



What Do I Do With These Numbers ?

San Fernando Valley

ASQ Section 0706

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Why Am I Collecting The Data??

- See if a problem exists (Acceptance sampling)
- Qualify a substitute process, material (Hypothesis Test)
- Effect of a factor on a response variable (Regression or Correlation)
- Determine factors effecting a process (DOE)
- Determine Process Capability (Cpk)
- Assess process stability (Control Charts)

What Type of Data Is It?

- Discrete (Attribute)
Good/Bad, Yes/No, Smooth/Rough
- Continuous (Variable)
Temperature, Reading, Time, pH
- Ordinal (Rank Order)
Preferential, Highest to Lowest

Do I Have The Right Data Collection Mechanism ?

- Are there good data collection forms?
 - ◆ Decimal place recording
 - ◆ Adequate space
 - ◆ Periodic Review
- Computer systems available
 - ◆ Appropriate spreadsheets
 - ◆ Able to be summarized

Data Collection Plan Features

Data Collection Plan _____ Project _____

What questions do you want to answer?

Being clear about your question will help you make sure you collect the right data.

Data		Operational Definition and Procedures			
What	Measure type/ Data type	How measured ¹	Related conditions to record ²	Sampling notes	How/where recorded (attach form)

Recording what data you are going to collect reminds you what you want to accomplish. Noting the type of data helps you decide how you should analyze the data.

An operational definition defines exactly how you will go about collecting and recording the data.

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How's My Measuring System?

- Discrete or Continuous – Is there enough resolution?
- Is the measuring equipment adequate?
- Has everyone been trained?
- Let's talk about Gage R&R
 - ◆ What is the variation? (30% rule)
 - ◆ Part to part vs. other variation

Common Problems with Measurements

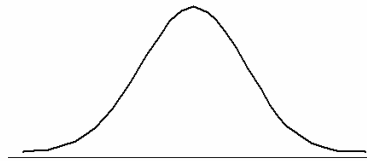
1. **Bias or inaccuracy:** The measurements have a different average value than a “standard” method.
2. **Imprecision:** Repeated readings on the same material vary too much in relation to current process variation.
3. **Not reproducible:** The measurement process is different for different operators, or measuring devices or labs. This may be either a difference in bias or precision.
4. **Unstable measurement system over time:** Either the bias or the precision changes over time.
5. **Lack of resolution:** The measurement process cannot measure to precise enough units to capture current product variation.

Sample Size Considerations

- Discrete Data – What is the level of concern? (defect level, %, etc.)
- How many sample can we afford?
- Continuous Data – What does the histogram look like? Is the distribution Normal (aka Bell Curve).
- Are there tests for normality?
- Is transformation necessary?

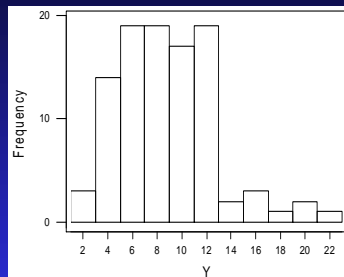
Recap: The Normal Curve

Definition: A probability distribution where the most frequently occurring value is in the middle and other probabilities tail off symmetrically in both directions. This shape is sometimes called a **bell-shaped curve**.



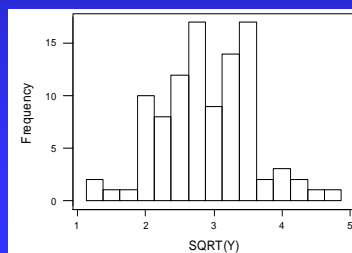
Example of a Square Root Transformation

Histogram of Y



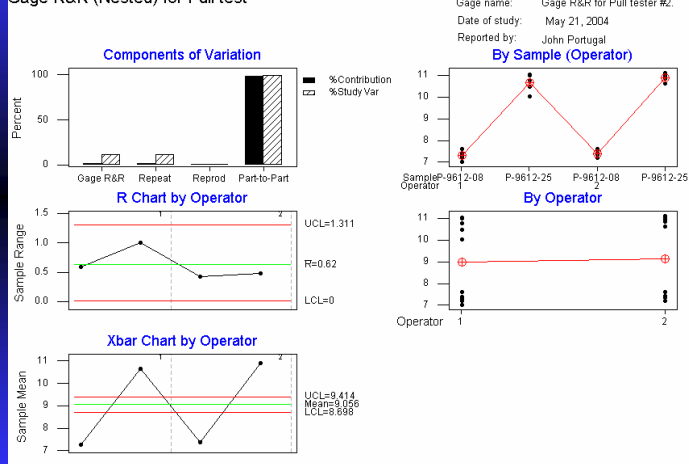
You can do anything you want with data as long as you treat all data the same!

Histogram of SQRT(Y)



An Example of Gage R&R

Gage R&R (Nested) for Pull test



How Do I Look At The Data

- It's PGA, Baby!!
 - ◆ Practical (Are there any obvious problems or patterns?) ANOB or ANOG
 - ◆ Graphical (Look at the Pictures)
 - ◆ Analytical (Check out the Statistics)

Economizing The Data Process

- Time Series Plot (Data Collection)
- Histogram (Shape and Spread)
- Data Review (Number Look Right?)
- Capability Study (Does It Meet Specs?)
- Control Chart (Is it Stable?)

All With The Same Data !!!

I don't have MiniTab is there anything else I can use?

- How about Microsoft Excel
 - ◆ An entire analysis tool package is there
 - ◆ You have to turn it on
 - ◆ Go to Tools>Add Ins>Analysis Tool Pak
 - ◆ Pick the right tool for the right job

After the statistical analysis

- Summarize the findings
- Issue a good report
 - ◆ In easy to understand language
 - ◆ Talk \$\$, it's a business you know
 - ◆ Explain what needs to be done
- Act upon the findings

THANK YOU !!