10 Ways to Improve your SPC System

September 14, 2021
Meet the Presenters

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Statistical Process Control (SPC) is the practice of using statistical techniques such as control charts and capability analysis to monitor and control a process.
Why Implement SPC?

Common language to Communicate about Quality
Why Implement SPC?

Increase Customer Satisfaction

Reduce scrap, rework, and waste

Increase confidence in quality results

Decreased human effort and probability of recalls
• While SPC can be extremely beneficial to any organization focused on quality improvements, there are many ways to start and later improve when first establishing a program.

• In our time together, we’ll cover 10 of them!
To recognize the most immediate impact, phase in your changes in a way that's least disruptive to production. Pilot new ideas to confirm results are desirable.
Avoid overload when implementing SPC
How to Prepare for a Marathon:
1. Get the right gear
2. Educate yourself
3. Create a plan
4. Gradually increase your training distance
5. Go run a marathon!

How NOT to Prepare for a Marathon:
1. Go run a marathon!
SPC is a Marathon

Preparing for a Marathon:
1. Get the right gear
2. Educate yourself
3. Create a plan
4. Gradually increase your training distance
5. Go run a marathon!

Preparing for SPC:
1. Obtain the right tools
2. Educate yourself
3. Create a plan
4. Educate a small team on your plan
5. Go run a mile!
SPC is a Marathon

Study the first Mile:

1. Learn from your Pilot
2. Make changes if necessary
3. Test your changes
4. When satisfied, expand!
It’s important for your quality technicians (data collectors) to have some formal training on SPC.
What we’ve heard …

You want me to do what?

I just make sure we’re still in tolerance.

That’s someone else’s job, not mine!

I was never really trained.

I don’t have time for that!

I’ve seen the charts but don’t know what they mean.

I was never really trained.
Educate the Whole Team
Advice for Educating the Team

• Keep it Simple
• Sell the benefits
• No formulas or math
• Keep it Conceptual
• Employ software that makes their lives easier
• Share (and celebrate) your successes
• Practice, Practice, Practice!
Identify characteristics that are best suited for monitoring. Focus your energy on those which are key indicators for success in your processes.
What’s Most Important?

CMM

CMM Data
What’s most Important?

For each possible Metric, ask yourself:

• Does this metric cause me to lose sleep?
• How quickly would I respond if a signal were detected?
• Would I respond if a signal was detected?
• Is there be a financial impact of missing a signal?
• Could this signal impact customer satisfaction?
The Value of an Hour of Work

$30

$300

$3,000
Understanding the differences between Common and Special cause variation to avoid over-controlling your processes.
Two common control chart chart mistakes

**OVERCONTROLLING**
Treating common-cause variation as special-cause
(Making changes when none were necessary)

**UNDERCONTROLLING**
Treating special-cause variation as common-cause
(Failing to make changes when they were necessary)
Are you really improving your process? Reducing time and effort? Letting statistics do the monitoring?
Sometimes, there's a reason to ignore Out-Of-Control signals on your Control Charts.
There’s a Signal … Is it important?

- Swerve to avoid?
- Often the impediment will take care of itself
Are all Signals important?

- Hit the brakes!
- Continuing can lead to serious issues!
Compute control limits when you're happy with a particular process and compare the future against that state. Use tests which accurately signal special cause variation.
Misuse of Control Limits

• Relying on Excel
  – Wrong standard deviation
    (STDEV.P or STDEV or STDEV.S)
• Never computing or re-computing limits
• Using too many or too few tests to provide signals
Standard Deviation vs. Estimated Sigma

Using Estimated Sigma
Recomputing Limits

Set 1: UCL = 77.2149, CL = 64.6504, LCL = 52.0859 (from: 1 to: 27)
Set 2: UCL = 80.3633, CL = 71.1152, LCL = 61.8651 (from: 27 to: 53)
Control Testing

Use tests that are:

1. Simple
2. Avoids false alarms
3. Signals that the average changed
4. Signals of a trend up / down
5. Signals for large / small variation
6. Detects unusual patterns

AIAG

- Beyond Limits
- 7 ascending
- 7 descending
- 7 above centerline
- 7 below centerline

JURAN

- Beyond Limits
- 2 of 3 above 2 sigma
- 2 of 3 below 2 sigma
- 4 of 5 above 1 sigma
- 4 of 5 below 1 sigma
- 9 above centerline
- 9 below centerline
- 6 ascending
- 6 descending
- 8 beyond 1 sigma
Understand the difference between Control limits and Specification limits. They are not the same thing!
Control Limits vs. Spec Limits

Control limits reflect **actual** process variation

Voice of the **Process**

Specification limits reflect **allowable** process variation

Voice of the **Customer**
We need the Tensile strength of that material to be between 100 and 125 PSI.

Under normal conditions, we expect the Tensile strength of that material to be between 95 and 115 PSI.
Control Limits vs. Spec Limits

Basic Statistics
- 750 data values
- Mean: 90.02
- Sigma of the individuals: 4.08
- Process std. dev. (σ) 133.786

Subgroup Statistics
- SS: 4
- Estimated Sigma: 3.91

Performance Statistics
- Ppu: 0.48
- Ppk: 0.48

Capability Statistics
- Cp: 0.50
- Cpk: 0.50

Out-of-spec:
- Above: 6.00%
- Below: 7.00%
- Total: 13.00%

Footnotes
- (σ) = Users Estimated Sigma
We've accomplished our goals when our processes are both Stable (in control) and Capable (In spec)
The Four States of Quality

- In control and capable
- In control, but not capable
- Out-of-control and not capable
- In control, but not capable
Four States of Quality

- In control / capable
- Out-of-control / capable
- In control / not capable
- Out-of-control / not capable
Four States of Quality

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Four States of Quality

SBC

tability

Before

ability
Statistical Process Control makes you aware of variation. Only your actions can reduce variation.
• Alerts / alarms are useful to get your attention, but you still must decide whether to act on them.
• The alert also doesn’t tell you WHAT to do!
Reducing Variation

Use software to highlight biggest sources of variation in your SPC program.
Control charts are only as valuable as the good practices that accompany them.
Confounding Factors

Searching for the facts that benefits your theories
Confounding Factors

Graph showing the increase in ice cream sales and shark attacks from May to July.
In Summary

Successful SPC Implementation

- Phase it in
- Educate the whole team
- Monitor only critical metrics
- Don't Overcontrol
- Respond only when necessary
- Use the best Control Limits
- Separate Control Limits from Spec limits
- Strive for SBC
- Take measures to reduce variation
- Avoid bias when analyzing data
- Avoid bias when analyzing data
Thank You, Quality Digest!

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