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Fundamentals of Process Capability

Stable Process



A stack of nine smooth, dark, rounded stones is balanced vertically on a rocky shore. The stones are dark grey or black with some lighter, brownish spots. The background is a blurred view of the ocean with white-capped waves crashing against the shore. The overall scene is serene and balanced.

Defined Specifications

A Ratio



How do you use
process capability?

What is Process Capability?



A Stable Process

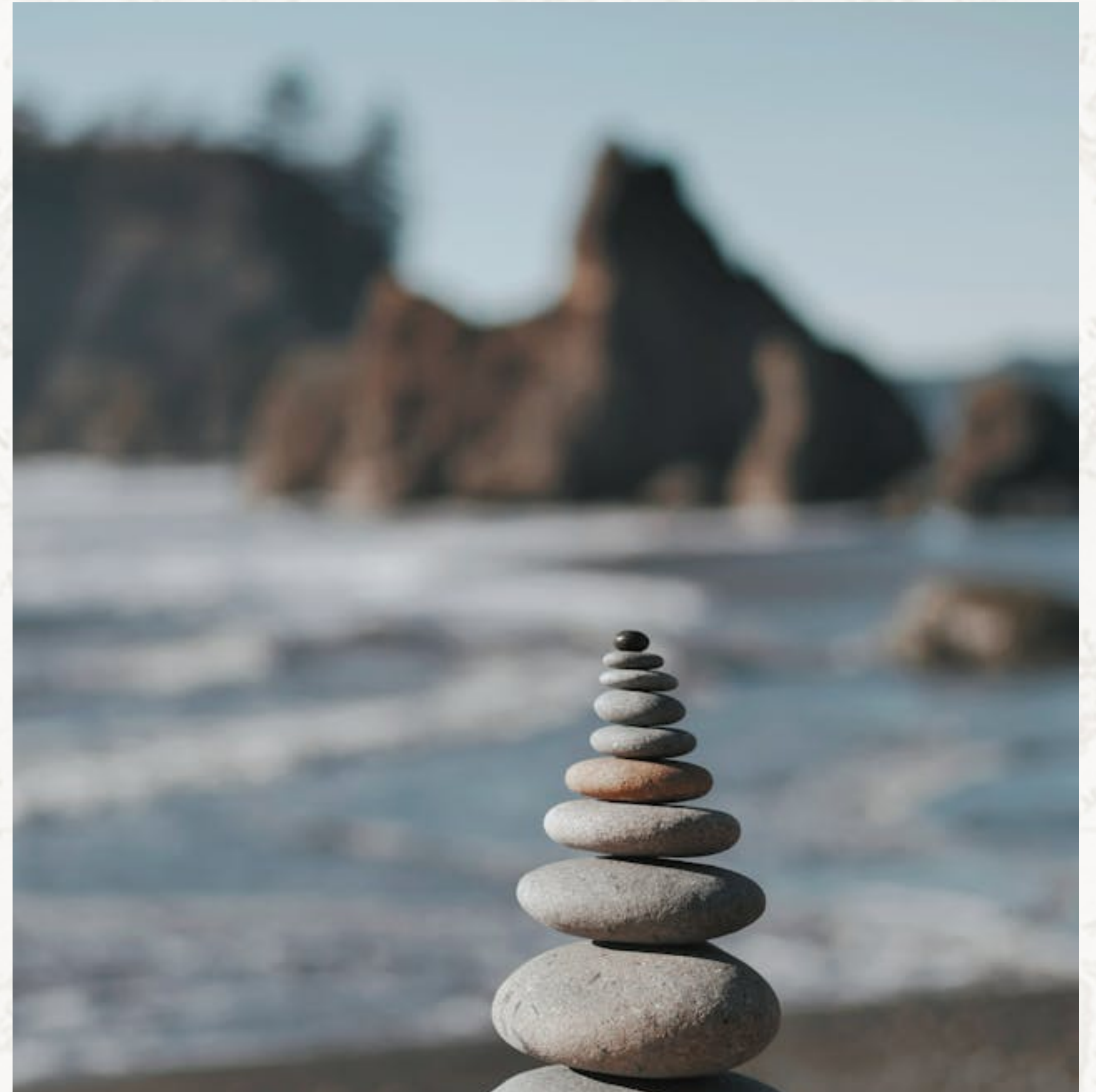
What is PC?

**A valid Capability Index requires
a stable process.**

In-control, monitored, improved

**Yes, I mean
Statistical Process Control**

**This creates the required nominal
and variation information**



Target & Tolerances

What is PC?

The measured features
are often noted on a drawing.

Target or optimum
with tolerance(s)



A Ratio

What is PC?

The spread of the specified
tolerance limits

over the spread of the stable
process



Which index

do you use?

Various Indices



C_p

Various Indices

$$C_p = \frac{(USL - LSL)}{6\hat{\sigma}}$$



Cpk

Various Indices

$$C_{pk} = \min \left(\frac{USL - \bar{x}}{3\hat{\sigma}}, \frac{\bar{x} - LSL}{3\hat{\sigma}} \right)$$



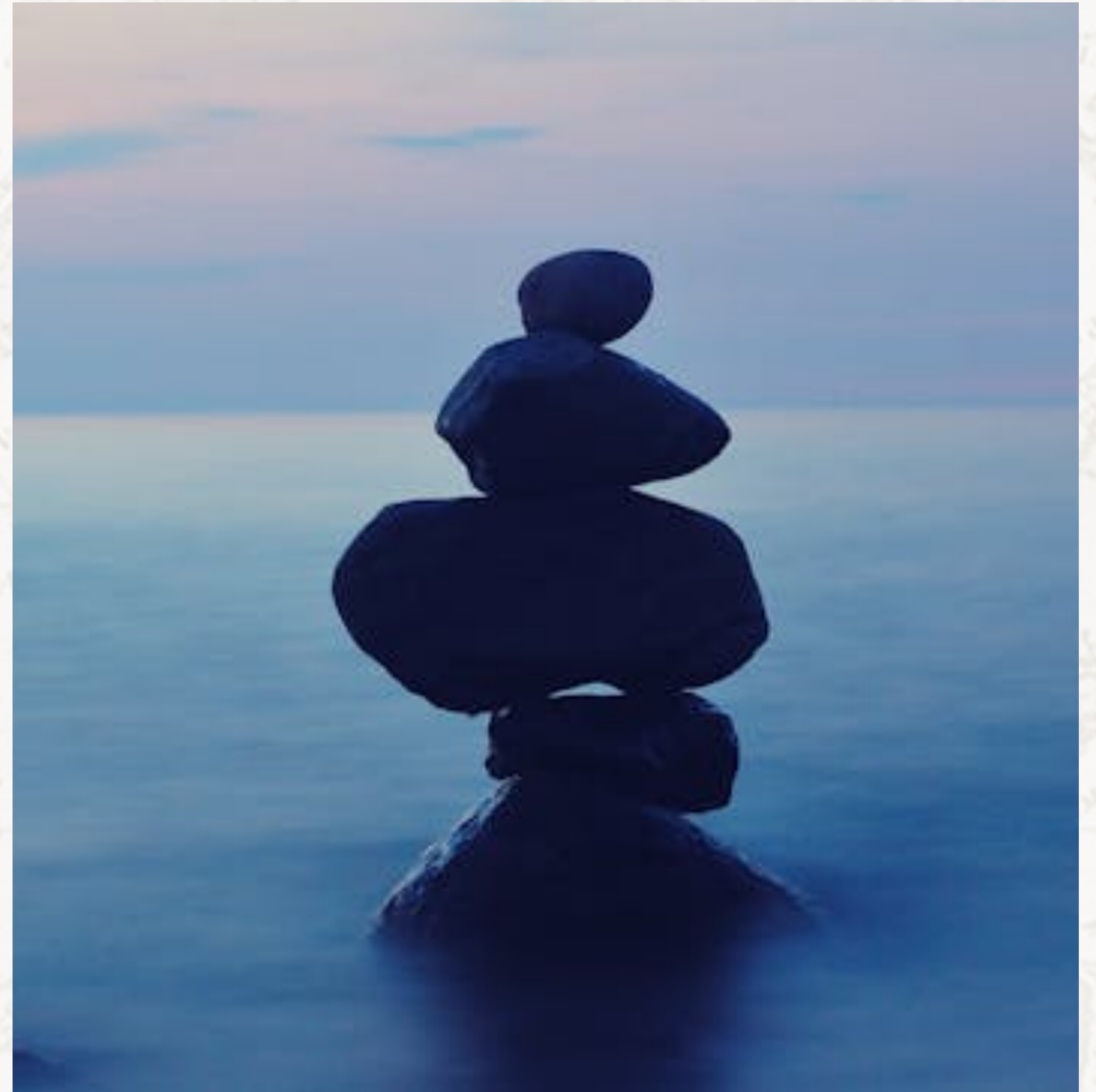
Others

Various Indices

Prototype parts (adjust the variance calculation)

Off-center target from tolerance

Non-normal distributions



How have you seen

seen PC go wrong?

Not really Process Capability



Lack of Stability

Not really PC

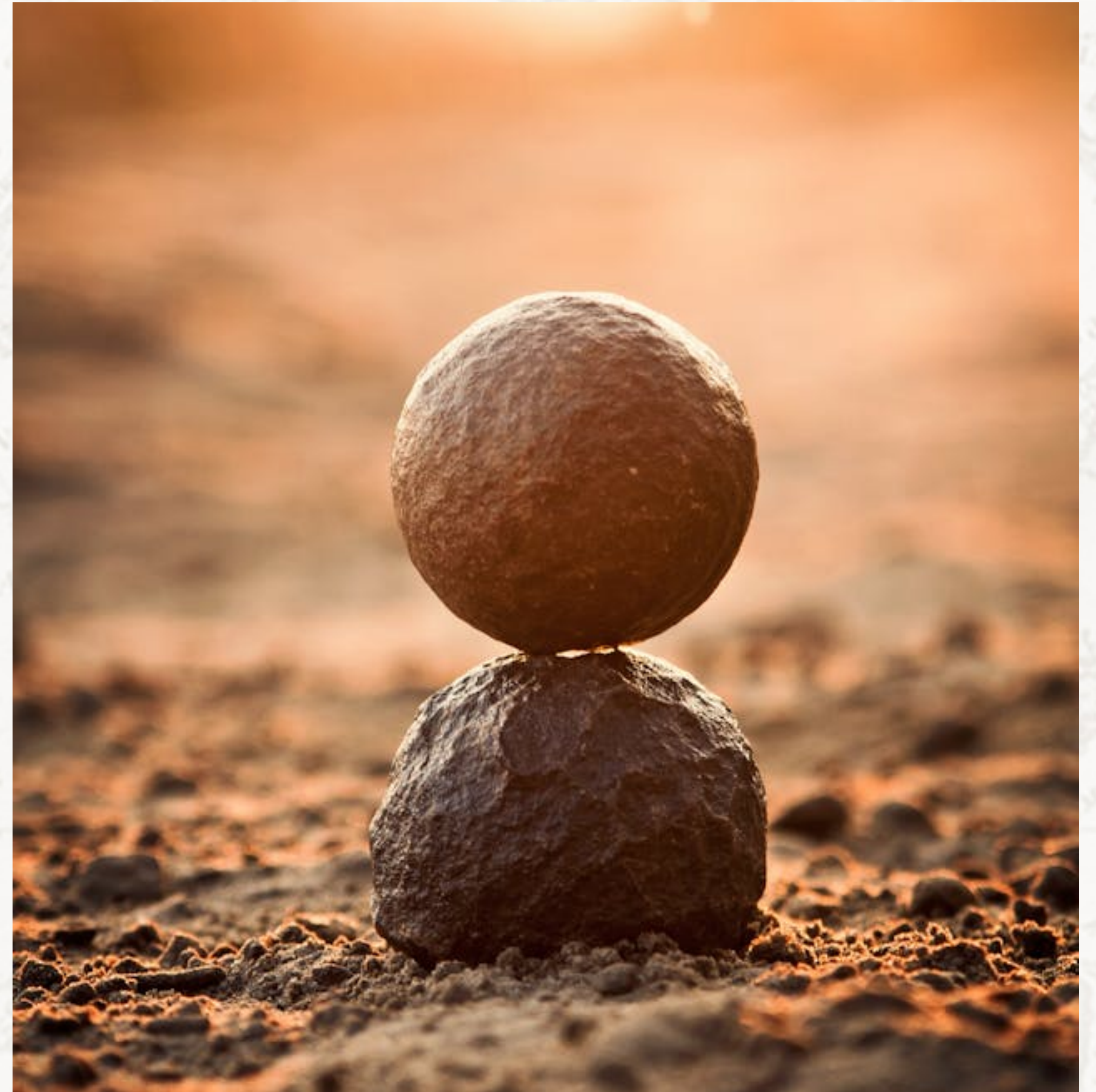
Faulty control chart process

Poor assumptions

Assume stability – no measure

Use theoretical values

No active monitoring for out of control situations



Tolerance Issues

Not really PC

Tight tolerances, production methods, and costs

Plus/Minus 10%

Critical dimensions lacking tolerances



Selection & Monitoring

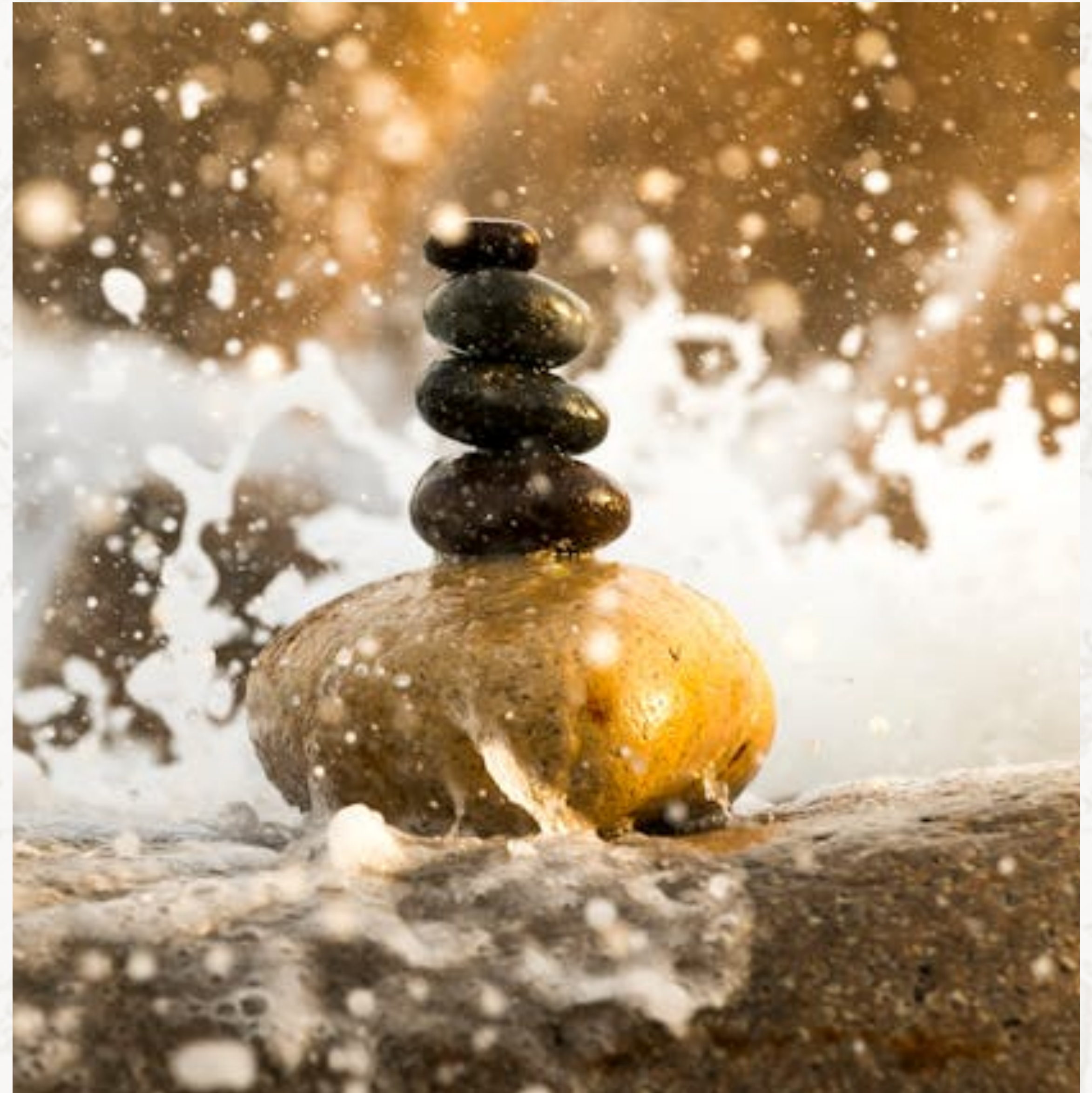
Not really PC

Vendor supplies generic Cpk,
doesn't have tolerances

Unnecessarily high Cpk targets

No monitoring and updates to
process values

No updates to Cpk calculations
when design tolerances change



What is working for

your organization?

Additional Comments and Questions

Thanks

see more at AccendoReliability.com