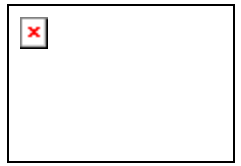
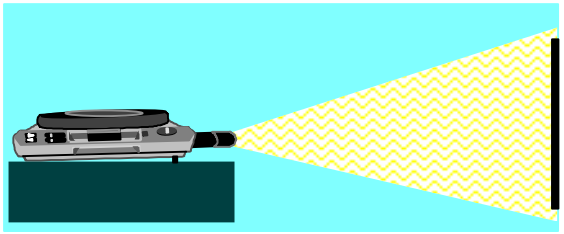
Set-up Reduction



Set Up Reduction

Definition

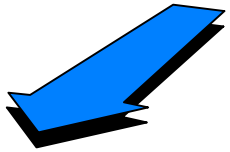
A concentrated and structured approach to the reduction or elimination of all activities that take place between the manufacture of the last item and the production of the first good item of a new batch



Set Up Reduction

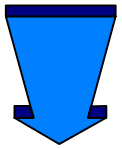
Set up reduction has a direct influence on the 3M's :-

MACHINE



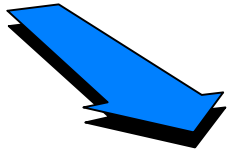
- Reduced down time
- Increased throughput
- Better utilisation of resource
- Reduced bottlenecking

MAN



- Improves utilisation of time of skilled labour
- Improves utilisation of intelligence of skilled labour
- Reduces walking time
- Reduces handling time
- Reduces potential for human error

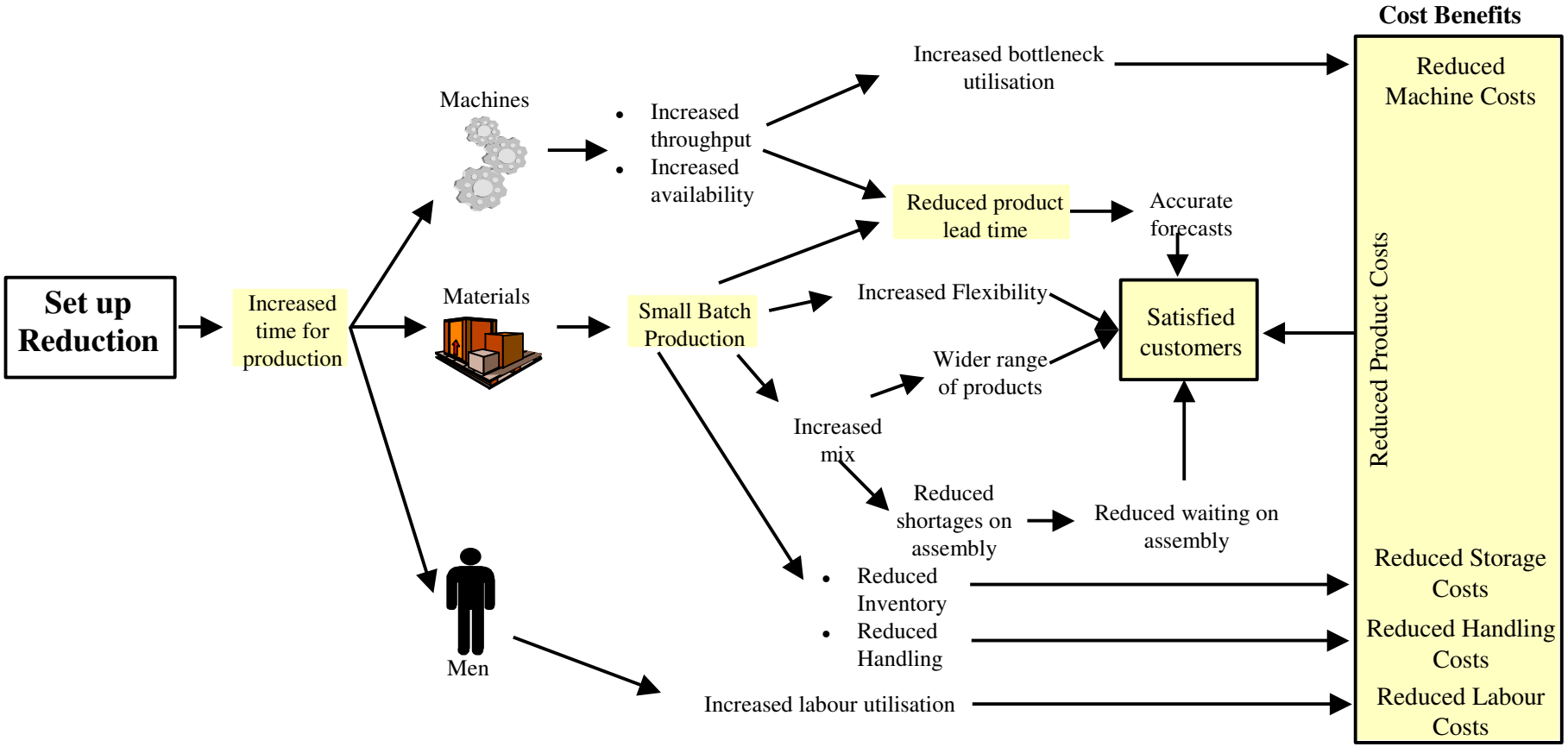
MATERIAL



- Allows smaller batch production
- Supports reduced inventory
- Improves inventory turnover
- Reduces material handling costs
- Drives reduction in scrap

Set Up Reduction

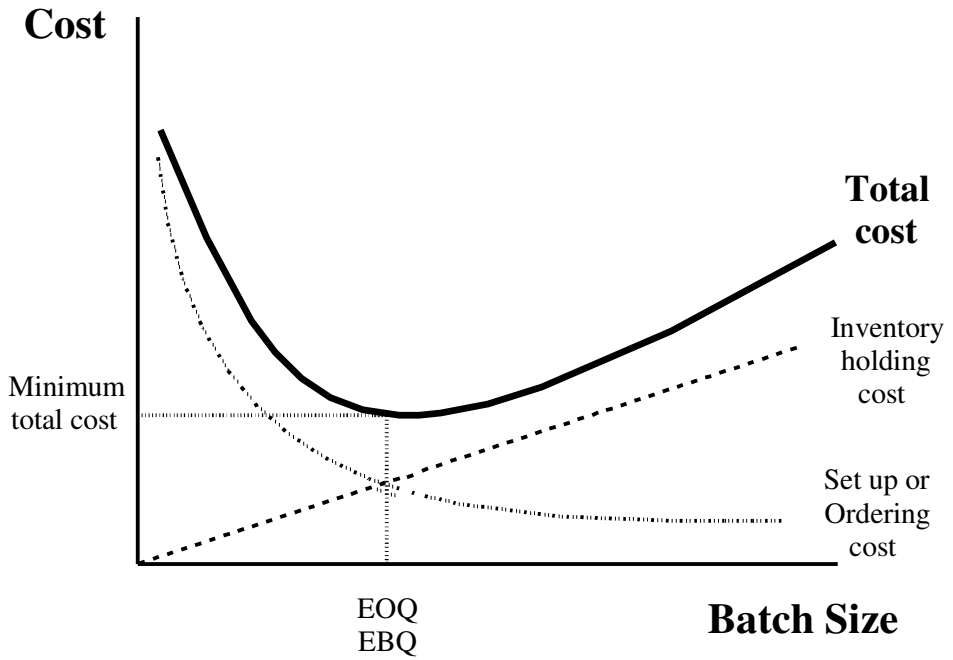
Why Reduce Set up Times?



Set Up Reduction

Set up Reduction & Batch Quantities

- Based on individual machine costs - no link to demand
- Simple trade off - no indication of hidden costs e.g. increased scrap, redundancy, etc.
- EOQ/EBQ is the balance point when total set up and inventory holding costs are minimum.



Set Up Reduction

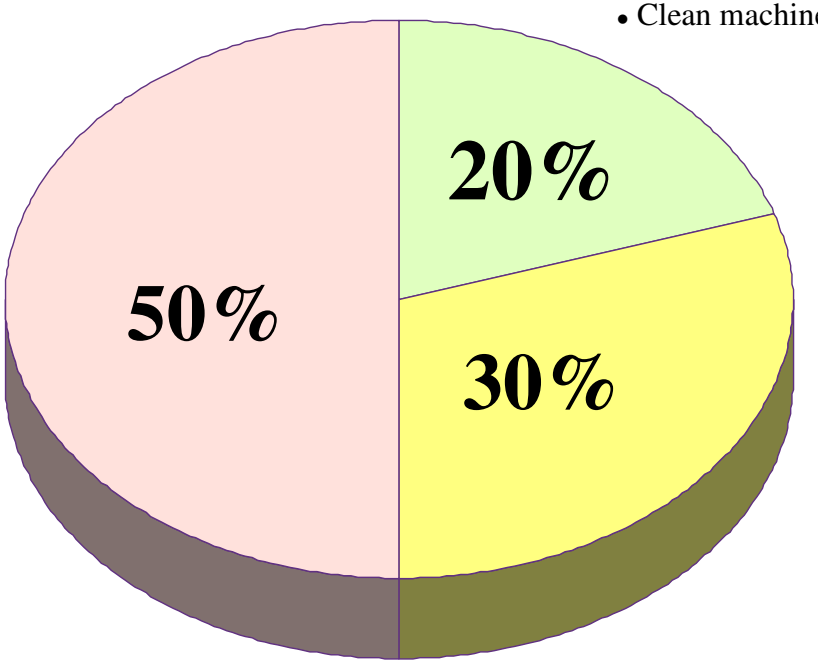
Typical elements of Set Up Time :-

Other

- Remove work
- Remove tools
- Return tools to stores
- Clean machine etc.

Adjustment & Tryout

- First cut
- Dimensional check
- Adjust machine
- Complete first off etc.



Preparation

- Obtain instructions
- Collect tools from stores
- Check and mount tools
- Check and mount material etc.

Set Up Reduction

Five Step Approach

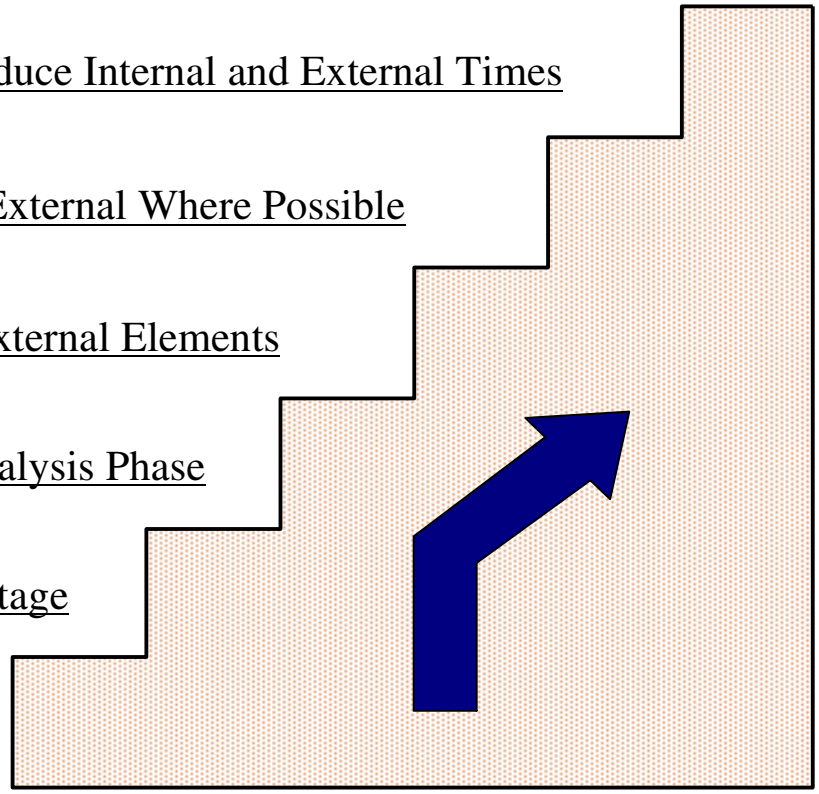
5. Reduce Internal and External Times

4. Convert Internal to External Where Possible

3. Identify Internal and External Elements

2. Analysis Phase

1. Preliminary Stage



Set Up Reduction

Step 3 - Identify Internal and External Elements

Internal

Tasks that can only be done whilst the machine/process is stopped.

Examples of internal Set up

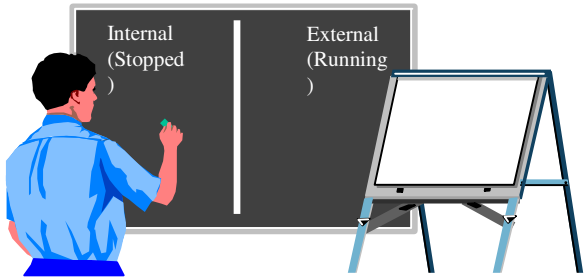
- Removing guards.
- Removing tools/loading tools.
- Removing components.
- Adjusting locators etc.
- Inspection and test.

External

Tasks that can be done whilst the machine/process runs on the previous job.

Examples of external Set up

- Collecting tools and materials.
- Positioning cranes and handling equipment.
- Preparing tools, clamps, bolts, etc.
- Clearing up and cleaning.
- Planning, organising, preparing data, etc.



Set Up Reduction

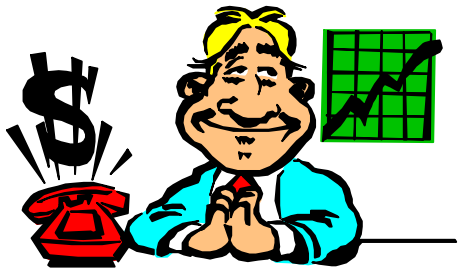
Benefits Summary

Reduced set up

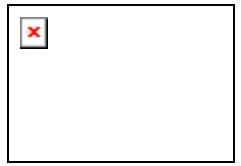
- Small Batches
- Avoids waste of overproduction
- Minimises Inventory
- Minimises lead times
- Make to Order Philosophy
- Improved production control
- Minimises overheads

Traditional

- Large Batches / Long Runs
- Encourages overproduction
- Creates buffer inventory
- Long lead times
- Make to Forecast Philosophy
- Complex production control
- High overheads



7 Quality Tools

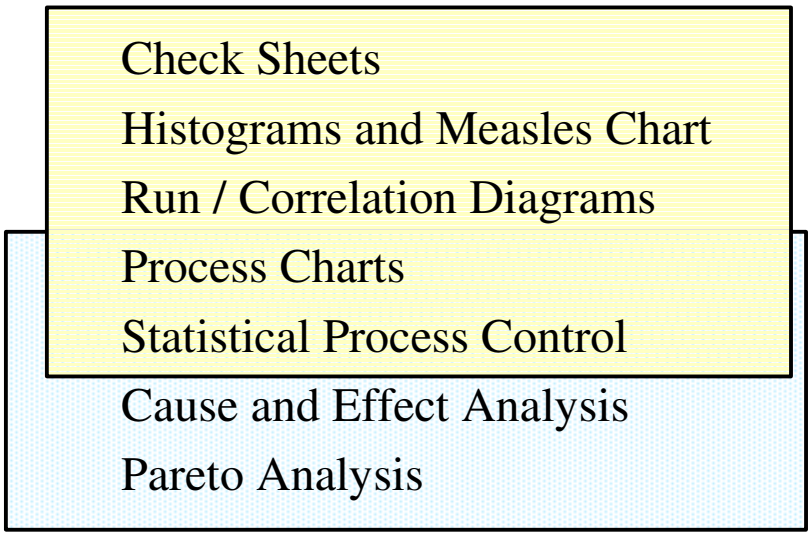


7 Quality Tools

Problem solving tools which can:-

- Help to identify and prioritise problems quickly and more effectively.
- Simplify the decision making process.
- Provide simple but powerful tools for use in continuous improvement activity.
- Provide a vehicle for communicating problems and resolutions throughout the business.
- Provide a way of extracting information from the data collected.

As well as using a systematic approach we also need to use tools which enable problems to be defined, data to be collected and analysed, solutions generated and selected and the effectiveness reviewed.



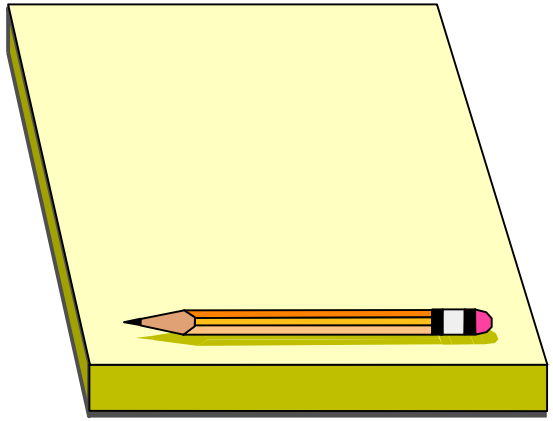
Data Collection Techniques

Analysis Techniques

7 Quality Tools

Checksheets

- A simple and effective method of gathering information.
- Ensures consistency of data collected.
- Can be completed whilst doing the normal job.
- Simplifies data collection and analysis.
- Highlights trends.
- Spots problems.

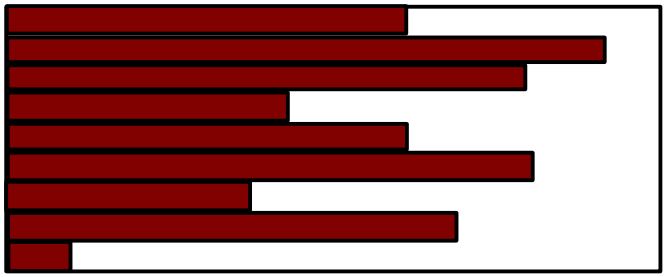


7 Quality Tools

Histograms and Measles Charts

Histograms

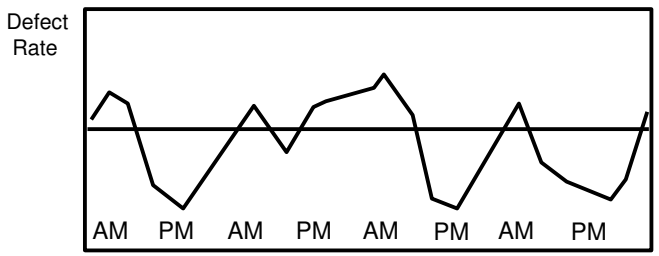
- Have much in common with the Pareto Diagram.
- Both show graphically the relative number of occurrences of a range of events.
- Makes important causes become apparent.
- Specification limits can be included to display the capability of the process.
- Can be used to collect data as it happens.
- Histograms may be vertical or horizontal.

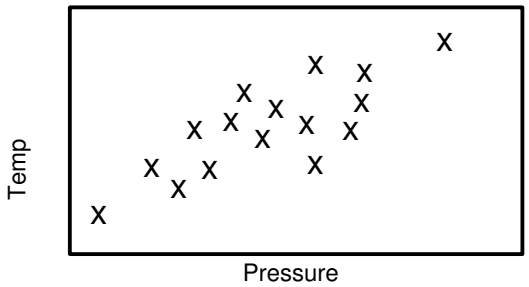


7 Quality Tools

Run & Correlation Diagrams

- Used to explore relationships between events and time, and between problems and causes (2 variables).
- Both are experimentation techniques to find out when and how problems arise and how they are rectified.
- Both are simple yet very effective methods.
- Definite trends can be easily detected.

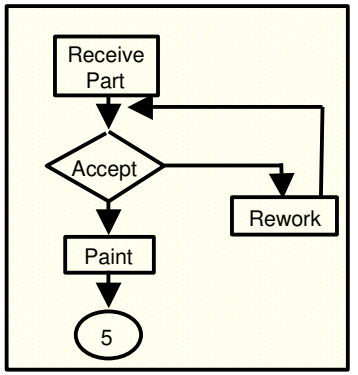




7 Quality Tools

Process Charts

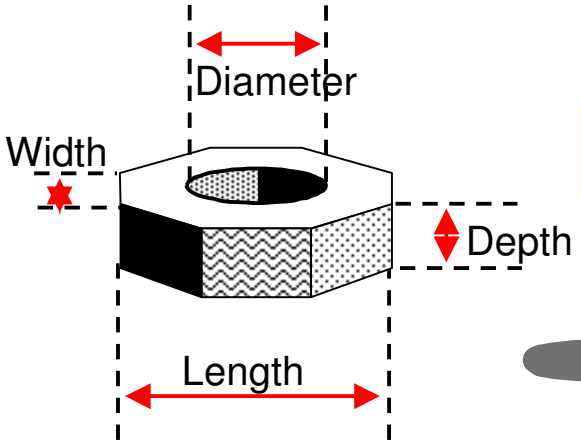
- Lists every step that is involved in the manufacture of a product or the delivery of a service.
- Excellent tool for identifying wasteful actions.
- It documents the process completely.
- Systematic approach to reveal possible sources of quality and productivity problems.
- The use of standard symbols aids clarity.
- Commonly used to promote improvements.
- The charts are best assembled using a team approach (preferably "front line staff").



7 Quality Tools

Statistical Process Control (SPC)

SPC is based on taking measurements of a process, product or feature.



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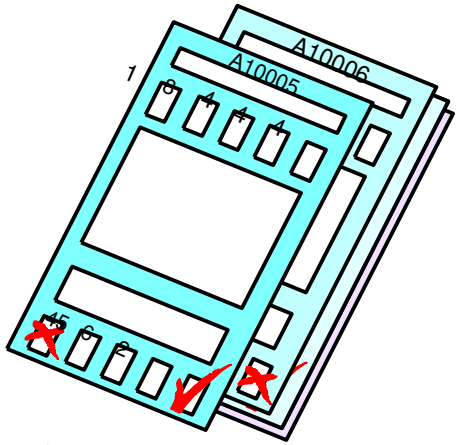
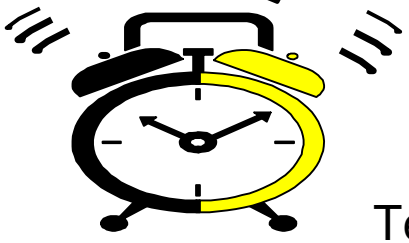
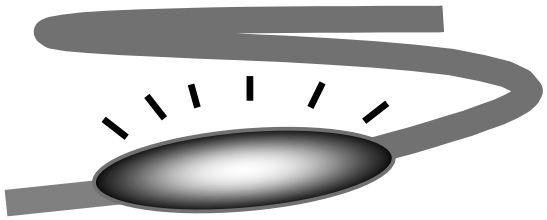




Time/Dwell

Temperature



Air pressure

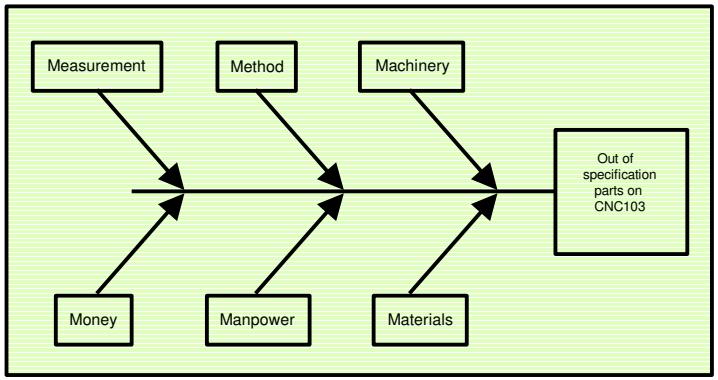
7 Quality Tools

Cause & Effect Analysis

- Identifies possible root causes of current problems.
- Provides a list of areas for which data will have to be collected and then analysed.

Having defined the opportunity / problem or "effect" in its simplest form, then :

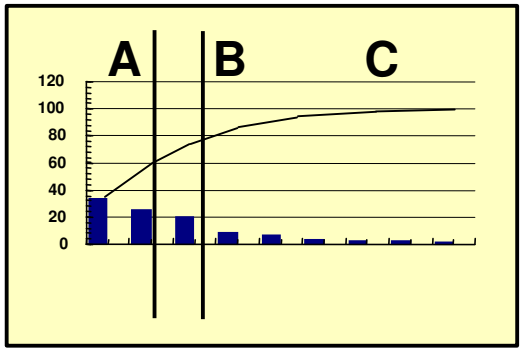
1. Assemble appropriate personnel.
2. Brainstorm the possible causes.
3. Group the causes into broad categories. Typically these might be the 6 M's.
4. Analyse the completed diagram and identify the most likely root cause/s of the effect.



7 Quality Tools

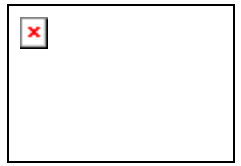
Pareto Analysis

- Simply a frequency distribution of attribute data arranged by category.
- Commonly known as "ABC Analysis" or "the 80 / 20 Rule".
  - *80% of the wealth is owned by 20 % of the people*
  - *80% of holidays are taken during 20% of the year*
  - *80% of overtime is worked by 20% of the workers*



- Its one of the most effective yet simple tools available.
- An effective ongoing improvement tool.
- Identifies the most significant problems to be worked first.
- Has varying applications for use in manufacturing.

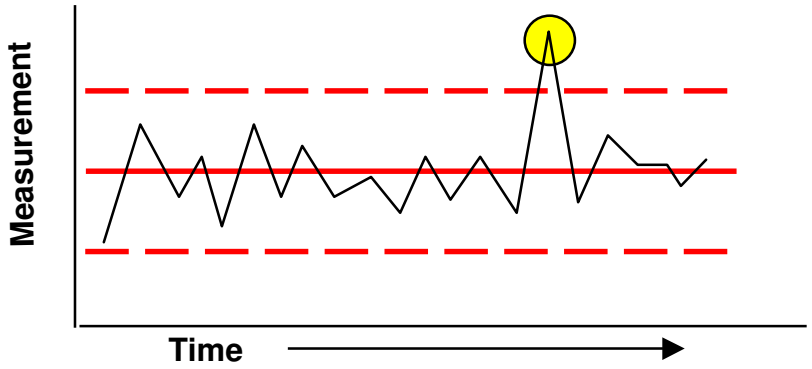
Statistical Process Control (SPC)



SPC

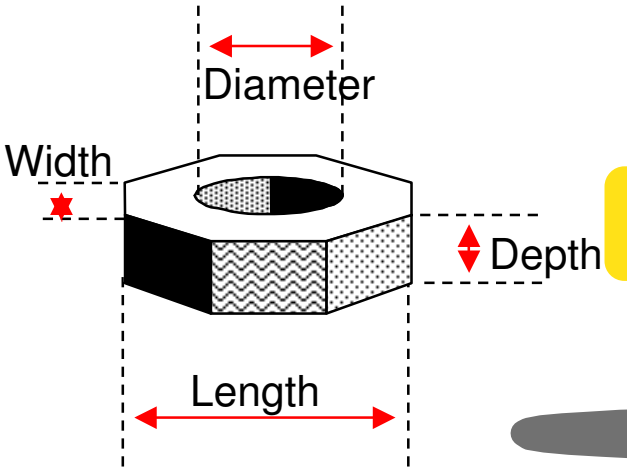
Definition

"Statistical Process Control (SPC) is a philosophy that uses statistical techniques in all areas of a company to make continuous improvements in quality and productivity by reducing variation in any process."



SPC

SPC is based on taking measurements of a process, product or feature.



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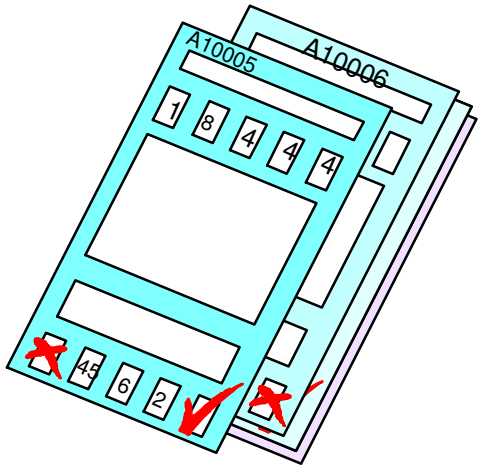
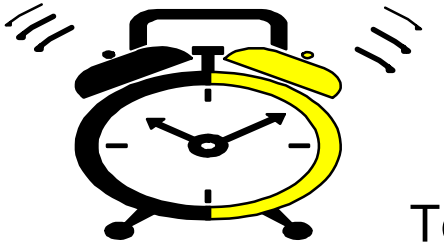
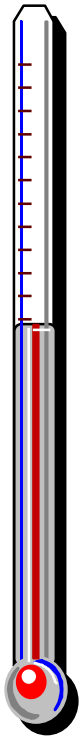
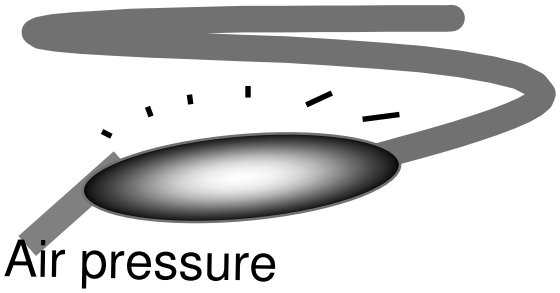




Time/Dwell



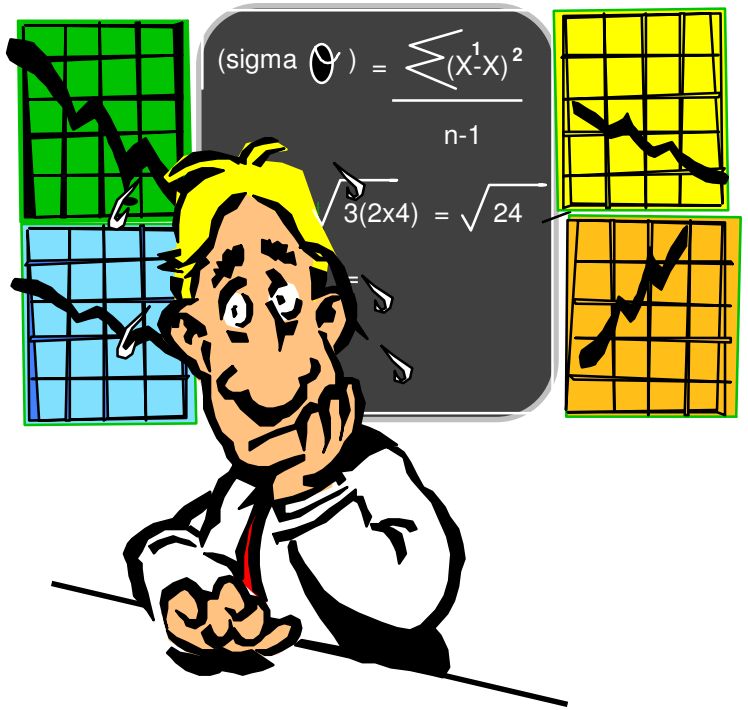
Temperature



Air pressure

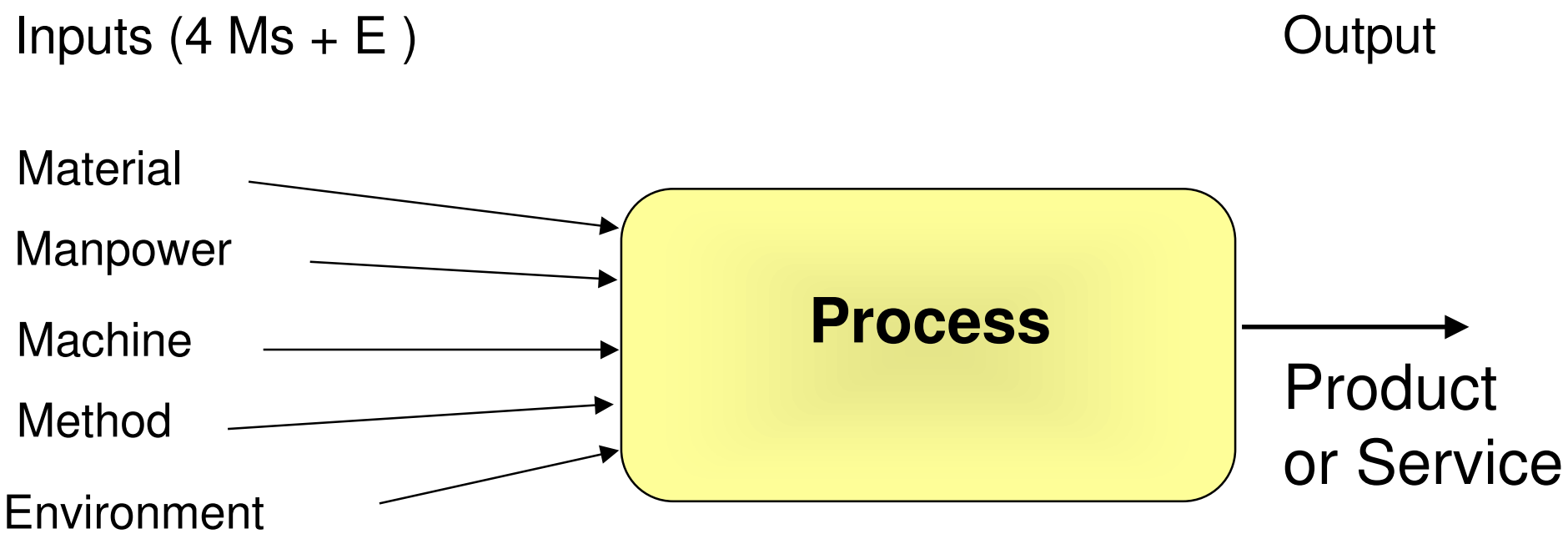
SPC

- No previous knowledge of SPC is necessary.
- You don't have to be a whiz at maths.
- SPC encourages the team approach.
- SPC can be applied to any process or activity.



SPC

All processes/activities are comprised of five inputs



A change in any of the inputs will affect the output

SPC

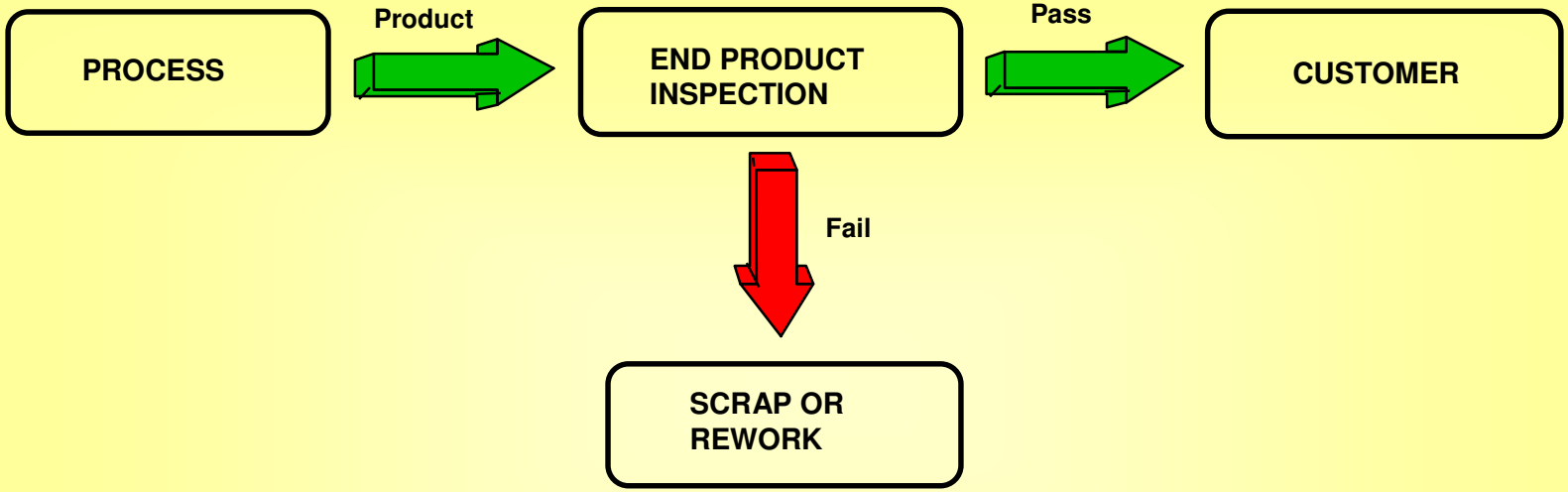
Example - A cup of tea

Material	-	Tea, Milk, Sugar, Water
Manpower	-	Yourself
Machine	-	Kettle, Spoon, Cup
Method	-	The way you make it
Environment	-	Kitchen

We all produce a different result.

SPC

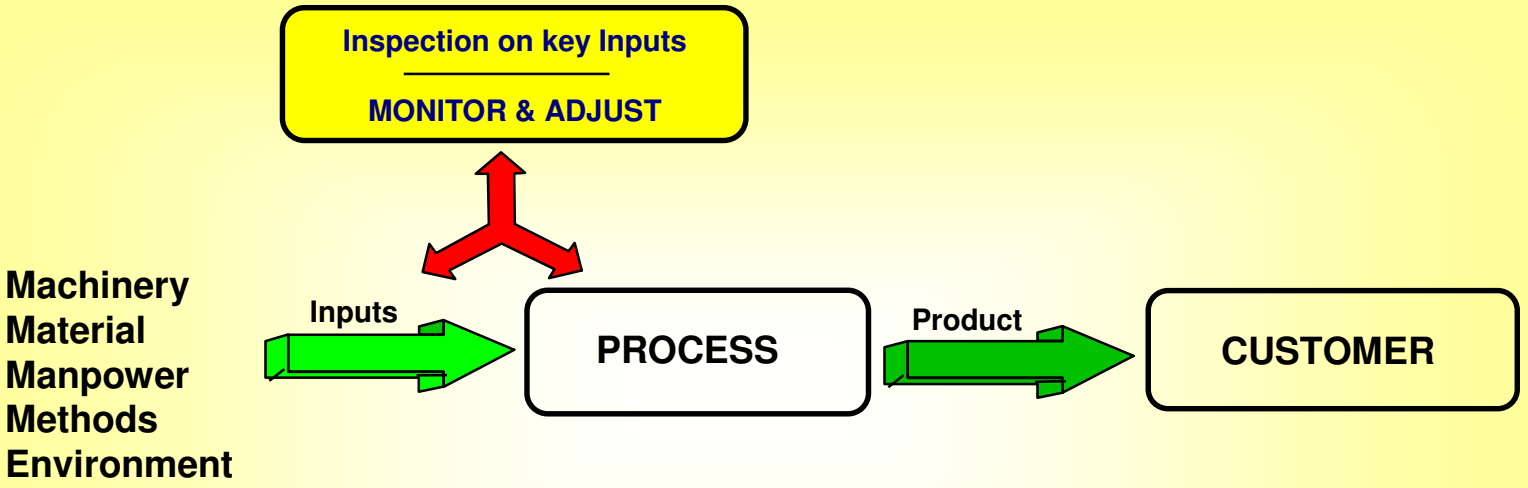
Detection concept of Quality :



- Concentrates on stopping the customer receiving out of spec parts.
- It is expensive and labour intensive.
- It's not 100% effective.
- It does not look at the cause of the problem.

SPC

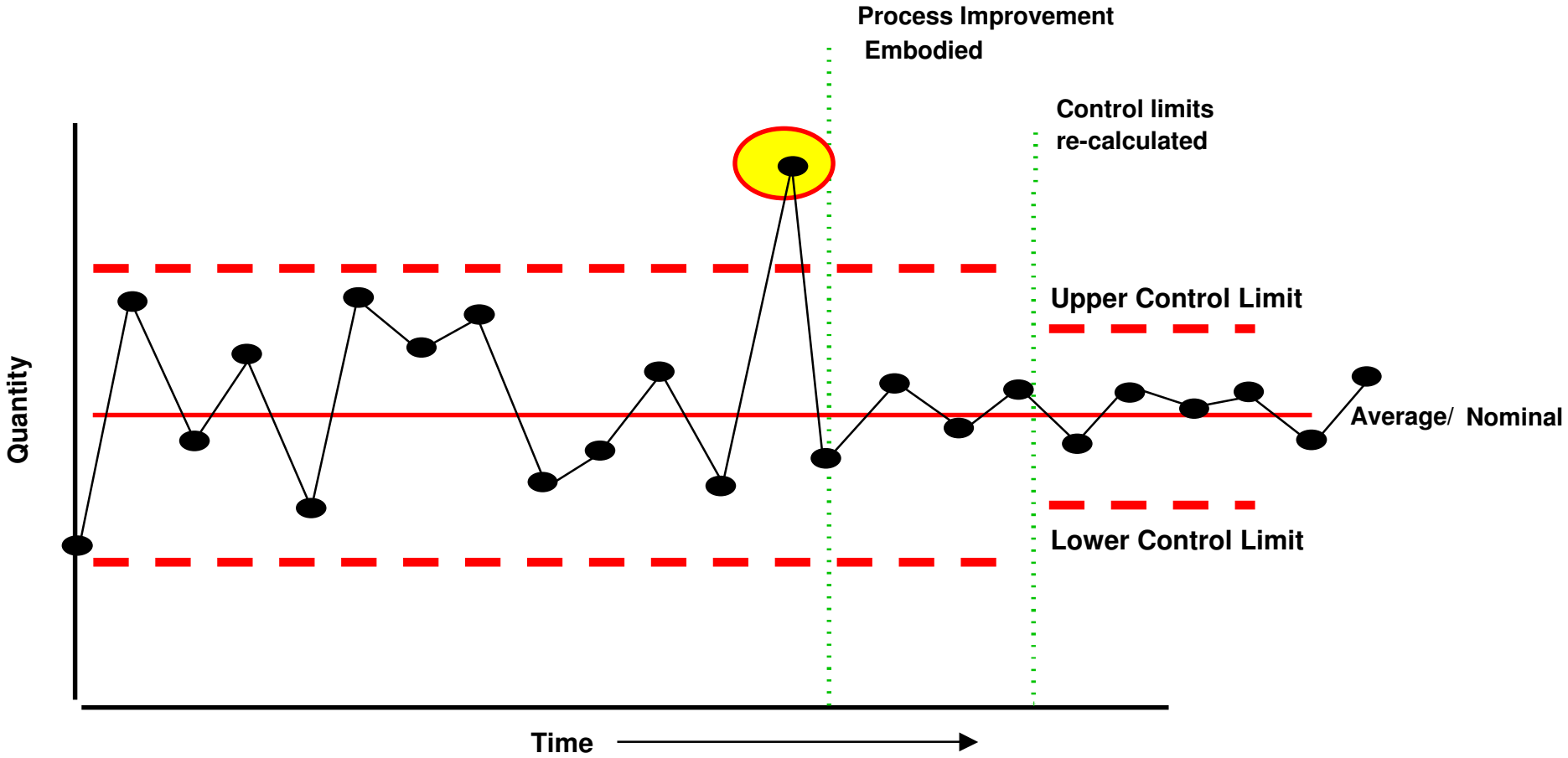
Ideal Quality Concept - control the process not the product



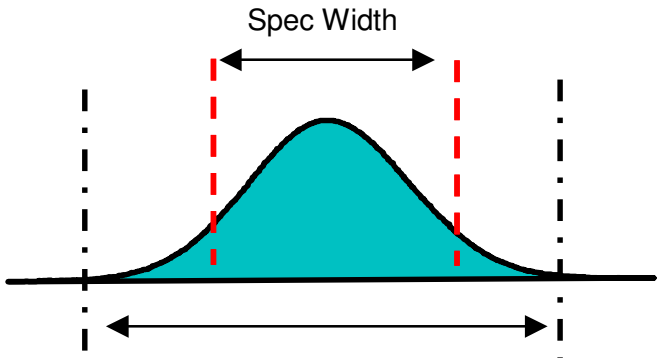
- Uses SPC to identify and control Variation within the process.
- Eliminates scrap and rework.
- Involves the process operator, inspection, management and suppliers.
- Concentrates on controlling the process and not the product.

SPC

Basic Control Chart



SPC



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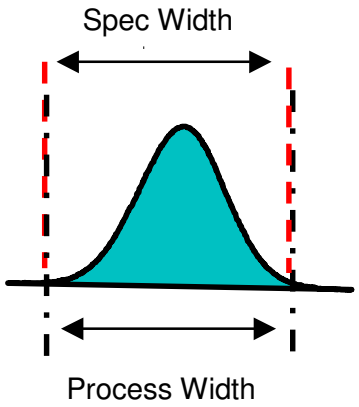

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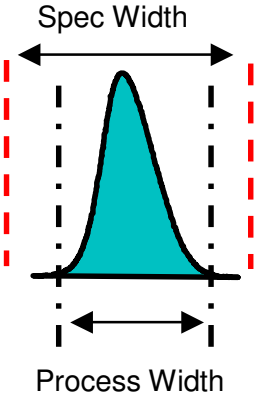

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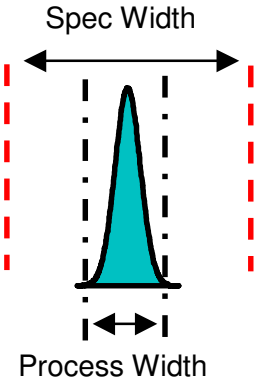

Cpk = 3

Process capability - Cpk

Examples assume the process is centred