

“If you can’t describe what you are doing as a process, you don’t know what you’re doing.” — *Edwards Deming*

- If you can’t adequately describe, define and quantify the issue or problem you can not start to solve or apply a corrective action, or even determine the need to act !!!

TIP – GO SEE !!!!!!!!

The Corrective Action Value Proposition – Choices

Understanding CA risk & value

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Precision Tooling 2014

Three Important Points

1. Not all issues require a corrective action – Attention / Alerts
2. Not all issues require a deep dive / root cause corrective action – Do Its
3. Deep dive CA should have a ROCA – Cost to Benefit Analysis - Data

Corrective Action – Common Sense

- Evaluate the need – for a formal CA (root cause)
 - Risk to the Business – financial / future business
 - Risk to the Customer – Safety / Financial
 - Regulatory Risks
 - Long Term Environmental Risk

Corrective Action – means ???

ISO 9001:2008 definitions:

Corrective Action

- An improvement action taken after some undesirable output has been detected – after the fact

Correction

- Screen out or removal of an unacceptable output - bad service or bad product

Corrective Action error types

- Special Cause single event or source for the variation – not system
- Common Cause – system that allows the variation (normal)

Root Cause Corrective Format

Tracking Number:

Customer Number:

Response Due Date:

Step	0	1	2	3	4	5	6	7	8
Action	Planning	Establish the Team	State the Problem	Containment Plan	Root Cause Analysis	Corrective Actions	Implement Corrective Actions	Prevent Recurrence	Cost to benefit Rollup
0	Planning Stage				Is an Emergency Response Action Needed?				
					What			Who	When
1	Establish the Team				Team Goals:				
					Team Objectives:				
	Department		Name		Skills		Responsibility		

Root Cause Corrective Action Format



See Excel Corrective form

Corrective Actions & Causes

Special Cause – One time fix it now

- Should be easy to find
- Can be expensive to fix
- Needs process or system control

Common Cause

- Hard to find / expensive to fix
- System issue
- Longer time to correct
- More resources needed

CA costs – where does it fit on the Taguchi loss curve?

- **New process or product** CA quality loss cost to the left and may be high
 - New product – design weakness – unplanned / undetected
 - New process unknown input variation or equipment variation – common cause or special cause
- **Mature Process or product** CA quality loss to the right
 - Loss of stability in the process
 - Defect Escapes
 - Process deterioration due to Equipment age
 - Bad lot of materials – other inputs
 - New operators – weak training

Quality Loss Function - Taguchi

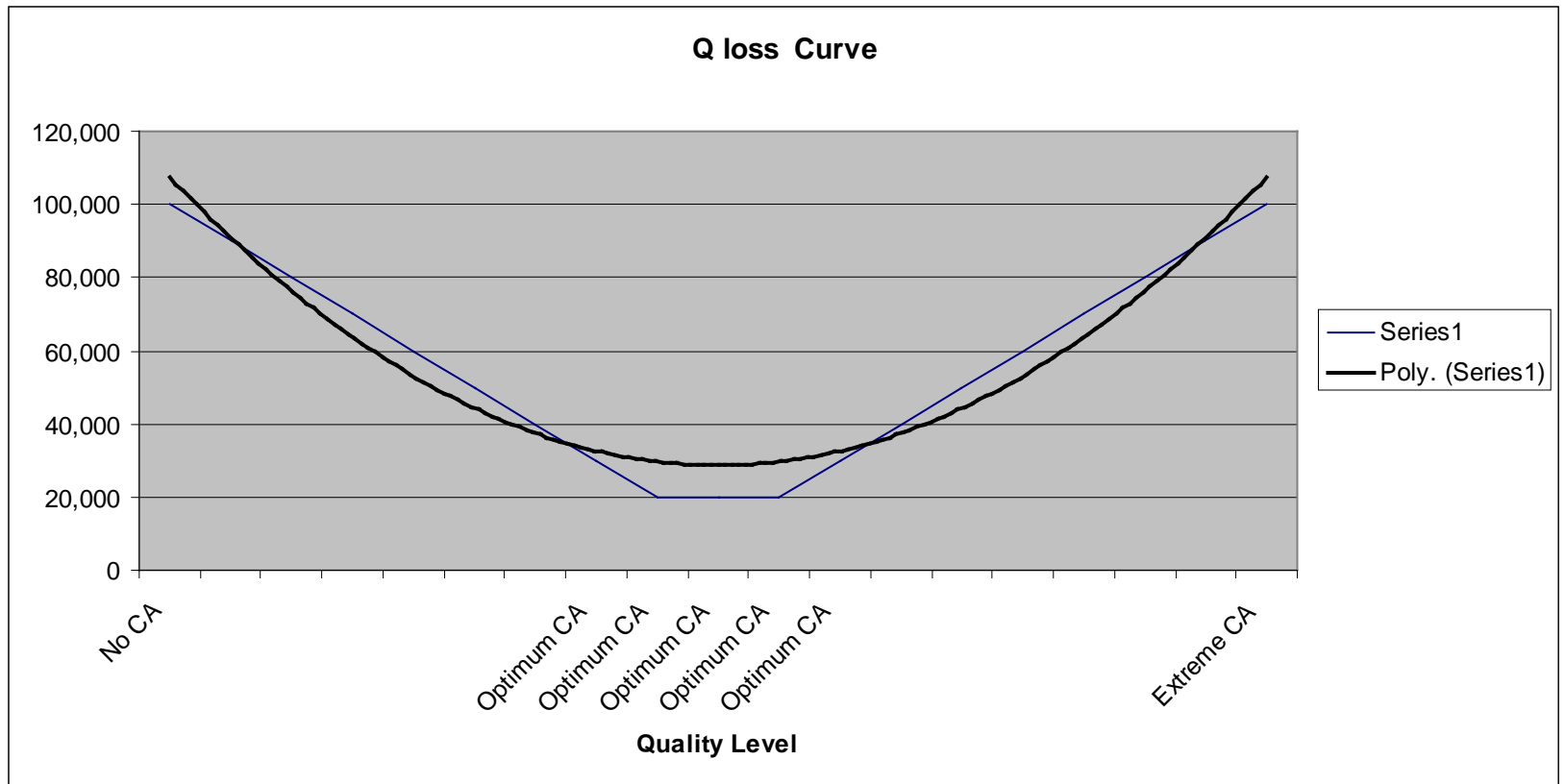
Definition

Simply put, the Taguchi loss function is a way to show how each non-perfect part produced, results in a loss for the company. Deming states that it shows " a minimal loss at the nominal value, and an ever-increasing loss with departure either way from the nominal value." - W. Edwards Deming Out of the Crisis. p.141

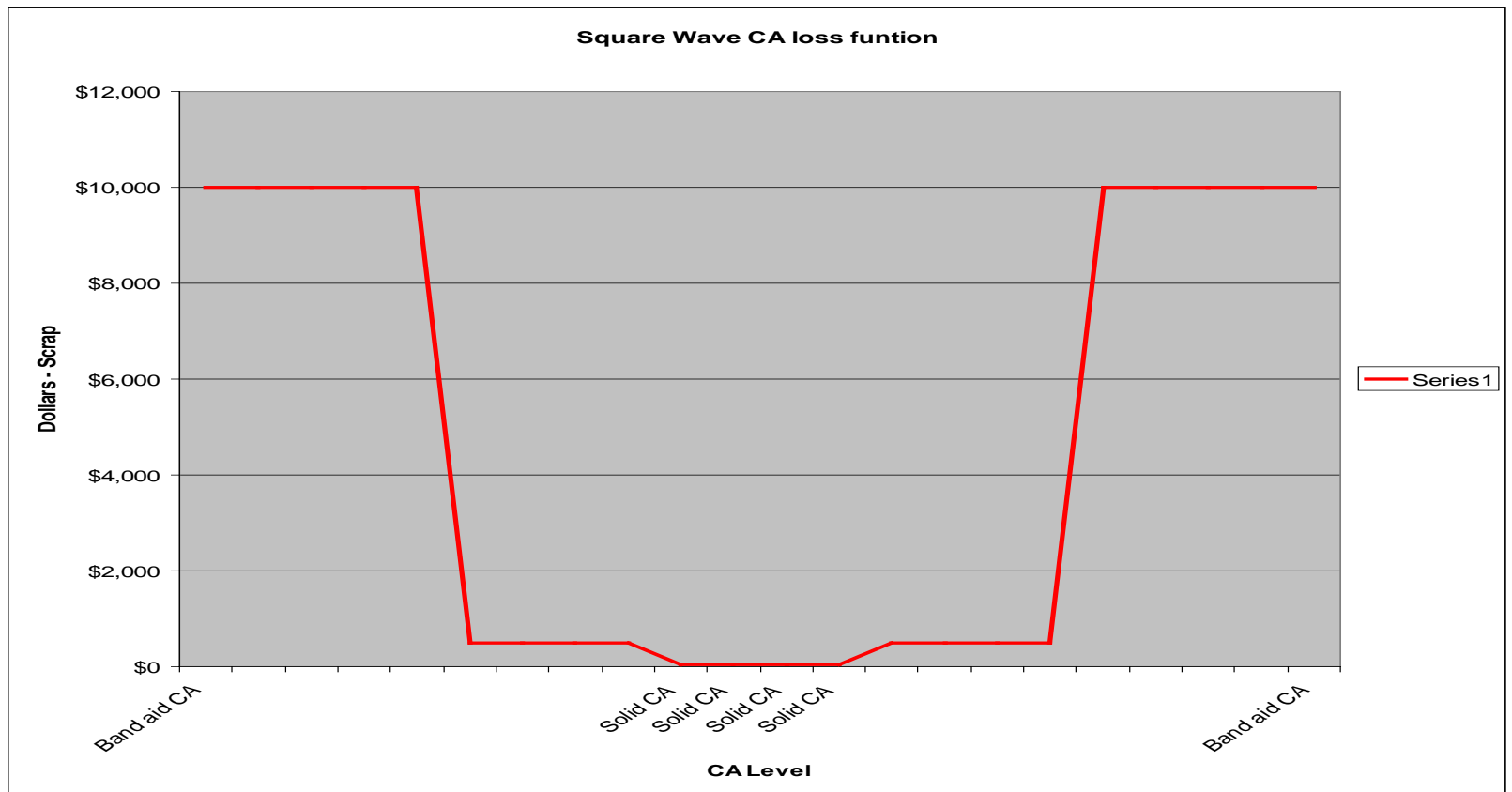
Quality Loss Function - Taguchi

- A parabolic representation that estimates the quality loss, expressed monetarily, that results when quality characteristics deviate from the target values. The cost of this deviation increases quadratically as the characteristic moves farther from the target value. - Duncan, William Total Quality Key Terms.

Loss Function applied to CA



Square Wave Loss Function



When do I take Full Root Cause Corrective Action ???

YES

- Large dollar impact - quantify
- Major customer impact – could loose
- High liability risk
- Major consumer lose – risk
- Large yield lose or significant yield lose
- Safety risk
- Major service disruption
- Business reputation

When do I take Full Root Cause Corrective Action? (Additional Examples)

YES

- Mission critical product
- Future business \ Market lose
- Medical Devices - High liability risk
- Federal Safety Regulated Product \ FDA
- Consumer Product Safety ordered
- Military Application Product
- Aerospace Product
- Automotive Application \ Industry
- Nuclear Industry

When do I take Quick – Do it Corrective Action?

YES

- Minor / small impact – to the business
- Easy best choice – based on no or low risk
- Low dollar lose – minimal payback on further action
- Low frequency of occurrence – one per year
- easy to control and low dollar lose
- No liability – no business or service disruption
- No customer impact – internal or external
- No escape to next process step or out the door

Open Discussion – Examples

- What are other cases or additional guidelines for taking a corrective action ????

Like - Safety

OSHA – related \ Lost time accident

When do I take **NO** Corrective Action or just a correction or delay?

- Analysis – says no fault / or issue – customer application / integration / use issue.
- No cost to correct benefit – acceptable lose
- Normal acceptable variation – correction only
- Falls within control plan parameters – low cost
- No risk – minor to insignificant business impact
- Low priority – band width issue – park it based on above / higher benefit to action needs

Open Discussion – Examples

- What are other cases or additional guidelines for **not** taking a corrective action ????
- Examples & Rational - 1 from each table.

Poor Delayed Corrective Action Examples

- GM Ignition issue – Design
- Toyota acceleration issue – Design
- Air Bag deployment harm issue – Design
- Ford / Firestone – tire issue - Design
- NASA Shuttle launch issue – System

To name a few !!!

CA Stoppers / other concerns

- Contractual Design Lock – FDA
- Process lock
- Proprietary reasons
- Unknown cause
- Low frequency - 5 + sigma
- Isolated - Internal \ External – contained
- No dissatisfaction – reason to act
- Can not get enough information to act – customer inhibited

Corrective Action - Decision Steps

1. Analysis – Validated issue- Yes / No stop and advise – help customer either external internal
2. Assess Risk - (Frequency) High - Yes
3. Impact - High Financial or Loose of Business current or future
4. Cost to act – Benefit to action - cost report or rollup. Action Return on resource investment
5. Approval – leverage corrective action for a business win / loss avoidance - calculate

Corrective Action needs assessment tools

- Voice of the customer – strong / weak
- Failure Modes and effects analysis
- Six Sigma calculator – capability analysis
- Warranty – field / voice of customer
- Rolled throughput yield analysis
- Process stability assessment and data
- Product Integration and use information
- Internal process control charts – attribute and variable

Cause Ranking Tool

CAUSE RANKING SHEET A3 - Late orders 38% level -

Management **Mgt**
 Method/Process = **Meth**
 Man power = **Man**
 Equipment = **Eq**
 Environment = **Er**
 Materials / Design inputs = **Mat**

1(Low)-10(High)
 1(Low Prob.)-
 10(High Prob)
 1(Low)-10(High)

Details to
 investigate

Additional information - Act on.

Number	Cause	Cause Type	Impact	Probability	Frequency	Rating	Actions	Responsibility	Due Date	Completion date	
15	Service disruptions / CS Questions	Man	8	8	7	448	Track one week / quantify	DL	3/18	4/7	Dept. losing 54 hours a week / Brain storm - make it a work flow 6.2 hours lost time.
5	Work flow not optimized	Method	6	8	8	384	design efficiency tools needed / aids	DL / CE Dept	4/30		Hold dept meeting / tracking work load and takt time
4	Paper processing vs. electronic doc	Method	4	9	9	324	Meeting needed CS / CE Managers and ASP	DS	3/18	4/3	VSM shows up to 2 hours delay - Project to go with EPDM implementation ??
9	End of day orders batch release from Finance	Method	5	8	8	320	Review with accounting - change to a flow release	DL / RG	5/15		Batch release - acct ?? - Improve design time, delays of up to 4 hours ?? Confirm.
21	Incomplete design inputs	Mat	9	4	4	144	tbd				

Action Ranking Tool

Improvement Idea Ranking and Action list

Updated

Cause number	CE design late causes	Improvement Ideas	Management/Engineering = ME Method/Process = MP Tooling = T Man power operation = MO Equipment = Eq Environment = E Material = M					Max rating 625	Action Score guide 0 - 81 Score = no action 256 or higher review for action	Notes	Resp.	Target completion Date
			Impact 1(Low)-5(High)	Ease to Imp. 1(Hard)-5(Easy)	Cost to Imp. 1(Expensive)-5(Low Cost)	Time to implement 1(a lot of Time)-5(Little Time)	Rating					
9	End of day orders batch release from Finance	Method	5	4	5	4	400	Batch release - acct ?? - Improve design time, delays of up to 4 hours ?? Confirm.	Review with accounting - change to a flow release. Sent Rick email and he is on PTO	DL / RG	23-May	
15	Service disruptions / CS Questions	Method	4	4	5	4	320	Cross function meeting held formal request system needed - EMAIL selected - mtg 4/23- Standard work created on process.	Dept. losing 54 hours a week to all disruptions / Brain storm - make it a work flow 6.2 hours lost time per week.	CS / CE Team	15-May	

Cost of corrective Action - categories / Factors

- Number of resources – people \$100.00 per hour
- Time required from analysis to CA effectiveness and verification (Hours / Days / Months)
- New Control costs
- Capital costs – New Equipment vs repair
- New or modified systems / software
- Training – new skills
- Documentation changes – ECO cost \$1500.00
- Design and test costs
- Layout and measurement costs
- New or additional control cost
- Cost model changes – increased cycle time, new material, additional labor

Cost of Special Cause corrective Action Categories

- Special Cause – one time occurrence
 - Less Analysis time / easy to find
 - Low frequency – easy to verify
 - Can be expensive on repair of equipment
 - Can be expensive on a one time sort
 - Less resources used to correct (not always)
 - Documentation and change cost minimal
 - Should be faster to correct – less time needed – labor
 -

Cost of Common cause corrective action categories

- Time – much longer project in nature
- More resources manpower / technical
- Management cost and involvement
- System change costs, software and documentation
- Higher change costs / ECO costs
- Training in system change
- Planning cost and or new system layout costs
- New controls cost

Corrective Action Steps – costing considerations

1. Form up a team – Resource **Cost**
2. Capture and detail problem \ issue description – Time **Cost**
3. Containment \ correction – **Cost**
4. Finding and implementing a Short term Solution – Time \ labor \ Equipment - **Cost**
5. Long term solution – prevent future reoccurrence **Cost**
6. Verification **Cost**
7. **CA BENEFIT ROLLUP – Saved \$, Loss avoidance \$, Save business / customer \$**

Costs in issue analysis

- Time to validate and verify is it our issue
- Technical resource time
- Test time
- Travel time
- Data capture time
- Data analysis time
- Field data time
- Customer interface and technical trouble shooting time
- Gathering application information and integration details

CA Avoidance Tools – MUSTS

- Robust Design validation and testing
- Design Failure Modes and Effect Analysis
- Sound Design for manufacturing - reviews
- Quality at the source
- Robust control plans
- Field testing of product
- Reliability testing of product and changes

Case Studies - Real world examples of CA - ACTION DRIVERS

CA YES \ NO

1. Automotive Plant - no ship - seat retention cables breaking 100% - 20,000 cables

- ACTION DRIVERS FOR A CA
- Business Impact
- Customer AMC automotive application
- Risk
- Cost = Y\$X 20,000 – Customer costs

Case Studies - Real world examples of CA - ACTION DRIVERS

CA YES \ NO

3. Delaminating plate to circuit Aluminium Plates at the customer - 1 lot of 1,200 parts \$6000.00
Customer claims parts are dirty. Demands immediate corrective action

ACTION DRIVERS for a CA

- Business Impact
- Customer MOT automotive application
- Risk
- Cost

Case Studies - Real world examples of CA - ACTION DRIVERS

CA YES \ NO

3.b Issue - Parts are coming in bent and damaged.

- ACTION DRIVERS for a CA
- Business Impact
- Customer MOT automotive application
- Risk
- Cost

RECAP

- Covered
- 1. What is a correct action vs. a correction
- 2. When do I take a corrective action
- 3. Special cause – CA and common cause CA
- 4. Cost of a corrective action - categories
- 5. Brief economics of CA
- 6. Analysis on the need and cost CA Types
- 7. Cost of problem Analysis
- 8. Quality Loss Function in relationship to corrective action \ band aid CA \ and no action.

Questions / Discussion – Group

- Value CA's ?
- Non CA examples ?
- Do it CA examples ?
- Root Cause – deep dive examples ?