plans – alias- structures and resolutions
- **System optimization – response surface plans**
 - Testing for nonlinearity
 - Further development of factorial experiment plans to a Central Composite Plan
 - Investigation of a system's behaviour by stepwise regression

- Methods of system optimization
- D-optimal experiment plan
- **DoE practice – key success factors**
 - Assessment and use of blocking and randomization
 - Preventive cost assessment
 - Implementation of prototype testing and planning ahead
 - Variance reduction through system analysis and early detection of high variances
 - Correct selection of factors
 - Correct selection of factor levels
- **Robustness testing – Taguchi experiment plans**
 - Anatomy of Taguchi plans – control and interference
 - Robustness criterion – Signal to Noise Ratio
 - System optimization using Taguchi experiment plans
- **Exercises**

Each theoretical step important to the understanding of Design of Experiments is demonstrated in a practical exercise with the participants. Independent “process improvements” and “system optimizations” are carried out using real examples. All practical exercises include the necessary success factors.

Prerequisites:

There are no prerequisites for this topic.

Software requirements:

Each participant must have a laptop with the following software: Microsoft Excel, Adobe Reader and Minitab (Version R15 or above). A demo version of the software Minitab can be downloaded from www.minitab.com.

Certification:

The training will end in all cases with a certificate of participation.

Training duration:

3-day training: 1st day from 09:00 am to 05:00 pm
2nd and 3rd day from 08:30 am to 05:00 pm

Training fee:

On request, we will gladly make you a personal offer.

Scope of services:

- Training documents in paper form
- Training documents as pdf document
- Certificate of participation

Coaching:

Should you so wish, we can put together a time and content tailored coaching concept for you after completion of the training.