

Introduction to Quality & Productivity Improvement

QUALITY—the ability of a product or service to meet customer needs and satisfaction.

The Cost of Quality

In most companies the cost of quality, including customer complaints, product liability lawsuits, redoing defective work, products scrapped, etc., runs from 20% to 40% of sales revenues.

—J.M. Juran—*“Juran on Planning for Quality”*

Quality Myth #1

Rumor has it—that quality and productivity are incompatible—that you cannot have both.

If you push quality, production falls behind. If you push production, quality suffers.

This is the experience of managers who know not what quality is or how to achieve it.

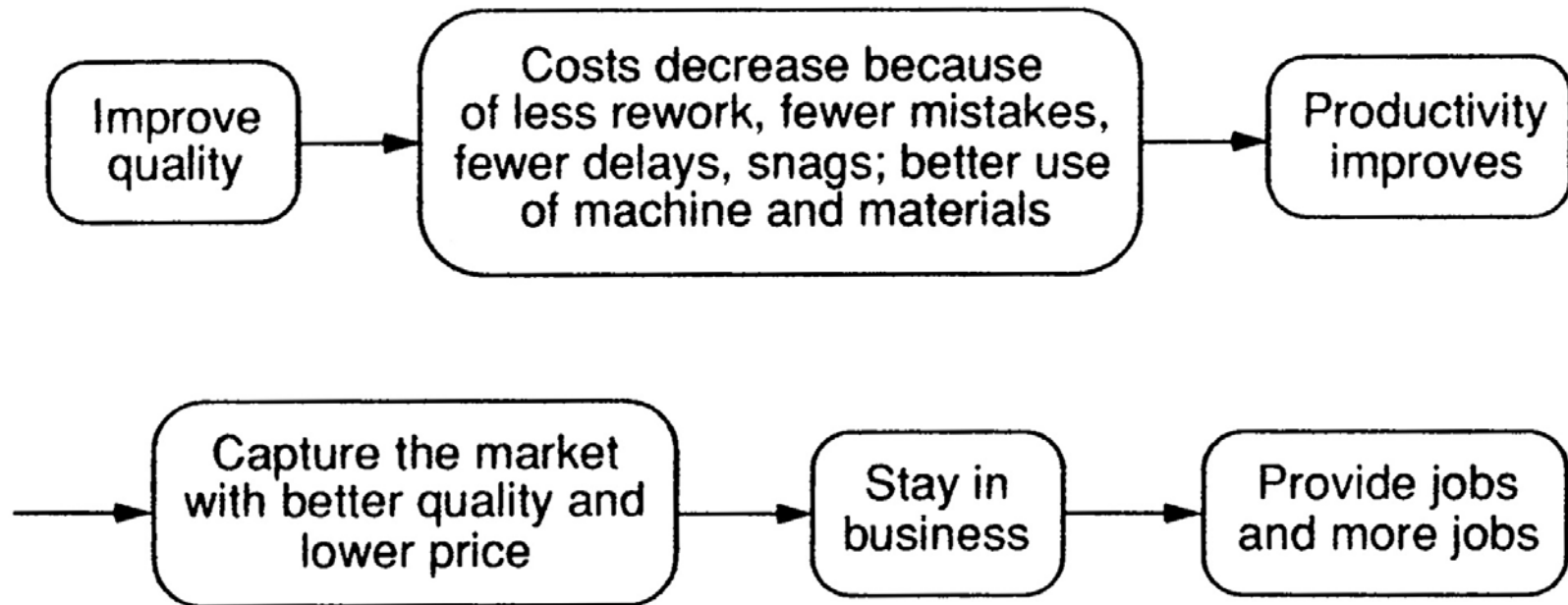
—Yoshikasu Tsuda

**Why is it that productivity increases
as quality increases?**

Less rework – not so much waste.

—W. Edwards Deming, *“Out of the Crisis”*

The Chain Reaction of Quality

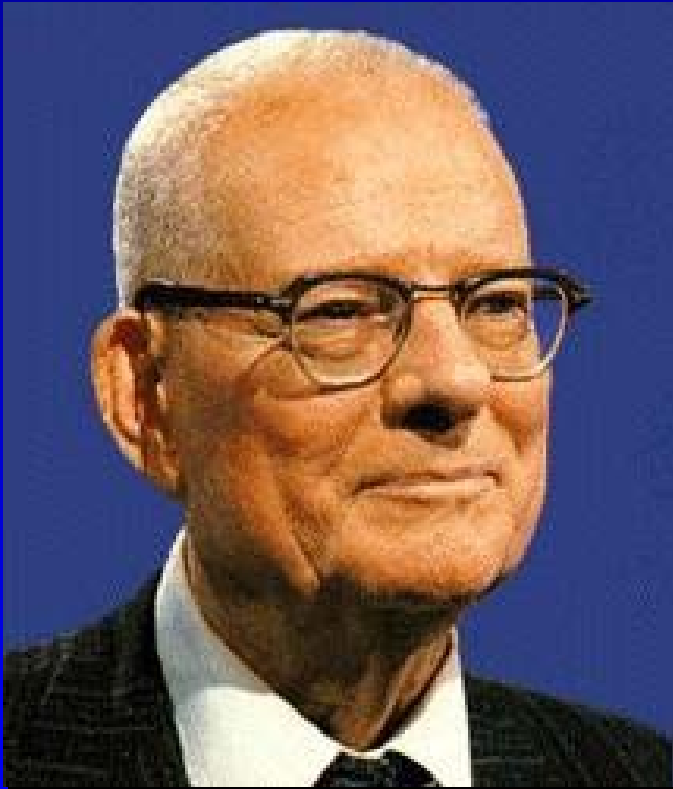


—Deming, *Out of the Crisis*

Quality improvement transfers wasted man-hours and machine-time into the manufacture of good product and better service.

—W. Edwards Deming, *“Out of the Crisis”*

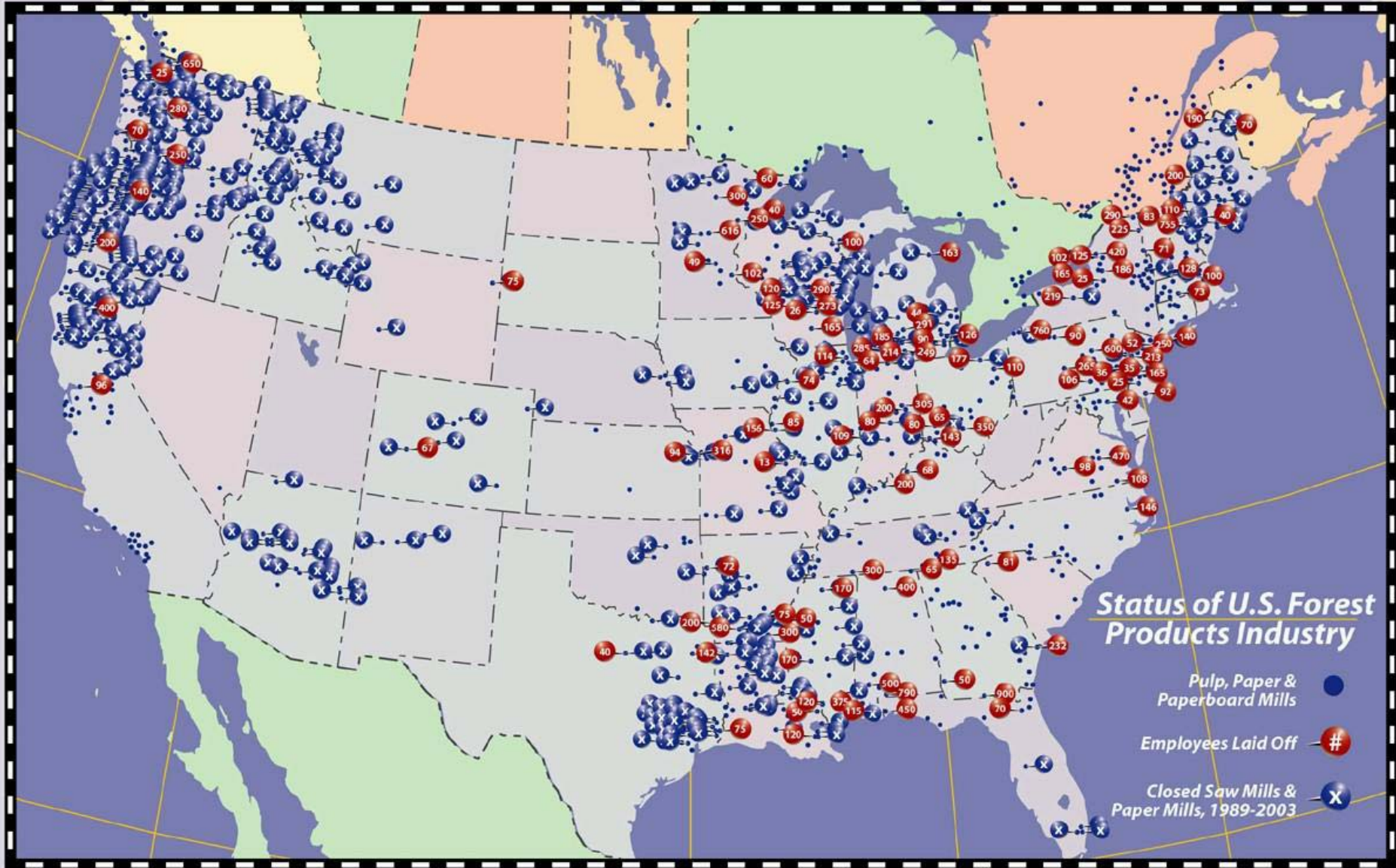
What does Deming say about American Industry?



W. Edwards Deming

**“You don’t have to
change...
...survival is not
mandatory.”**

Mill Closures & Layoffs, 1989 - 2003



How Do We Improve Quality?

Inspection—find and sort out bad product

Class exercise—read the following sentence

“Forest fires are the result of the thoughtlessness of man, combined with those factors of nature which allows a small flame to spread.”

Now go back and count the number of f's in the sentence—but count only once. Write your answer on a piece of paper.

Inspection Exercise

How many f's are there?

“Forest fires are the result of the thoughtless-
ness of man, combined with those factors of
nature which allows a small flame to spread.”

**Lesson—inspection doesn't
work very good!**

How Do We Improve Quality?

You cannot inspect quality into a product

By the time product is inspected, its level of quality has already been established

To improve quality, you have to improve the process that produced it

—W. Edwards Deming, *“Out of the Crisis”*

Improve the Process

“You must focus on the process if you are to continually improve your ability to meet your customers’ needs and expectations. There is no substitute for knowing your process and improving on them.”

—W. Edwards Deming, *“Out of the Crisis”*

What's this talk about customers?



1 What marketing suggested



2 What management approved



3 As designed by engineering



4 What was manufactured



5 As maintenance installed it



6 What the customer wanted

“The problem isn’t what we don’t know...
...but what we think we know.”

—Henry Hinck, Idaho Forest Industries

What is a Process?

- All work is process
- Processes can be identified, understood, measured, and improved

What is a Process?

- A process produces a product or service from a combination of
 - People
 - Machines & equipment
 - Materials
 - Methods
 - Environment

Tools for Improvement

- Checklists
- Simple tools for improvement
- Statistical Process Control (SPC)
 - Control charts
 - Lumber size control (SPC-LSA routine)
- Mill studies—controlled experiments

Circular Saw Maintenance Checklist

Daily	Weekly	Monthly
<input type="checkbox"/> Sawteeth swage & sharpness	<input type="checkbox"/> Saw ___ speed ___ plumb ___ flat (log side) ___ lead ¹ ___ shanks	<input type="checkbox"/> Carriage ___ frame ___ trucks ___ dogs
<input type="checkbox"/> Arbor bearings (heating)	<input type="checkbox"/> Saw collars ^{2, 3}	<input type="checkbox"/> Mill foundation
<input type="checkbox"/> Drive belts	<input type="checkbox"/> Lug pins ²	<input type="checkbox"/> Husk
<input type="checkbox"/> Guide pins	<input type="checkbox"/> Carriage wheels	<input type="checkbox"/> Saw guide (position) ¹
<input type="checkbox"/> Cleanup (debris, oil, etc.)	<input type="checkbox"/> Guide track	<input type="checkbox"/> Spreader
<input type="checkbox"/> Machinery guards in place	<input type="checkbox"/> Headblock-knee assembly	<input type="checkbox"/> Saw arbor (straightness) ^{2,3}
	<input type="checkbox"/> Drive and driven pulleys	<input type="checkbox"/> Track cleaners
	<input type="checkbox"/> Bolts (tightness)	<input type="checkbox"/> Pulleys & sprockets
	<input type="checkbox"/> Belt tension	<input type="checkbox"/> Bracing
	<input type="checkbox"/> Setworks (set)	<input type="checkbox"/> Hydraulic hoses

Machine Center _____ Date _____

Checked by _____ Initials _____

- 1 Items to be checked after changing saws.
- 2 Items to be checked after saw has been hung.
- 3 Items to be checked after saw has been severely overheated.

Lumber Quality Control Checklists

Terry Brown, Oregon State Extension

1. Falling & Bucking
2. Yarding, Decking, Loading
3. Log Yard (Sort Yard)
4. Debarking
5. Long Log Bucking
6. Carriage & tracks
7. Bandmill, Headrig, Resaw
8. Edgers—fixed, selective, combination
9. Dropout Sorting/Green Lumber Making
10. Trimmers
11. Green Chain
12. Automatic Lumber Sorters
13. Rough Green Storage
14. Dry Kiln
15. Rough Dry Storage
16. Planer Mill
17. Lumber Degrade Evaluation
18. Finished Lumber Storage & Shipping

Simple Tools for Improvement

- Check sheet
- Pareto chart
- Cause & effect diagram
- Histogram

Check Sheets

Used to gather data on processing problems to determine what problems are occurring most frequently.

Maintenance	Month						Treating Plant Check Sheet
Unscheduled	January	February	March	April	May	June	Total
Air Compressor							
Boiler							
Electrical							
Fill Pump							
Heat Exchanger							
Pressure Pumps							
Steam Leaks							
Steam Traps							
Tank Gauge							
Unloading Pump							
Total							

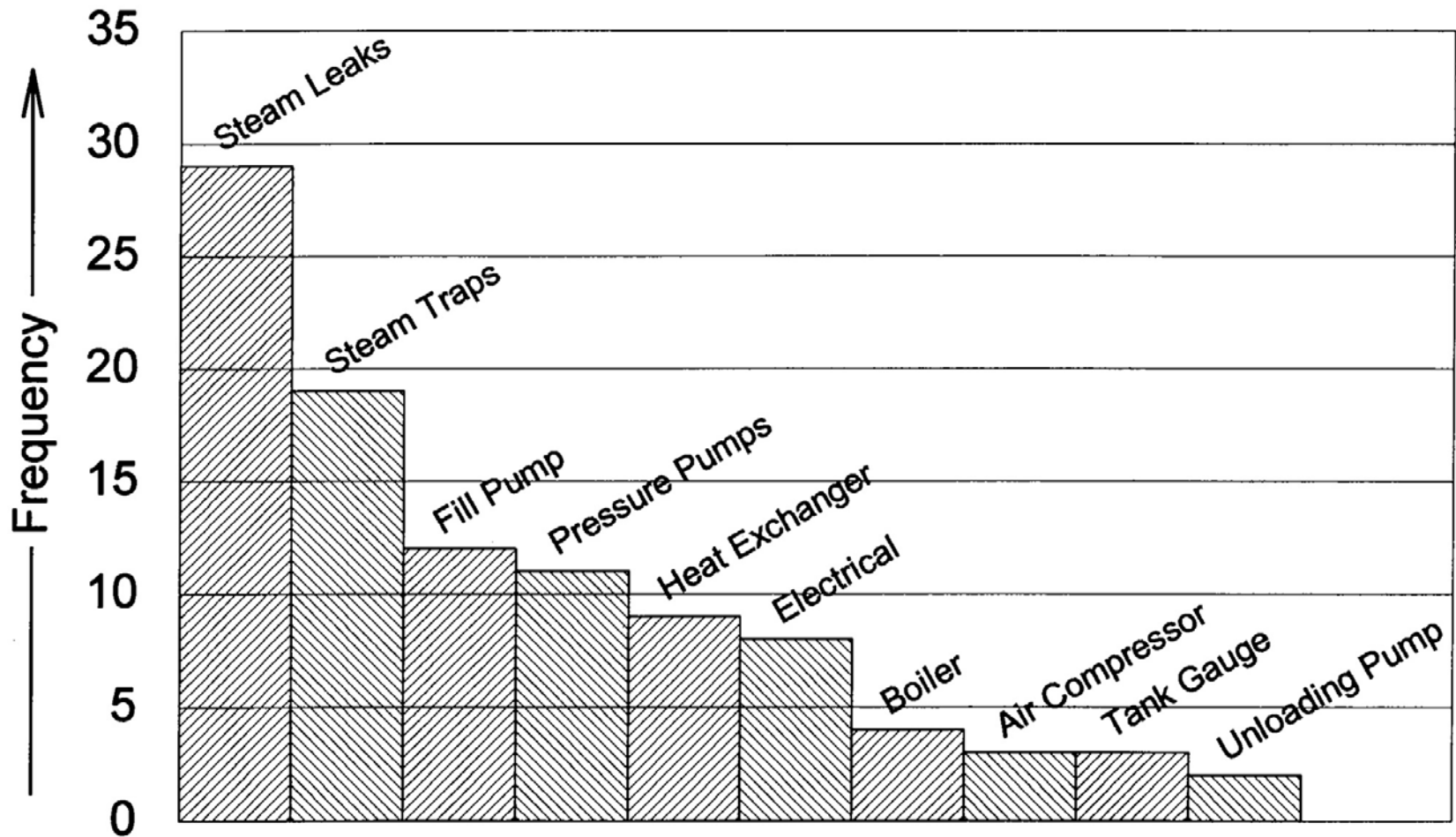
Maintenance	Month						Treating Plant Check Sheet
	January	February	March	April	May	June	Total
Air Compressor							
Boiler							
Electrical							
Fill Pump							
Heat Exchanger							
Pressure Pumps							
Steam Leaks	 		 		 		
Steam Traps		 					
Tank Gauge							
Unloading Pump							
Total							

Maintenance	Month						Treating Plant Check Sheet
	January	February	March	April	May	June	Total
Air Compressor							3
Boiler							4
Electrical							8
Fill Pump							12
Heat Exchanger							9
Pressure Pumps							11
Steam Leaks	 		 		 		29
Steam Traps		 					19
Tank Gauge							3
Unloading Pump							2
Total	19	20	17	16	16	12	100

Pareto Chart

- 80/20 rule
- Shows the relative importance of all the problems
- Helps choose a place to start solving problems
- Monitors success
- Identifies basic causes of a problem

Treating Plant Unscheduled Maintenance

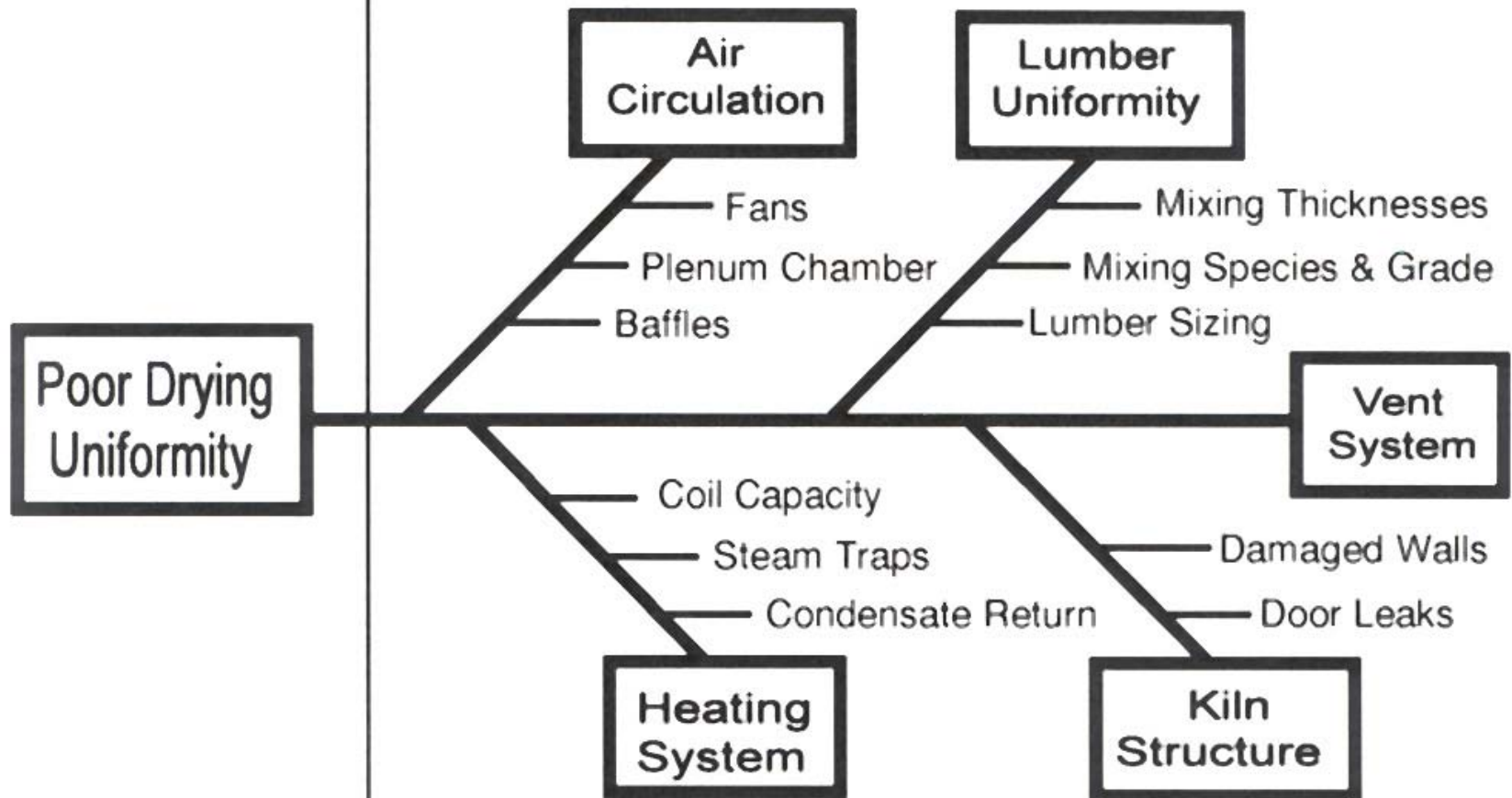


Cause & Effect (Fishbone) Diagram

- Used to identify, explore, and display possible causes of problem
- Possible causes grouped into major categories
- A detailed diagram looks like fishbones
- From the diagram, select the most likely causes for further study

Problem

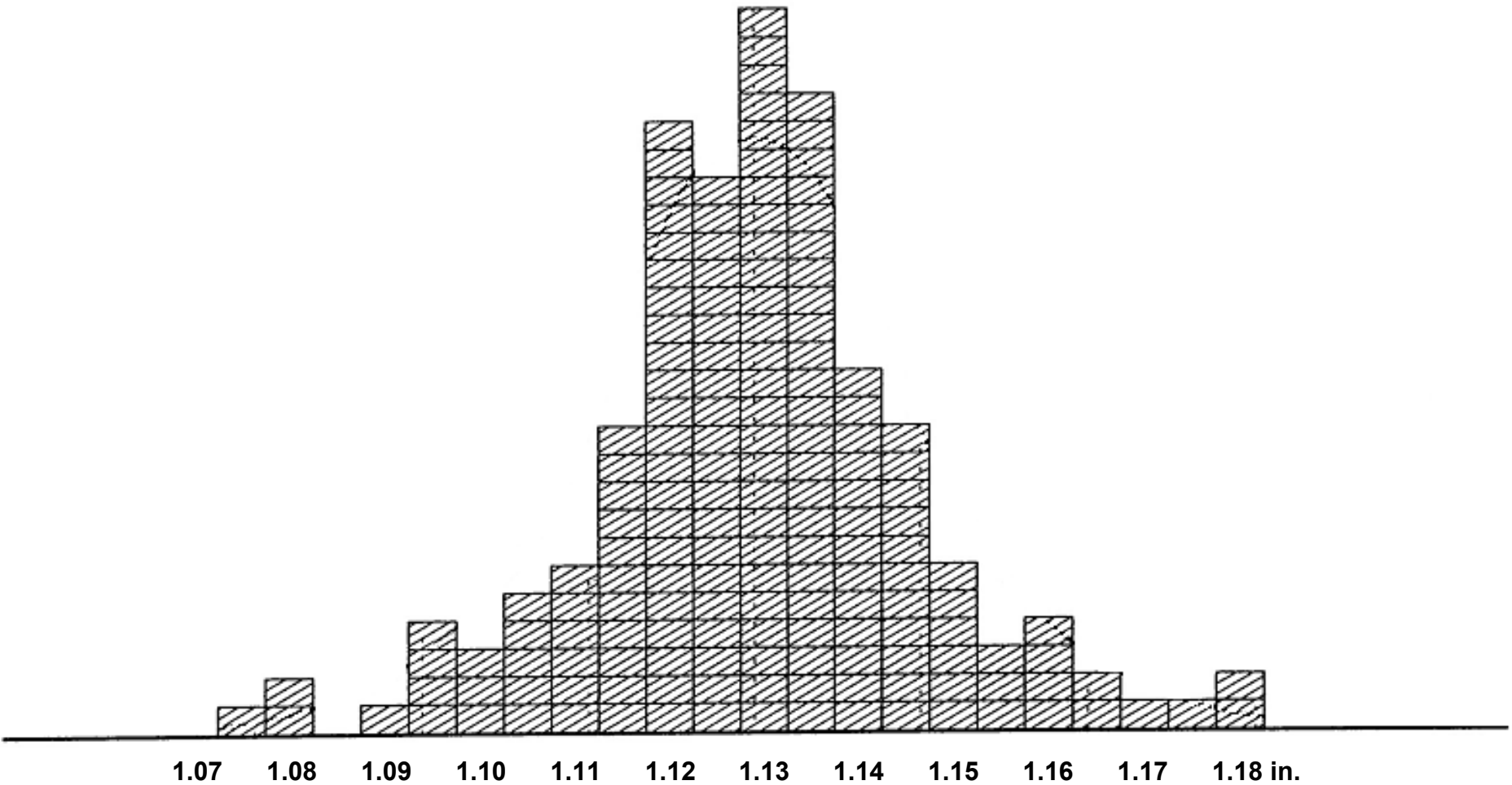
Possible Causes



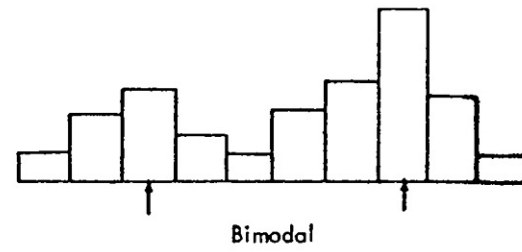
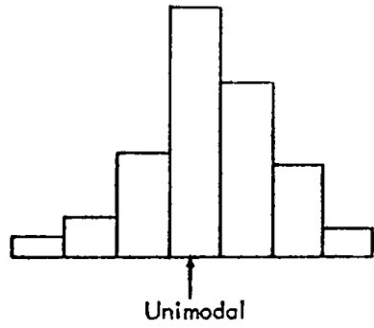
Histograms

- Display large amounts of data that are difficult to interpret in tabular form
- Show the relative frequency of occurrence of the data values
- Reveal the centering (**average tendency**), variation & shape of the data
- Help answer “Is the process capable of meeting product specifications?”

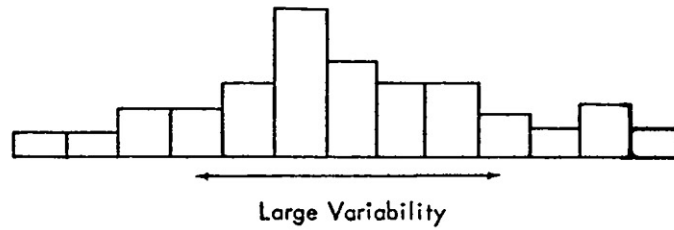
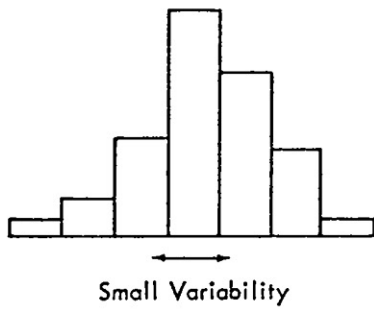
Histogram



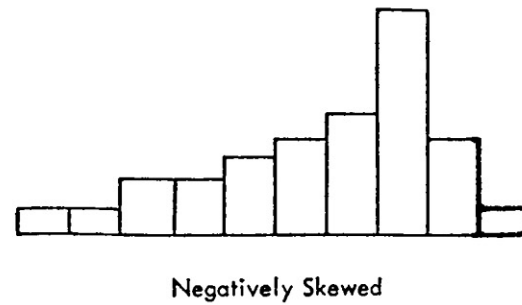
Illustrations of Central Tendency



Illustrations of Variability



Illustrations of Skewness



Mill Studies

- Work sampling
- Time & motion
- Productivity
- Volume recovery
- Grade yield
- Quality control



