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Corrective Action Methodology

8D Problem Solving Training

April, 2014

Corrective Actions

- When a Nonconformance or any other issue which hampers quality production delivery is encountered, Greene, Tweed promotes using a systemized approach to problem solving.

- Corrective Action Reports (CAR's) are the means by which this systemized approach to problem solving is documented and able to confirm effectiveness.

Corrective Actions

- Some reasons for ineffective problem solving:
  - Incorrectly or incompletely describing the problem.
  - A hurried problem solving process.
  - Lack of team participation from cross functional groups with the required technical skills.
  - No logical process.
  - Misidentification of the root cause and correcting only a symptom.
  - Not effectively implementing the permanent corrective actions.
  - Not applying the lessons learned to related products or processes.

Eight Disciplines – Problem Solving

- The industry accepted standard for a systemized approach to problem solving is called 8D.
  - Please note that some industries and/or customers will summarize this into what is called a 4D for reporting, but the full 8D approach should be utilized in order in obtain a robust solution.
- The 8D problem solving process was originally developed during World War II under Military Standard 1520 and has since become an internationally recognized practice in multiple industries.

Eight Disciplines – Problem Solving

- Why is the 8D problem solving process important?
  - Improves Quality
    - Identifies the root cause of problems
    - Permanently corrects the cause
  - Saves Time
    - Time is not wasted on fighting repeated problems.
  - Saves Money
    - Helps to do it right the first time.
    - Captures lesson learned for similar processes & future product.
  - Helps develop a consistent, repeatable industry accepted process for solving problems.

Eight Disciplines – Problem Solving

Elements of the 8D Process

D0 – Planning phase

D1 – Develop a cross functional team of experts

D2 – Define & describe the problem

D3 – Develop, implement,& verify the containment plan

D4 – Identify & verify root cause(s) & escape point(s)

D5 – Select permanent corrective actions for root cause & escape point

D6 – Implement & validate permanent corrective action

D7 – Ensure prevention of recurrence

D8 – Recognize efforts of the team

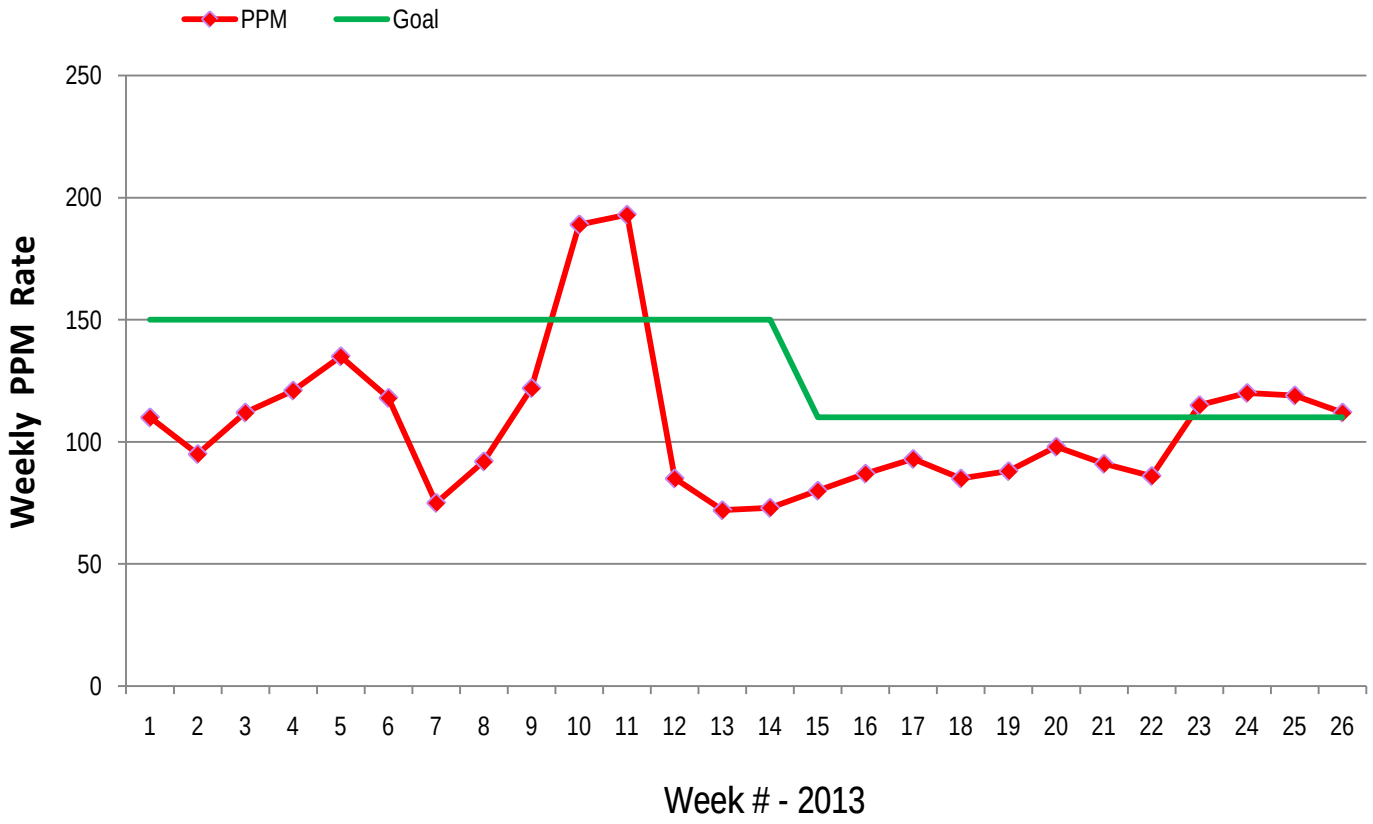
Eight Disciplines – Problem Solving

D0 – Planning

- Initial evidence gathering.
- Symptoms of the problem are documented and quantified.
  - Customer complaints recorded
  - Trend charts
  - Pareto charts

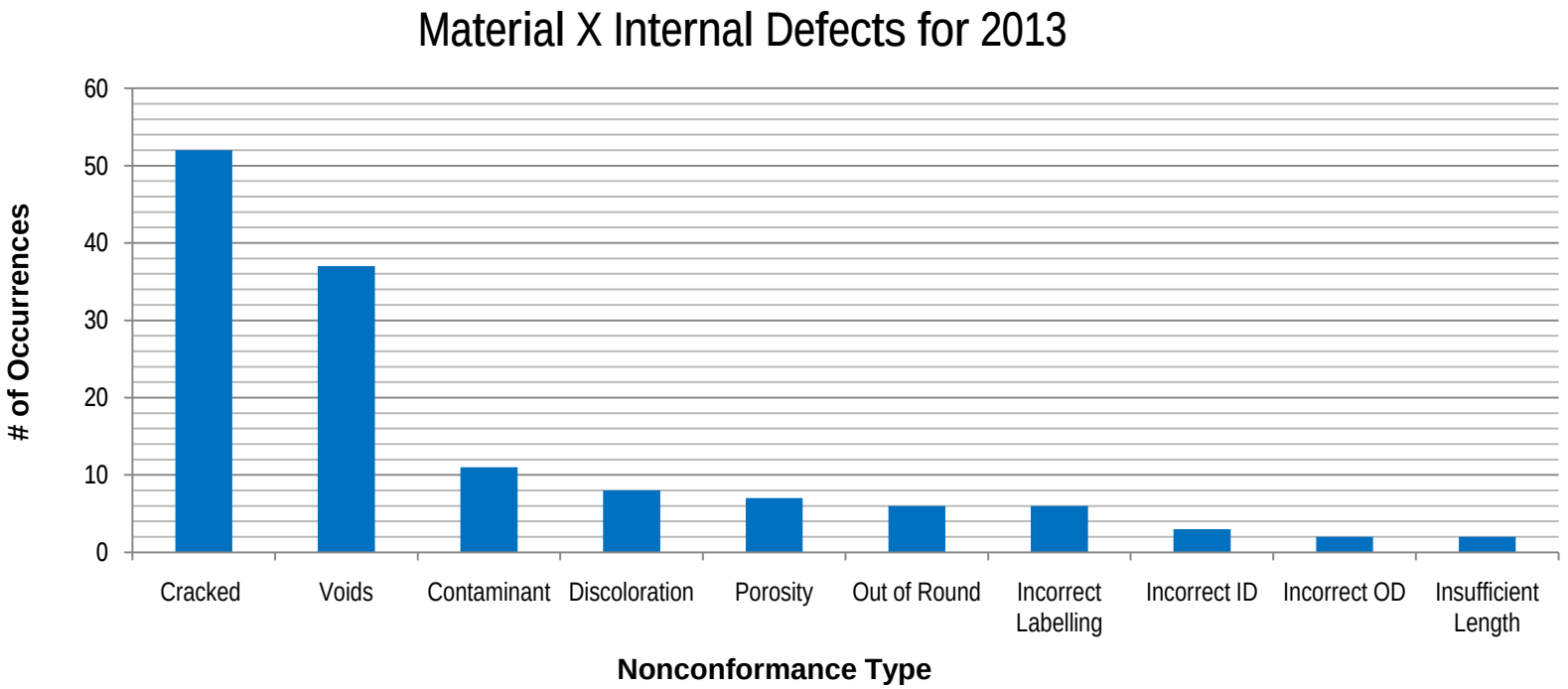
Eight Disciplines – Problem Solving

- Trend Charts



Eight Disciplines – Problem Solving

- Pareto charts



The 80/20 Rule – 20% of the defects cause 80% of the problem occurrences

Eight Disciplines – Problem Solving

D1 – Develop a cross functional team of experts

- Establish the team membership based on different technical skill sets with the product, process, and application knowledge relative to the problem.
  - Depending on the problem, this could include participants from quality, engineering, manufacturing, materials, supply chain, customer service, inspection, receiving, inventory, etc.
  - Depending on scope of the issue, the core group should include 3 to no more than 10 members, and may draw from expertise from outside the group as needed.
- Complex problems are not solved by one person.

Eight Disciplines – Problem Solving

D2 – Define & describe the problem

- All work occurs in a system of interconnected processes in which variation will always occur. Understanding the drivers of variation & reducing them are key to successful problem solving.
- Identify ‘what is wrong with what’
- Detail the problem in quantifiable terms
  - Who, What, Where, When, Why, How, & How Many
  - ‘Is / Is Not’ or comparative analysis is helpful in describing problem

Eight Disciplines – Problem Solving

- ‘Is / Is Not’ Comparative Analysis

	IS	IS NOT	What are the Differences	What Changed?	What are the Potential Causes?
What?	What parts have the problem?	What are the most similar parts without the problem?			
	What is deviation from specification?	What other deviation on the part could be expected?			
Where?	Where was the part when the deviation was first detected?	Where else could the deviation be expected?			
	Where on the part did the deviation occur?	What are the adjacent locations on the parts or on the mating parts without deviation?			
When?	When was the deviation first noticed? (in both calendar time and in life cycle)	What earlier date or phase could the problem occur?			
	What is the pattern? (one time event, stable, increasing, decreasing, random or cyclical)	Since detection, what other occurrence could be expected?			
Who?	What customer had the deviation?	What customer for a similar part did not have the problem?			
	What supplier, shift, or batch had the deviation?	What supplier, shift, or batch for a similar part did not have the problem?			

Eight Disciplines – Problem Solving

- ‘Is / Is Not’ Comparative Analysis
  - List differences/uncommon factors
    - Ask what is unique, peculiar, different, distinctive, and unusual about the ‘IS’
    - Consider elements such as methods, materials, machines, manpower, measurement, maintenance, environment, or transportation.
  - List changes in differences / uncommon factors
    - Ask what has changed in, on, around, or about this difference / uncommon factor.

Eight Disciplines – Problem Solving

D3 – Develop, implement,& verify the containment plan

- The goal of containment is to isolate the effects of the problem from any internal or external customer until the permanent corrective action(s) are implemented.
- In many cases the containment may be enhanced and/or expanded inspection, for example:
  - Increased sample rate AQL or 100% inspection
  - Material testing report rather than a certificate of compliance
  - Increased non-destructive testing such as X-ray

Eight Disciplines – Problem Solving

D3 – Develop, implement,& verify the containment plan

- It is extremely important during the containment phase to identify all inventory of the suspect material regardless of point in the process.
  - Finished product at supplier, customer, and end user
  - In transit
  - Work in Progress (WIP) including at sub-tier suppliers
  - Raw material or subcomponents
- Once identified these should be segregated and if possible re-inspected for non-conformance condition.
- The written corrective action response should include dates when each containment was implemented and/or identification of when batches were fully contained.

Eight Disciplines – Problem Solving

D4 – Identify & verify root cause(s) & escape point(s)

- Goal is to identify the true root cause instead of only symptoms.
- If only the symptom is treated this may only result in causing a different type of defect or having repeated recurrences in the future.
- The escape point is the place in the process where the root cause could have been detected & contained, but was allowed to pass.

Eight Disciplines – Problem Solving

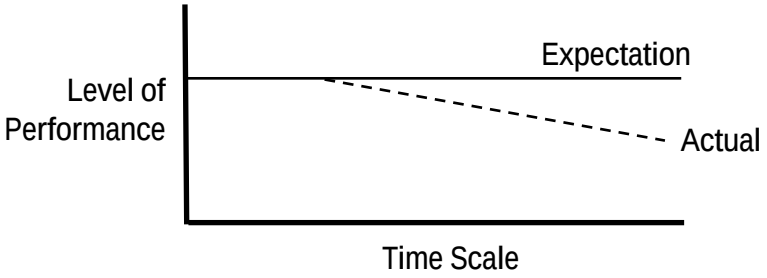
D4 – Identify & verify root cause(s) & escape point(s)

- Various tools & techniques are available to identify the root cause of an issue:
  - **Process Charts** – Can identify the nature of the change that occurred to narrow down potential Root Causes
  - **5 Why Analysis** – Identifies the difference between a Direct Cause (or symptom) and the actual Root Cause
  - **Fishbone (Ishikawa) Diagram** – Brain storming to identify the full range of potential factors in the Root Cause
- Multiple techniques will likely be required in complex issues, especially in cases where multiple root causes may be in play.

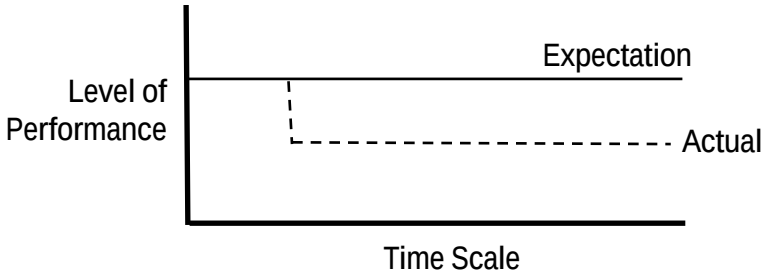
Eight Disciplines – Problem Solving

- Identifying the nature of change which induced the problem will help in identification of the root cause.

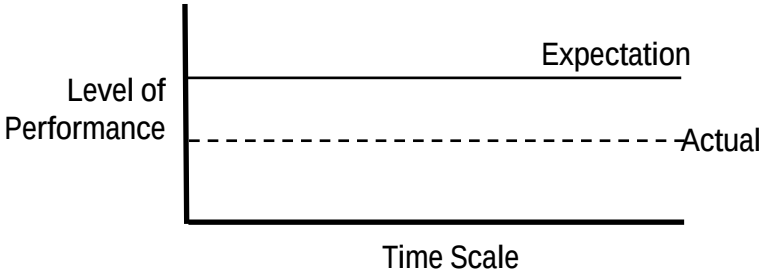
Gradual Change



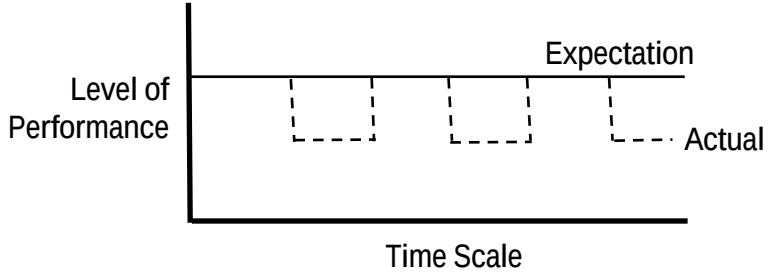
Abrupt Change



'Never Been There'



Cyclic Change



Eight Disciplines – Problem Solving

- 5 Why Analysis is a simple question asking method used to explore the cause/effect relationship underlying a certain problem.

  Problem: My car won't start.

  1. *Why?* The battery is dead. (This is the Direct Cause)
  2. *Why?* The alternator isn't working.
  3. *Why?* The alternator belt is broken.
  4. *Why?* The alternator belt is 30,000 miles beyond it's service life and has never been replaced.
  5. *Why?* I haven't been maintaining my car according to the recommended service schedule. (This is the Root Cause)

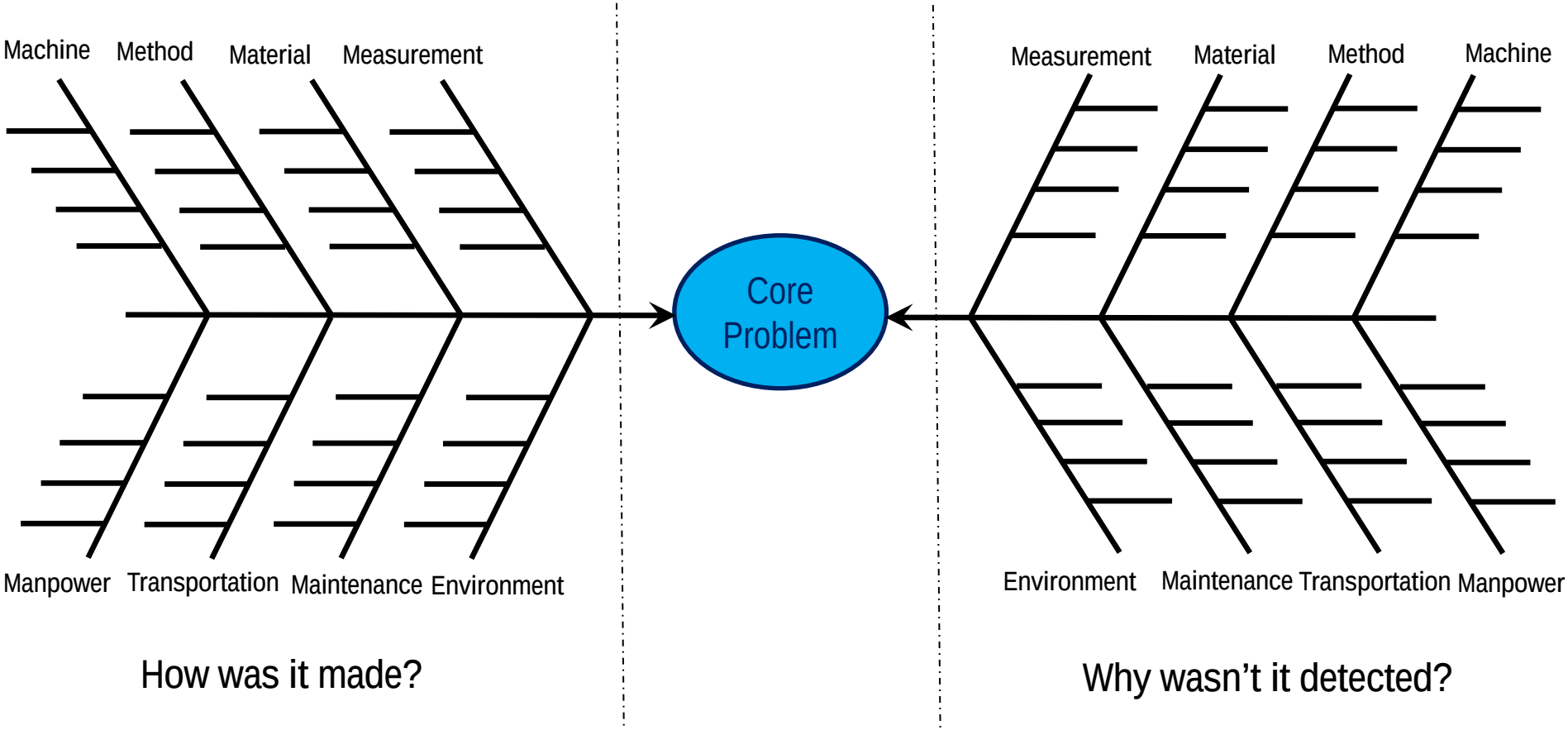
  Solution: Start maintaining the car according to the recommended service schedule.

Eight Disciplines – Problem Solving

- A Fishbone (or Ishikawa) diagram is a means of identifying potential factors which could cause an overall effect on the end product. These factors can be grouped into 8 categories:
  - Methods, Materials, Machines, Manpower, Measurement, Maintenance, Environment, or Transportation.
- The factors can be used to identify two issues:
  - How was the non-conformance made?
  - Why wasn't the non-conformance detected in the process?
- A cross functional team should generate & categorize the potential causes, then prioritize them into the most likely .

Eight Disciplines – Problem Solving

- Fishbone (Ishikawa) Diagram



Eight Disciplines – Problem Solving

- Fishbone (Ishikawa) Diagram – Examples of potential factors
  - Machine – tool speed, mold pressure, tolerances, fixturing
  - Method – annealing, cure, heat treatment, drying, cooling, plating, welding
  - Material – property variation, compounds, contamination, particle size, thermal expansion, thermal or electrical conductivity
  - Manpower – shifts, training, break times, fatigue, machine programming
  - Measurement – calibration, repeatability, gages, resolution, sampling plan
  - Maintenance – wear, spare parts, efficiency, filtration
  - Environment – humidity, temperature, barometric pressure, lighting, cleanliness
  - Transportation – packaging, labeling, handling, climate control in transit

Eight Disciplines – Problem Solving

D5 – Select permanent corrective actions for root cause & escape point

- Goal is to select the best permanent corrective action(s) to eliminate the root cause(s) and also to identify them at their escape point(s) if they were to occur.
- Fully evaluate both decisions as to how they affect the process so that they will be successful when implemented.
- Do NOT create any undesirable side effects.
  - Investigate both the benefits and potential risks. Don't rush into implementation.

Eight Disciplines – Problem Solving

D5 – Select permanent corrective actions for root cause & escape point

- If the permanent corrective action includes a change to the design, process, equipment, materials, or sub-tier supplier, then prior notification must be given to Greene, Tweed in order to verify if the change will require a new First Article Inspection Report (FAIR) or 'Copy Exact' notification rules are affected.
  - This communication must be routed through the Greene, Tweed Supply Chain Specialist or Supplier Quality Engineer. They in turn will ensure the correct parties are notified internally and provide the supplier any further documentation requirements.

Eight Disciplines – Problem Solving

D6 – Implement & validate permanent corrective action

- Incorporate the permanent corrective action and discontinue the containment activity.
- Verify that the corrective action(s) for the root cause(s) & escape point(s) are effective and without adverse consequences.
- Validate the change by monitoring the long term success.
  - Is the corrective action still effective after 30 days? Is it effective after 90 days?

Eight Disciplines – Problem Solving

D6 – Implement & validate permanent corrective action

- The written corrective action response should provide details about the first batches made with the implemented corrective actions, such as implementation dates.
- Provide enough evidence to show that the implementation of the corrective action has taken place and is on schedule.

Eight Disciplines – Problem Solving

D7 – Ensure prevention of recurrence

- Modify the necessary systems including policies, practices, and procedures to prevent recurrence of this problem or of similar problems.

  - Routers
  - Work Instructions
  - Inspection Plans
  - Preventive Maintenance
  - Employee Training
  - Visual Aids
  - Process Flow Diagrams
  - Control Plans
  - PFMEA / DFMEA
  - Gages
  - First Article Inspection
  - Customer Approval
  - Machine Programs
  - Etc.

Eight Disciplines – Problem Solving

D7 – Ensure prevention of recurrence

- Investigate similar products and operations to see if the permanent corrective action would be applicable and if so, standardize it's use for all affected areas.
- Document the lessons learned so that future product doesn’t encounter the same issue.
- Make recommendations for systemic improvements as necessary.

Eight Disciplines – Problem Solving

D8 – Recognize the collective efforts of the team

- Documenting the achievement. This documentation of the achievement helps share the knowledge and learning gained with the rest of the organization.
- This promotes the ethic of cross functional team work in the organization.
- This recognition tends to reinforce behavior and self esteem.

Greene, Tweed Supplier Corrective Action Request Form (SCAR)

Not all elements of the 8D are required to be reported to Greene, Tweed, but should still be documented internal to the supplier.

Supplier Corrective Action Request

Supplier		**GT Quality Notification No.**	
Supplier RA No.		**Part Number**	
Purchase Order No.		**PO Line Item**	
Supplier Part No.		**Batch Number**	
Issue date		**Order Quantity**	
Supplier Response Due Date:		**Quantity Defective**	

⇦ Initial input by Greene, Tweed

Problem Description:

⇦ Initial input by Greene, Tweed, additional detail may be added by supplier

Containment/Immediate Action:

⇦ Summary of D3 input by supplier

Root Cause:

⇦ Summary of D4 input by supplier

Corrective Action:

⇦ Summary of D5 input by supplier

Successful Implementation Verification:

⇦ Summary of D6 input by supplier

Remarks:

⇦ Initial input by Greene, Tweed, additional info may be added by supplier

Approval Signature:	**Date:**

⇦ Supplier Management signature & date

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Working Towards Mutual Success

In closure of this presentation, Greene, Tweed wants to make sure that you understand that you can use us as a resource if you need assistance in either technical expertise or in more advanced techniques in the problem solving process.

Your company's success is critical to our success & we always need an open line of communication.

Any Questions?