Lecture #42

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Final
Course Summary

1. Evolution of Quality Design & Control
   - Quality revolution
   - Historical perspective
   - Modern Quality Philosophy
   - Quality & the Engineering Design Process
   - Strategic View of Quality Improvement: Variation, S/N
   - Contrasting approaches: increasing S versus reducing N
2. Conceptual Framework for Quality
   - Deming’s Philosophy
     14 Obligations of Top Management
   - Traditional view of quality
     Engineering Specifications
   - Taguchi’s definition of quality
     Loss function
   - Cost-of-quality
3. Statistics Review
   - Characterizing data
   - Probability distributions
   - Normal distribution
   - Calculating and working with probabilities
   - Sampling distributions
     In particular for sample means
   - Normal probability plot
   - Hypothesis testing
     $x$’s and $x$bar’s; $\alpha$ and $\beta$ risk; Type I and II errors
4. Concept of SPC
- Origin & Characteristic Behavior of Variability
- Process Behavior over time
- Shewhart’s ideas - economic control
- Control chart - process management
- Process of SPC

5. Statistical Basis for Shewhart Control Charts
- Control charts -- connection with hypothesis testing principle
- X-bar control chart
- R control chart
6. Control Chart Details
   - Mechanics of chart construction
   - Interpreting control charts
   - Example - cylinder boring process
   - Graphical techniques (Scatter diagram, Pareto chart, cause & effect diagram)

7. Rational Sampling
   - Sample size, frequency, selection considerations
   - Consecutive vs. distributed sampling
   - Stratification and Mixing

• Chapter 8 -- Workshop #1
9. Process Capability
   - Process capability vs. process control
   - Calculating capability: %, Cp, and Cpk
   - Boring example revisited
   - Variation in Assemblies
   - Statistical assignment of tolerances
   - Loss function
   - What happens when things go wrong....

10. Roll Mill Process Case Study
    • Workshop #2
11. Control Charts for Individuals
   - X and Rm
   - EWMA Charts
   - Autocorrelated data -- time series

13. Control Charts - Attribute Data
   - Definitions (defects, defectives, operational definitions)
   - Binomial distribution
   - p chart
   - np chart
   - p chart variable sample size charts
   - Poisson distribution
   - c chart
   - u chart
14. Case Studies for Attributes
   - Press 120 -- Molding process
   - Accounts payable process
Final Thoughts

• Many of you will be leaving MTU -- good luck!!

• You have a great education -- your potential is unlimited -- don’t settle. Be ambitious -- aim high!!

• Never stop learning. A degree is only a first step.

• Got questions?? -- contact us.

• As time goes by, you will look back fondly on your days at MTU. Stop in one of these days (or drop us a note) & let us know how you are doing.