The Cost of Poor Quality: A Working Model
Benefits of Calculating Your COPQ

- With recalls grabbing the headlines, automotive manufacturers always have an eye on the cost of poor quality. These costs go beyond operational impacts to include lost goodwill, expenses incurred from replacement or rework – even the loss of business and customers.

- Enhancing trust with customers and capturing new business mean perfecting your processes and eliminating the risks and costs of faulty components. Quality can be a significant differentiator and can either help or hurt your reputation as a manufacturer.

- Why should you care about understand your COPQ?
  - Reduced COPQ leads to increased profitability
  - COPQ helps a company prioritize problems
  - Action based on COPQ promotes effective resource use
  - Tracking of COPQ incentivizes higher quality
Step 1: Identify your path for estimating COPQ

- Estimated number of defects
- Estimated hours to address defects
- Estimated cost per defect
- Estimated costs incurred for each defect
- Estimated total cost for a defect category
- Estimated total costs for all defects for the year
Step 2: Define a Process
Example Process for Evaluating COPQ

Inspect
• Review the process

Observe
• Interview employees

Analyze
• Review data for correlation with observation

Map
• Map the process chain, activities and people

Cluster
• Cluster the problems into COPQ model

Identify
• Identify problems and consequences

Measure
• Decide what COPQ can and should be measured

Quantify
• Calculate the cost of the problem

Integrate
• Integrate the costs into the system
Step 2: The Defined Process
Implementation Plans for a COPQ Analysis

- Identify Metrics for Failure Costs, such as Warranty % and Cost of Warranty; Labor; Rework; Scheduling
- Separate Costs by Product; Complaint Symptom, Part, Customer, Region or other Category
- Utilize Pareto for Cost Analysis and Prioritization of Corrective Actions
Step 3: Calculation
The COPQ Equation

Direct Costs
(External Failures + Internal Failures + Appraisal + Preventive Action)

Indirect Costs
(Customer Dissatisfaction + Loss of Reputation)

= COPQ
Step 3: Calculation
Evaluating Direct and Indirect Costs

COPQ

Direct Costs

- Prevention
- Appraisal
- Internal Failure
- External Failure
- Non-Value Added
- Equipment

Indirect Costs

- Customer-Incurred Costs
- Customer Dissatisfaction
- Loss of Reputation
- Lost Income
- Loss of Opportunity
- Socioeconomic Costs

Research has found invisible or hidden COPQ may be 3-4x visible costs.
Step 3: Calculation
COPQ Elements to Consider

- Popularized by H. James Harrington, IBM Quality Expert, in 1987 book Poor Quality Costs
- Translating COPQ into monetary terms is useful in overcoming a communication gap between the quality department and upper management
- COPQ creates an economic common denominator for discussion of investments in quality improvements and comparison to other improvements that may have profit enhancement
- Aligned with other manufacturing initiatives, such as Lean and Six Sigma
- “Defects” are considered one of the 7 Categories of Waste/non-value adding activities
## Step 3: Calculation
Costs to Consider to Create a COPQ

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<th>Appraisal Costs</th>
<th>Internal Failure Costs</th>
<th>External Failure Costs</th>
<th>Manufacturer Indirect Costs</th>
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<td>• Complaints in Warranty</td>
<td>• Extra Manufacturing Operations</td>
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<td>• Laboratory-acceptance Testing</td>
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<td>• Quality Equipment</td>
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<td>• Joint Quality Planning</td>
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- **Prevention Costs**: Costs incurred to prevent defects and errors from occurring in the first place.
- **Appraisal Costs**: Costs incurred to detect defects after they have occurred.
- **Internal Failure Costs**: Costs incurred due to defects that are found and repaired within the organization.
- **External Failure Costs**: Costs incurred due to defects that are found and repaired by customers or third parties.
- **Manufacturer Indirect Costs**: Costs incurred due to the manufacturer's actions not directly related to the product but impacting the overall cost of quality.
Step 3: Calculation
Consequences of COPQ for Manufacturing

- Scrap/Rework
- Waiting Time
- Identification of Problem
- Re-planning
- Unnecessary Meetings
- Delay/Overtime
- Start-up Time
- Unnecessary Administration
- Unnecessary Controls
- Time for Contacting Other Departments
- Problem Investigated by Other Internal Department
Step 3: Calculation
Outlining Time Factors in COPQ
Step 4: Prioritization
Compare the COGQ to COPQ

Cost of Quality = Cost of Good Quality + Cost of Poor Quality

**Cost of Attaining Quality**
- Prevention
- Prediction & Audit

**Cost of Poor Quality**
- Detection
- Internal & External Failure

Proactive approach is to install quality systems and processes.

Most manufacturers spend more resources here after a quality incident.
Step 5: Measure & Manage
Set Baseline & Track Over Time

Example COPQ Tracking Graph

- External Failure Costs
- Internal Failure Costs
- Appraisal Costs
- Appraisal Costs
- Prevention Costs

Year 1
Year 2
Year 3
Year 4
“Defects are not free. Somebody makes them and gets paid for making them.”
ZEISS Industrial Metrology can support your efforts to reduce your Cost Of Poor Quality.

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