Designing Quality Products and Processes

Product development

Translates customer expectations for functional requirements into specific engineering and quality characteristics.

Phases of product development

- Concept
- Prototype design
- Prototype construction
- Pre-production
- Early – full scale production
- Full scale production

Quality Function Deployment (QFD)

House of Quality

Quality function deployment (QFD)

Product design matrix

House of quality

Six steps for building house of quality
Quality Function Deployment (QFD)
House of Quality

Taguchi Philosophy & Methods
Philosophy
Taguchi did for “on-line” process control
what
Deming did for “inspection”

Philosophy
“Robust” design
Robust product
Robust process
**Tagachi Philosophy**

*Understanding variation in its own right*

**Tagachi Philosophy**

*Goal: two separate dimensions*

"On target" and "Low variation"

**Tagachi Philosophy**

*Goal: To have a product that is "on target" with a minimum amount of variation*

A measure of how close the design is to the optimum "performance" of a product or process.

**Tagachi Methods**

*Measure of “Robustness”*

*Signal-to-noise ratio*

**Tagachi Methods**

*Parameter Design*

Control factors

Noise factors

**Design of Experiments for Product & Process Design**

*Exploratory vs. confirmatory studies*

Descriptive statistics

Inferential statistics
**Design of Experiments for Product & Process Design**

Multivariate studies
Comparison with sequential two-way tests

- Low Temp
- High Temp

- Low
- High

**Design for Six Sigma**

**Process Improvement Methodologies**

**DMAIC**

- Define - project objectives
- Measure - data required for decisions
- Analyze - to identify improvement needs
- Improve - by implementing
- Control – by monitoring effectiveness

**Other Process Improvement Methodologies**

- **DMADV** - Define, Measure, Analyze, Design, Verify
- **DCCDI** - Define, Customer Concept, Design, Implement
- **IDOV** - Identify, Design, Optimize Validate
- **DMEDI** - Define, Measure, Explore, Develop, Implement
Reliability

The ability of a product to perform a required function under stated conditions for a stated period of time

Four implications of an reliability analysis
1. Quantification of reliability in terms of probability
2. A statement defining successful product performance
3. A statement defining the environment in which the equipment must operate
4. A statement of the required operating time between failures.