

# **Fundamentals of Total Quality Leadership**

## **Module 3: System of Profound Knowledge**

### **Lesson 3: Variation**

# Student Information

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## Lesson Objectives

By the end of this lesson to student will be able to:

- EO 3-12 Describe the concept of variation.
- EO 3-13 Explain the significance of the quality loss function.
- EO 3-14 Explain the importance of continuous process improvement for reducing variation.
- EO 3-15 Describe the difference between common and special causes of variation.
- EO 3-16 Describe the difference between specification limits and control limits.
- EO 3-17 Describe the difference between stable and capable processes.
- EO 3-18 Explain who is responsible for taking action on common cause and special cause variation.

## Length of Instruction

# Fundamentals of **T**otal **Q**uality **L**eadership

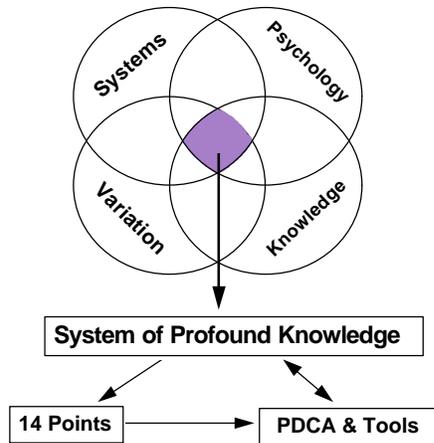
Module 3  
System of Profound Knowledge  
Lesson 3  
Variation

## Learning Objectives

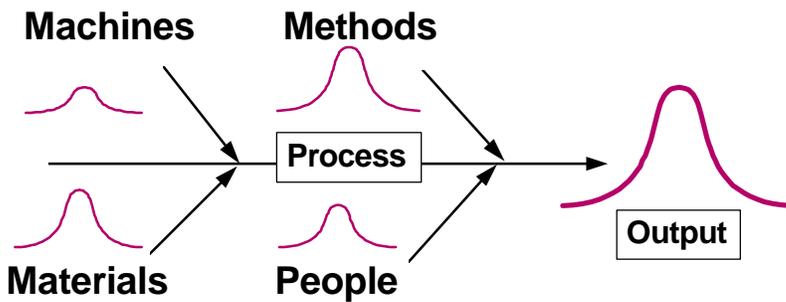
*At the end of this lesson the student will be able to:*

- ◆ Describe the concept of variation
- ◆ Explain the significance of the quality loss function
- ◆ Explain the importance of continuous process improvement for reducing variation
- ◆ Describe the difference between common cause and special cause variation
- ◆ Describe the difference between specification limits and control limits
- ◆ Describe the difference between stable and capable processes
- ◆ Explain who is responsible for taking action on common and special cause variation

### DON Approach to Quality Management

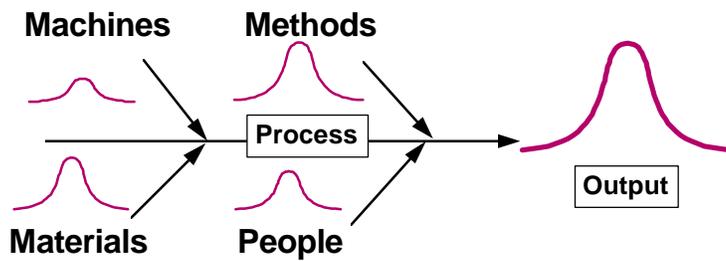


### Why Variation Occurs



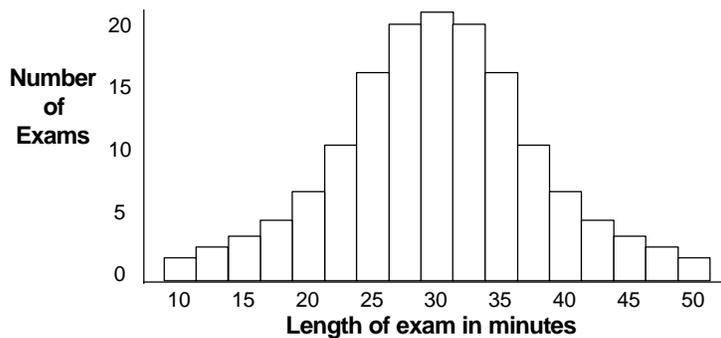
◆ Variation in the process leads to variation in the output

## Shewhart's Discovery



- ◆ Variation is inherent in all processes
- ◆ Process causes can be identified, measured, and analyzed
- ◆ Deliberate action is required to reduce variation

## Understanding Variation

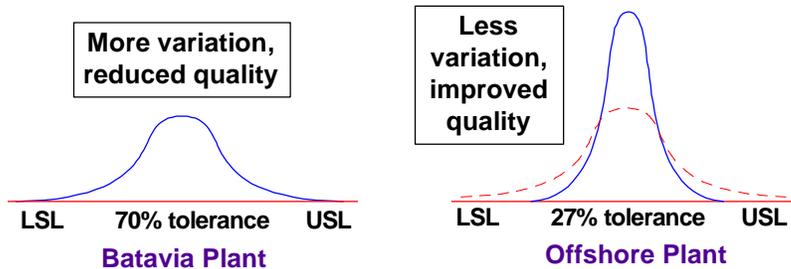


- ◆ Distribution of measures from the health exam process

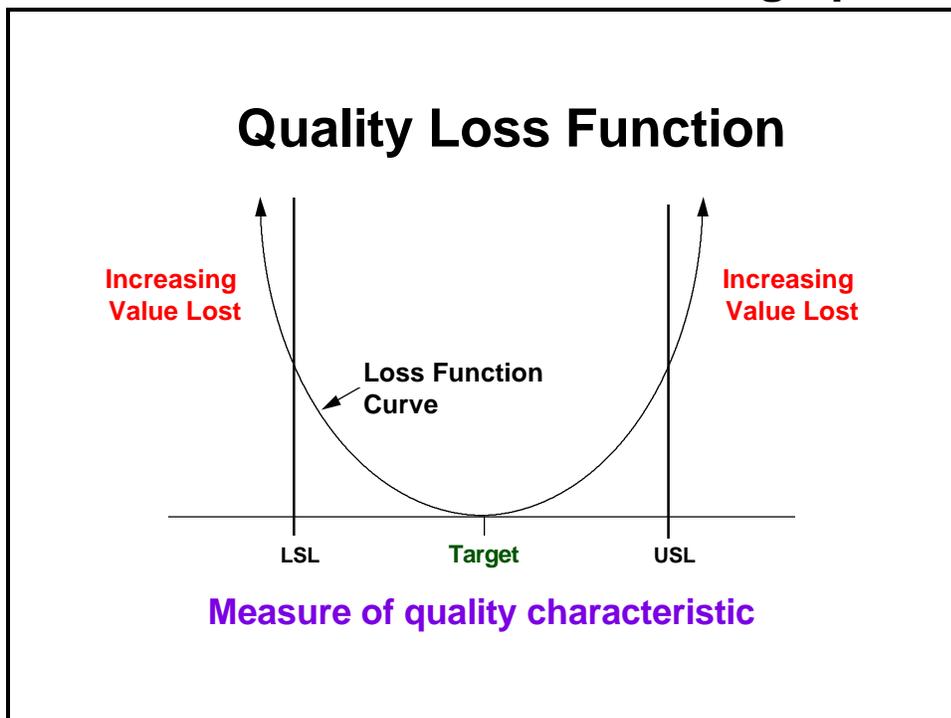
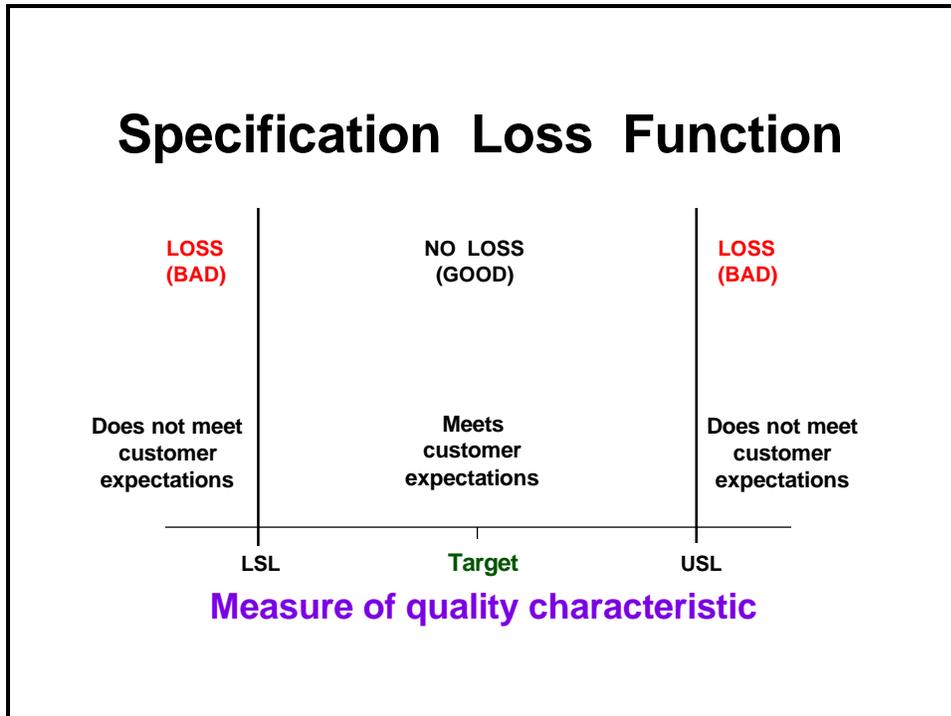
# Video...

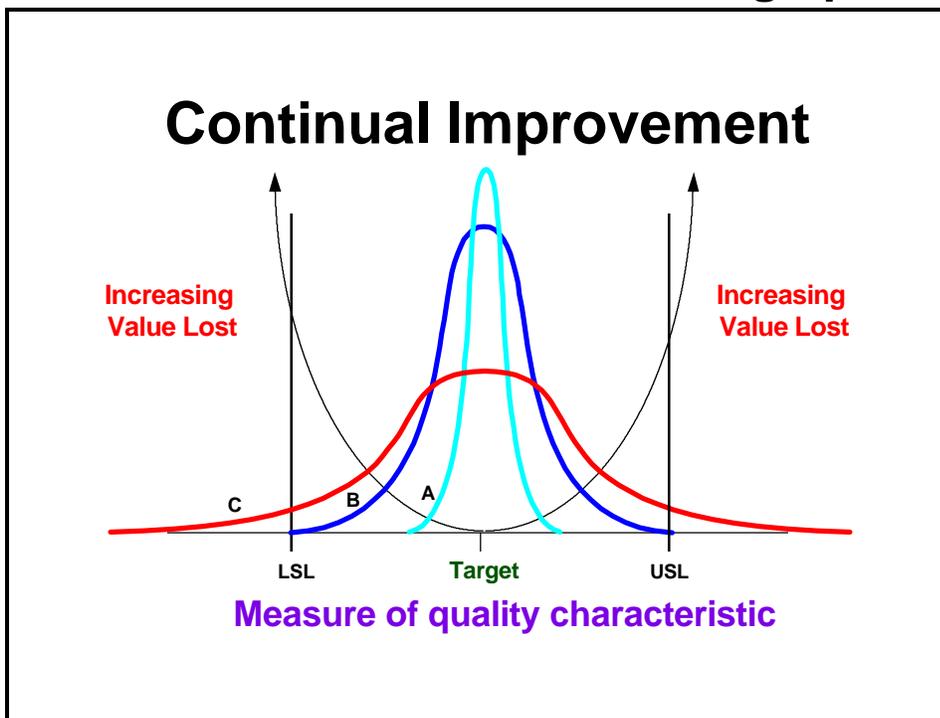
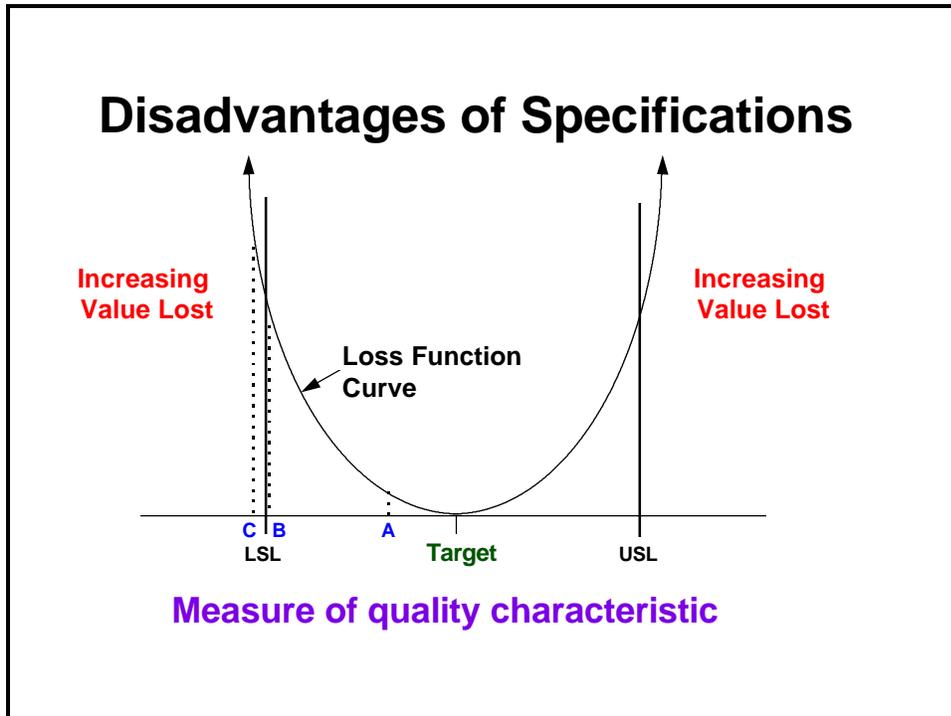
**“Continuous Improvement:  
The Batavia Incident”**

## Lessons from Batavia

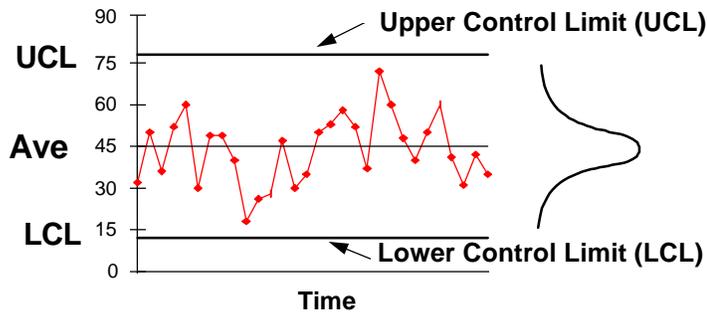


- ◆ All transmissions from both plants were built to the same design criteria
- ◆ Ford discovered building to design criteria did not guarantee quality





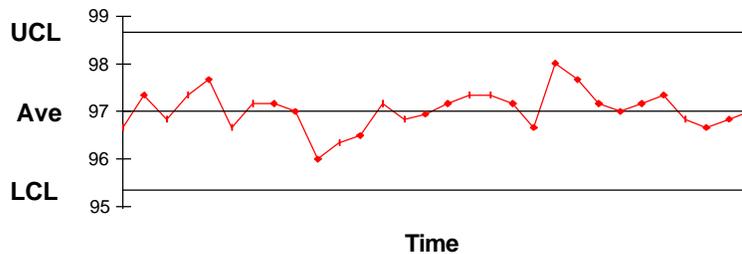
## Variation and Control Charts



◆ **Control Charts allow us to study what is happening in the process**

## Common Cause Variation

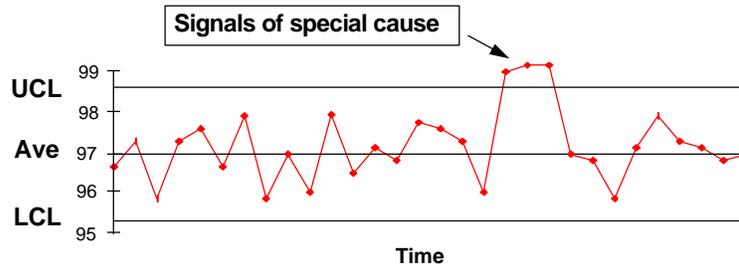
**Causes that are inherent in the process over time, affect everyone working in the process, and affect all outcomes of the process**



◆ **Common cause variation exhibits a random pattern of data points that fall within control limits**

## Special Cause Variation

Causes that are not in the process all the time or do not affect everyone, but arise because of special circumstances

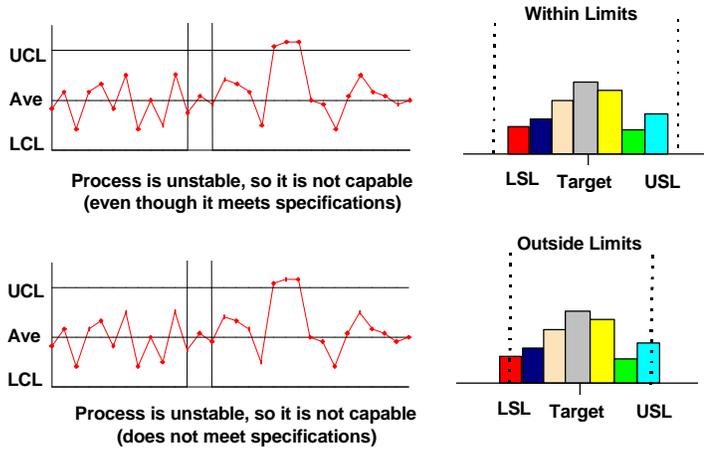


- ◆ Special cause variation exhibits a non-random pattern of data points which may include falling outside control limits

## Control Limits and Specification Limits

- ◆ **Control limits** are determined by the process data and define how the process is functioning
  - The “Voice of the Process”
- ◆ **Specification limits** are determined by design requirements or customer expectations and define the required product or service design dimensions
  - The “Voice of the Customer”

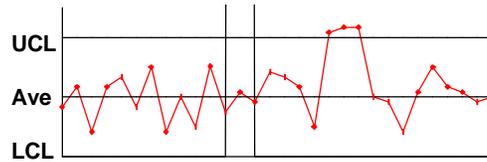
### Stability and Capability related to Special Cause Variation



### Benefits of Stable and Capable Processes

- ◆ **Benefits of a stable process**
  - Prediction of process output
  - Improvement of the process
  
- ◆ **Benefits of a capable process**
  - Meets customer defined needs
  - Accomplishes the mission

## Reduction of Variation



**Reduction of common and special cause variation require different types of action**

## Responsibility for Reducing Variation

- ◆ Reduction in common cause variation is the responsibility of leadership and management
- ◆ Reduction in special cause variation is the responsibility of the process workers (if authority has been delegated to them)
- ◆ Quality improvement teams have responsibility by charter to take action on common and special cause variation
- ◆ Tampering and underadjusting must be avoided

# *Exercise...*

## ***“The Red Bead Experiment”***

## **Lessons from the Exercise**

- ◆ Variation in the number of red beads resulted from a system created by management
- ◆ Blaming and firing the workers does not improve the system
- ◆ Management is responsible for changing the system so that workers can meet customer defined needs
- ◆ The role of the leaders is to make it possible for people to identify and remove red beads in the organization

## **Lesson Summary (1 of 2)**

- ◆ **Variation is part of the System of Profound Knowledge**
- ◆ **Variation is inherent in everything**
- ◆ **Variation can be identified, measured, analyzed, and reduced to improve quality**
- ◆ **The quality loss function is the rationale for continuous process improvement and shows the cost of process variation**
- ◆ **Specification limits and control limits are different**
- ◆ **Variation results from common and special causes**

## **Lesson Summary (2 of 2)**

- ◆ **Capable processes are required to accomplish the mission**
- ◆ **Management is responsible for reducing common cause variation by working on the process**
- ◆ **People working in the process are responsible for removing special causes of variation**