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DATA Analysis Foundations using Minitab (2 days)

Learn about file structures, menus, dialog boxes, Help, and navigation shortcuts allowing for the most efficient use of Minitab. Import datasets from Excel and Access. Look for evidence of lack of normality and trends, display differences between groups, and relationships among variables using and customizing effective graphic displays. Quantify mean shifts, differences and variation using summary statistics. Report study results with confidence by characterizing performance with intervals. Create macro programs to automate your dashboard calculations and statistical reports.

Don't run the risk of trusting sample statistics and graphics alone when making decisions with critical and costly ramifications! The principles of confidence intervals, tolerance intervals and hypothesis testing are the foundation of statistical analyses that ensure greatest confidence in all data-based decisions. Apply t-tests and ANOVA to compare mean to target and to detect and explain expected mean differences with confidence. Similarly make reliable comparisons of variability or defect levels for two or more designs, machines, raw materials or processes using variance and proportion tests. Determine the appropriate sample size for each study using power analysis.

Quality Analysis for Validation and Process Control
(2 days if acceptance sampling, expanded gage R&R, short-run, rare events and between/within control charts, and in-class R&R activity are included)

This course demonstrates the statistical methods required for process control and FDA validation efforts. Discover the techniques that your suppliers should implement to ensure that incoming materials and components meet your quality requirements. Provide internal and external customers with proof of process capability for normal data.

Use Gage Repeatability & Reproducibility (R&R) studies, for both destructive and repeatable measurements, to determine if your measurement system can adequately distinguish between part sizes. Implement Attribute Agreement studies to determine if your visual- or go/no-go inspections can consistently differentiate between good and bad parts. Nearly all measurement systems have multiple gages requiring an Expanded Gage R&R Study to quantify sources of measurement variation. Design the right sampling plans to ensure effective R&R studies, capability analysis, and control charts.

Based on statistical process control (SPC) concepts, implement the correct control charts to separate special cause from common cause variation in your manufacturing or business processes. Develop the best quality inspection plans using Acceptance Sampling methods. These plans reduce sampling to the lowest possible cost, while minimizing the costly risk of accepting or shipping out-of-spec products.

PREREQUISITE: Foundations

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Experimental Design: Foundations & Strategies (2 days)

Are your products and processes performing to their maximum potential? Our experimental design (DOE) courses demonstrate how to optimize performance, making it great. Master the 5 design characteristics that make factorial experimentation more efficient and successful than any other approach. Apply the 7 step method to execute the best data collection plan that will establish cause and effect relationships. Select the best designed experimental plan, producing the most information in the least number of runs.

Avoid choosing designs that will not provide the information you need. Determine the number of replicates needed to ensure high confidence that important effects are detected. Include blocks and covariates in your design to minimize the influence of noise. Study main and interaction effects, quantify them, and leverage the experimental results to model the input-output relationships. Use data visualization graphics and response optimization to gain insight into these relationships and achieve optimal performance.

Embrace the real efficiency of experimental design by applying strategies for running sequential experiments. Use highly efficient, low resolution designs to screen a large number of variables in your brainstorm list down to the vital few, in the least number of runs. Use folding and de-aliasing methods to separate important interactions with the fewest additional runs. With main variables and interactions identified, complex processes may still require the next level of understanding to achieve peak performance; apply response surface designs to refine your models, threading the needle to peak performance. Determine design and process settings to simultaneously achieve multiple response requirements. Gain a deeper understanding of DoE principles with an in-class designed experiment.

PREREQUISITE: Foundations

Advanced Experimental Designs (1 day)

Embrace the benefits of Taguchi's Robust Designs for variation reduction and Tolerance designs for quantifying the contribution of factor variation to response variation. Use cost-effective designs for testing factors at more than 2 levels, split-plot designs for hard-to-change variables, and multiple response optimization to simultaneously improve performance and minimize cost. Analyze pass/fail response data with binary logistic regression. Expand your experimental design options with the use of random and nested factors.

PREREQUISITE: Foundations & Design of Experiments with Minitab

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ANOVA and Regression Principles (1 day)

Apply an array of ANOVA methodologies to discover relationships among variables and create statistical models to predict and optimize performance. Create linear and non-linear models for both continuous and attribute responses. Develop models with single or multiple, continuous and categorical input variables. Compare analysis opportunities among the common modeling techniques: ANOVA, General Linear Model (GLM) and Regression. Apply transformations to improve model predictions. Create graphics to effectively display and communicate modeling relationships.

PREREQUISITE: Foundations, Design of Experiments

Non-normal Data Analysis and Capability (1 day)

When your data fails the normality test, what's next? First determine why the data failed normality. Discover methods that do not depend on a particular distribution, when these methods are most useful, and when they should be avoided.

Use methods that assume a non-normal distribution by gaining insight into such popular non-normal distributions as the Weibull or Lognormal, and how these distributions differ from the normal distribution. Apply good practices for choosing the best distribution….SURPRISE! It is not all about the p-value.

Embrace tools commonly used in reliability analyses to study your non-normal data. Create tolerance intervals for data from non-normal distributions. Determine whether your products will meet reliability requirements. Apply non-traditional capability methods when a distribution won't fit your data.

PREREQUISITE: Foundations & Quality

Reliability Methods (2 days)

Compare non-normal distribution parameters with hypothesis tests and intervals. Create test plans that ensure confidence in meeting reliability specifications. Apply analysis methods to data where some or all units do not fail. Easily and effectively analyze data with multiple failure modes. Manage and analyze warranty data, and predict future warranty costs. Study time between failures for repairable systems to help with maintenance and retirement plans and budgets. Develop regression models to predict reliability under various real-world stress conditions, and create accelerated test plans to reduce the time needed for testing. Develop reliability prediction models for pass/fail data.

PREREQUISITE: Non-Normal

Contact Karen Meldrum, kmo@tir.com, 810-357-1877 if you have any questions.