The Quality Control Function

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Quality Control

Can not be avoided

- Is expensive
- Optimum level required

Must be very clearly focussed

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Lack of Focus

Too much data

- Information too late
- Picture not clear

Poor decisions, unnecessary cost

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Focus on Functions

Reasons for quality control testing

- Analyse for key control parameters
- Establish *minimum* testing requirements
- Document operations and procedures

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Key Functions

All have different requirements

- Customer service
- Product monitoring
- Process control
- Product development
- Investigations

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Distinguish Between

Performance Targets

and

Process Control Parameters

They are not the same and must not be confused

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Performance Targets

Are those fabric properties
that the customer specifies
e.g.
Weight 150 gsm ± 5%
Shrinkage not more than 6%

This is what we are supposed to deliver

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Control Parameters

Are those yarn and fabric properties,
machine settings and process conditions
which have to be held at constant levels
to guarantee the Performance Targets

This is how we achieve our Performance Targets

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Control Parameters

Examples:

- Yarn Count
- Course Length
- Finished Course Density

Right-First-Time means no compromise
in hitting Control Targets

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Minimise the Amount of Testing

Test only what is strictly necessary

- Shrinkage testing is not always necessary
  ...courses and width will serve
- Grey fabric weight is not necessary
  ... it is not a control parameter
- 100% inspection is seldom effective
  ... it means that quality is out of control

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Quality Control Testing

Should be a precision tool

- For designated control parameters
- At specific locations
- For defined reasons

Data are not just for filing.
They must have an immediate purpose

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STARFISH Philosophy

Product Quality and Performance
are guaranteed by

- Rational Product Design
- Accurate Process Control

START as you mean to FINISH

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Major Activities

- Identify critical processes
- Establish control parameters
- Define procedures to maintain control
- Ensure proper operative training
- Investigate how to improve control

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Accurate Process Control

Requires a knowledge of the
normal operating capability of the process

Determine Standard Deviations

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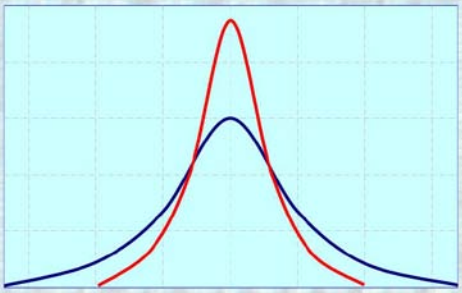
Standard Deviation



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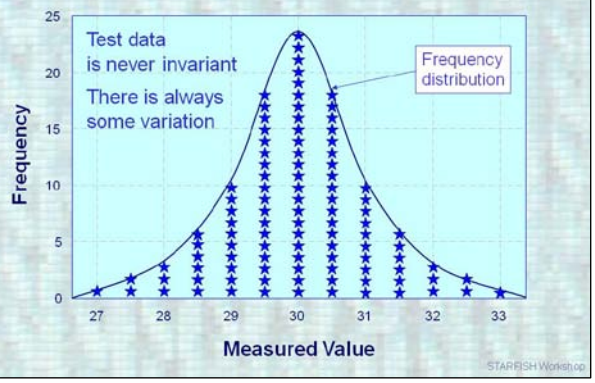
Variability of Test Data



Standard Deviation - Definition

SD is a measure of variability

Deviation of an individual measurement, Xi
= (Xi - Mean)

Variance = mean (squares of deviations)

Standard Deviation = square root of Variance

Low Standard Deviation means
low variability in measurements

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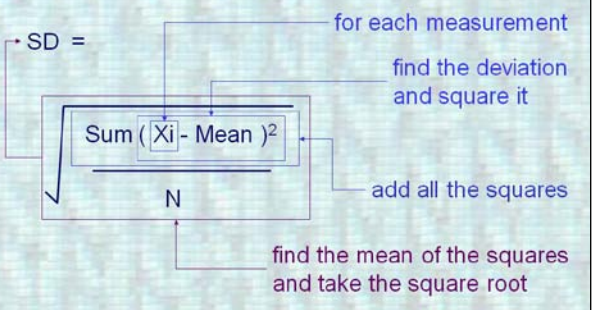
Standard Deviation - Calculation



Spreadsheets allow automatic calculation

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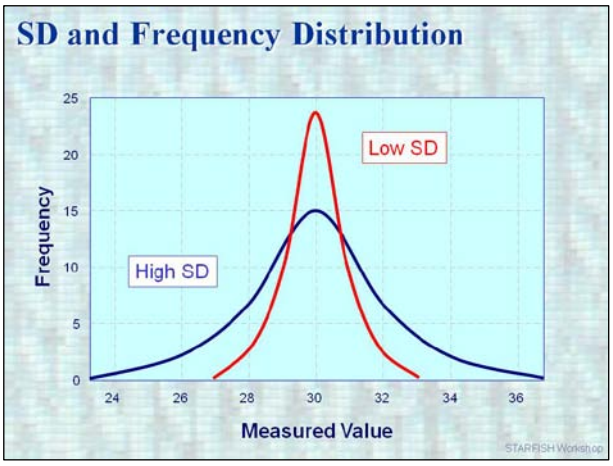
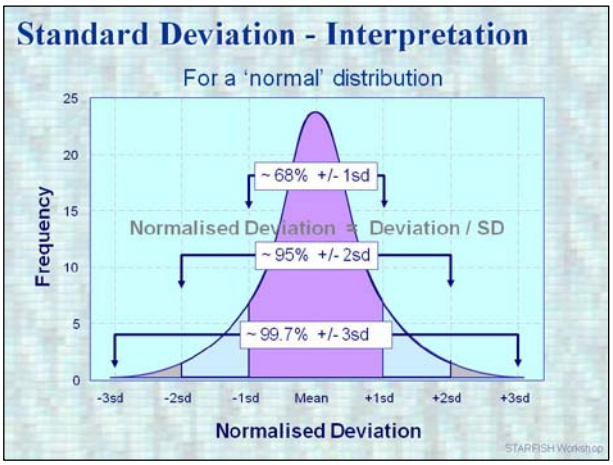
SD and Frequency Distribution



Standard Deviation - Interpretation



SD and Process Control

Well-controlled processes deliver low Standard Deviations

SD contains all of the variations in

- materials
- methods
- machinery

SD is an objective indication of the current level of control in the operation

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Coefficient of Variation

Standard Deviation expressed as a percentage of the Mean

CV = 100 . SD / Mean

CV allows comparisons of variability to be made between properties that have different means

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Standard Error

The more measurements we make the more reliable is the mean

Standard error is an indication of the reliability of the mean

SE = SD / square root (N)

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Standard Deviations

Are fundamental to process control

- They reflect the normal capability of a process
- They determine the current limits of control

They comprise:

- Assignable variation
- Random variation

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Assignable Variation

Example:

Variation in Yarn Count
causes variations in Fabric Weight

All assignable variations must be identified and held to a minimum

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Random Variation

Variation which can not be assigned to specific causes

After assignable variations have been identified and reduced to their minimum, the sources of apparently random variation can often be identified.

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Quality Control Charts

For monitoring Control Parameters

- Show whether a process is in control
- Can detect change or drift
- Simple, quick, understandable display

Statistical Process Control

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Control Chart Parameters

To construct a control chart we need to calculate:

- The Target Value
- The Normal Tolerance
- The Action Tolerance

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Target Value

The Design Specification

This is the value that we hope to deliver, on average, over a long period of time.

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Normal Tolerance

Two Standard Deviations

If the deviation from the Target Value is less than the Normal Tolerance

then the process is almost certainly operating within its normal capacity

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Action Tolerance

Three Standard Deviations

If the deviation from the Target Value is more than the Action Tolerance

then the process is almost certainly operating outside its normal capacity

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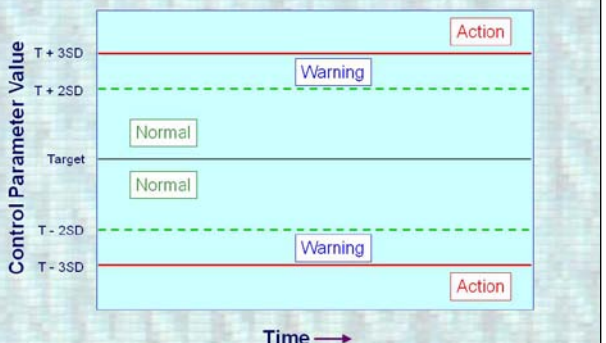
Quality Control Chart Outline



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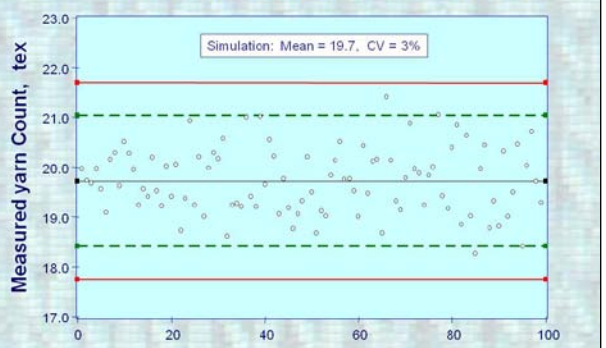
Control Chart For Yarn Tex



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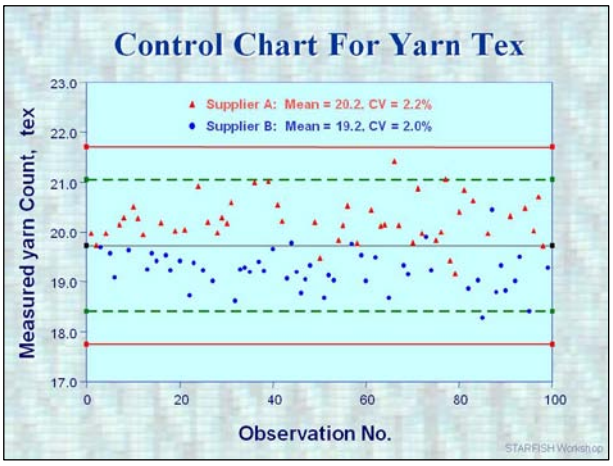

Supplementary Action Criteria

Gradual drift may not be obvious

- Therefore, take action if:
  - two consecutive warnings, same side
  - a run of seven on one side
- First action is:
  - make new measurements
  - confirm the action signal

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Caution

Variation is also contributed by

- Measuring instrument
- Measurement procedure
- Environment
- Operator

Standardize procedures, calibrate equipment and train operators thoroughly.

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Action

Must be taken immediately

Three general sources of problems

- Machinery
- Materials
- Operator

Control charts can be displayed

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Additional Uses

Control Charts can also be used to:

- Monitor design tolerances
- Monitor customer tolerances
- Optimise product design

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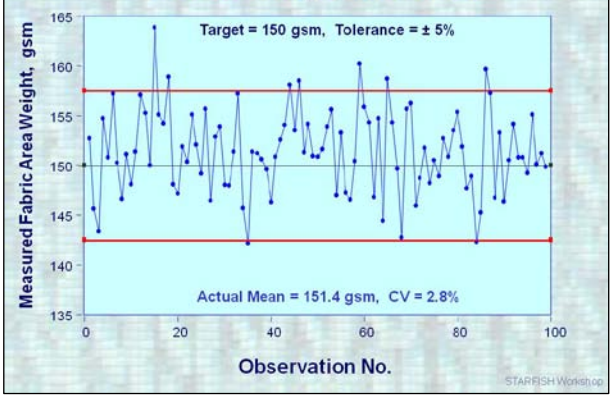
Monitoring Tolerances



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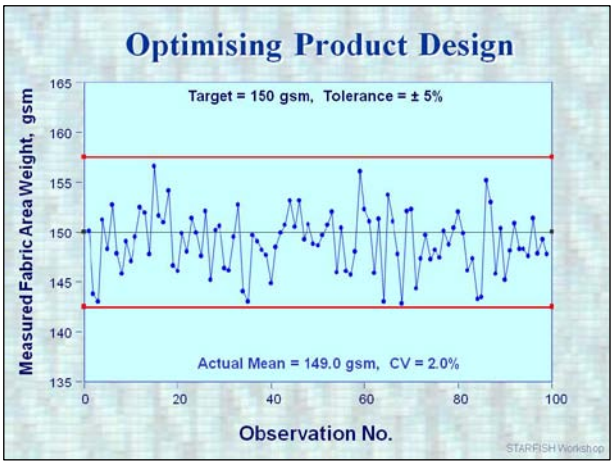
Optimising Product Design
Target = 150 gsm, Tolerance = ± 5%
Actual Mean = 149.0 gsm, CV = 2.0%
Measured Fabric Area Weight, gsm
Observation No.
165
160
155
150
145
140
135
0
20
40
60
80
100
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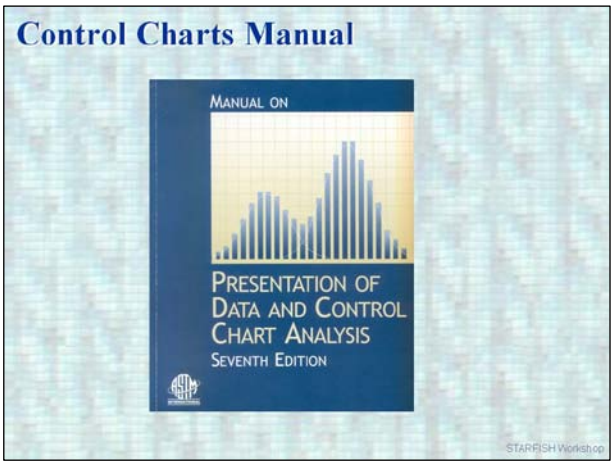
Control Charts Manual
MANUAL ON
PRESENTATION OF DATA AND CONTROL CHART ANALYSIS
SEVENTH EDITION
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