

**8D Problem Solving
(8D)
Instruction - supplier guideline R0-12-2024**

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1. Purpose

The Purpose of this instruction is to describe the method of conducting a problem-solving analysis through 8D methodology. This Instruction is also to include the activities involved in the 8D problem solving, root cause analysis, corrective and preventive actions, implementation of the Corrective /Preventive action and updating the relevant quality documentation.

2. Definitions

ERA	Emergency Response Action
ICA	An Interim Containment Action (ICA) is any action that prevents customers from experiencing the symptoms of one or more problems.
PCA	A Permanent Corrective Action (PCA) is the best action or actions (there may be more than one) that eliminate the root cause of a problem.
Preventive action	Preventive action refers to any actions taken to prevent the present problem, a similar problem, or a systemic problem from occurring again
PFMEA	Process Failure Mode and Effect Analysis
PWI	Process Work Instruction
PFD	Process Flow Diagram
CTQ	Critical to Quality
CTP	Critical to Process
8D	Eight Discipline Problem Solving
DFMEA	Design Failure Mode and Effect Analysis
NCR	Non Conforming Report/ NCR system

3. Responsibility

Responsibility of doing 8D lies with the Suppliers which supplied the defective part irrespective of the place of manufacturing. The 8D leader must be defined by the Quality Manager and the local management must assure that the team selected is available to participate on the 8D activities.

4. Process

8D Problem Solving

Activity	Suggested Tools	Document
<p>D0 : Problem Awareness</p>		<p>8D Report</p>
<p>D1 : Define the Team</p>		
<p>D2 : Describe the Problem</p>	<p>IS – IS NOT</p>	
<p>D3 : Implement and Verify containment Actions</p>		
<p>D4 : Identify the Potential Cause</p>	<p>Cause & Effect Diagram</p>	
<p>Select Probable Cause</p>	<p>5 Why</p>	
<p>Verify – Is Probable Cause a Root Cause?</p>		
<p>D5 : Select & Verify Corrective Action</p>		
<p>D6 : Implement & Validate Corrective Action</p>		
<p>D7 : Prevent Reoccurrence</p>		
<p>D8 : Follow-up & Reward the Team</p>		

4.1 Introduction

4.1.1 General

8D is a standardized problem-solving tool for suppliers to identify, correct and eliminate or prevent problems from re-occurs again. 8D is a problem-solving methodology for product and process improvement. It is structured into eight disciplines, emphasizing on teamwork. The team as whole is better and smarter than the quality sum of the individuals

4.2 8D Problem Solving Steps

4.2.1 D0: Problem Awareness

D0 is the first step in the 8D Problem solving process. This follows immediately after you become aware of the issue/problem.

In this step we need to document as much information as possible about the problem in the standard 8D template

- Part number and Part Name
- Damage/Fault code and description
- Nature of the complaint description: This can be the customer verbatim, or symptoms as expressed by the customer.
- Who discovered the issue and raised the NCR and When
- Quantity affected now and, in the past.
- Is it a re occurrence issue? If so, mention the related NCR Number or complaint description

Ask and answer all questions fully:

- What is? What is not?
- Where is? Where is not?
- When is? When is not?
- Extent is? Extent is not?
- sketch (if applicable)

If no data, get the data! No guesses!

Often may require doing Emergency Response Action (ERA) at this Stage.

Emergency Response Action: Emergency Response action is nothing, but the action required to stop the customer bleeding in the first place.

Example.

Problem description: NCR received for Bad bolt quality on the surface (20 Bolts rejected during installation of Turbine)

Emergency response action in this case is to send the replacement for the 20 affected bolt so that customer can continue the installation.

Other example of ERA is stopping all deliveries until the stock is checked or issue a Quality Alert immediately to increase awareness on the customer complaint.

Note: Emergency response action may not be required in all the situations. With the same above example consider the customer has excess stock of bolt which he used to continue the installation; in this case you do not require to do the ERA

4.2.2 D1: Define the Team

The focus here is to establish the team necessary to solve the problem and implement corrective and preventive actions and to begin the team exercise.

Defining the team is one of the critical parts of the 8D problem solving. Usually, problems have involved with more than one function/process, so it is difficult for one person to have all the necessary information, and skills to solve a problem completely. Considering this it is very critical to have the right people who are cross functional.

Consider the following while selecting the Team for the 8D problem solving

- Ensure that members are from cross functional: This is critical as solving problem requires representatives from all affected areas. People with different experiences and talents will help teammates to have innovative thinking.
- Ensure that the people who are selected have adequate training/Knowledge in 8D and Expertise in the area he represents.
- There can be few people who are core members and at different phase of the problem solving, you may need different types of expertise so you can rotate as required. Primarily these are classified in 8D as Invited members.
- Team should have min 3 and max 10 people

Once a 8D team has been selected, team members need to work as effectively as they can. The 8D process depends upon the efforts of all team members to achieve the team's objectives to solve the problem. To do this task, each core team member can choose to perform a role as described below.

- **8D Leader:** The 8D Leader is the person responsible for leading team members through the 8D process. This person has leadership and interpersonal skills.
 - Leads the team to complete 8D
 - Acts as the team's facilitator
 - Works with the team to set objectives and tasks
 - Asks for and summarizes members' opinions
 - Develops agendas for meetings and team activities
- **Timekeeper:**
 - Allocates time to each activity for a given meeting
 - Monitors meeting progress against the plan
 - Keeps time for the team discussion
 - Proposes time adjustments etc
- **Recorder:** The Recorder is a team member who generates, holds, and publishes team reports, such as 8D reports, meeting minutes, action plans, etc
 - Controls documents for the team
 - Takes Notes during the meeting
 - Takes responsibility for creating and distributing 8D

4.2.3 D2: Describe the Problem

Understanding the problem is a very important in the 8D, describing the problem in a right way will leads to the better understanding of the problem and finding a root cause and solution becomes easier.

The major steps involved in describe a problem is to:

1. Define problem statement
2. Develop a problem description

4.2.3.1 Define problem statement

A problem statement is a concise description of the issues that need to be addressed by a problem-solving team. A problem statement should be:

- Identify the object and defect of a problem
- Expressed in technical term
- Not be expressed as symptoms reported by customer.
- a starting point for the problem description

Separate Symptoms into Multiple Problem Statements

Usually, complex problems come in multiples dimensions. It is best to handle one problem at a time for the effective problem solving. Complex, multiple problems should be separated and defined in a problem statement.

Guideline to separate problems:

- Review available information and find out if more than one problem exists
- Separate and prioritize the problems
- Agree on the order of handling the problem

4.2.3.2 Develop a problem description

A problem description defines the scope of the problem in terms of what the problem is and what it is not, but logically could be. Problem description gives you the details that will help the team to find the root cause.

To develop a problem description, you need to relate the problems to these – what, where, when and what Extent. For this purpose, it is advised to use the IS - ISNOT work sheet which is given below

The IS-IS NOT worksheet is primarily used to understand the problem in a better way. The IS-IS NOT work sheet

- Is used in the observation phase of the 8D problem solving
- Only include the factual data and information
- Draw the boundary or scope of the defect for the better understand the situation
- It is used in the V4 to find and refine the root cause.

	IS	IS NOT
What	Object or item	No Similar Product
	Defect:	What defect could the object have but does not?
Where	Where is the object located geographically when the defect is noticed? Where in the process?	Where could the object be located but it is not?
	Where is the defect located on the object ?	Where could the defect be located but it is not?
When	When was the defective object first noticed? When has it been observed since?	When could the defective object have been noticed but was not?
	What is the timing pattern and trend (continuous, random, or cyclical)?	What could the timing pattern and trend be but it is not?
How Many	How many objects have the defect?	How many objects could have the defect but do not?
	How extensive is the defect?	How extensive could the defect be but is not?

Important things to be considered while creating the IS-IS NOT is described below

- Only enter the facts
- Do not look for solutions
- No conclusions to be drawn
- For each "IS" item create at least one "IS-NOT"
- Look for a similar product/process for comparison.
- If you do not have the information for some questions, try to get the data. Do not assume.

4.2.4 D3: Interim Containment Action

The focus in D3 is to develop the Interim Containment Actions and implement it until Permanent Corrective Actions are implemented. The Interim Containment Actions isolate the effects of the problem from any internal/external customer so that customer is protected from further receiving the defective products or effect from the defective parts.

An Interim Containment Action (ICA) is any action that prevents customers from experiencing the symptoms of one or more problems. The interim containment action may not be required in certain cases, so it is advised to evaluate the need for the ICA during start of the D3.

The following to be remembered when deciding and implementing Interim Containment Action:

- ICA is to stop the symptom of the problem reaching the customer
- ICA is also to stop the symptom of the problem experienced by the customer.
- ICA to be verified for effectiveness before it is implemented
- ICA to be documented
- ICA to be monitored for its effectiveness during the 8D
- Once Permanent Corrective Action is completed and validated then the ICA must be removed because it adds cost to the operation.

Steps involved in the interim containment action are

1. Identify and Select ICA
2. Test to Verify ICA for its effectiveness
3. Implement the ICA
4. Monitor the effectiveness

4.2.5 D4: Root Cause Analysis

The objective of the Root cause analysis is to establish the root cause(s) of the problem and validate the same. Finding the root cause is the most important part of any problem-solving effort. When you identify the root cause, you can solve a problem at its most basic level.

At this stage each root cause theory should be tested against the problem description by isolating and verifying the root cause. Also, the place in the process where the effect of the root causes could be detected and contained in this stage.

The steps involved in the Root-cause analysis is as below

1. Identify the Potential cause: Use Cause & effect Diagram to list all the potential causes
2. Select 5-7 Probable Cause: Discuss with the team and after examining all the data and fact decide the probable causes. Review IS-IS NOT and problem description.
3. Find Root cause: Apply 5-Why analysis for all the probable cause to find out the root cause.
 - a. Asking "Why" is a drill down method for cause and effect or can be used as a stand alone.
 - b. "5 Why" is a tool that you can use to drill down to enable the root cause.
 - c. Although we call it a "5 Why," it often can be "5, 10 or 15 Why." You must keep asking WHY until you cannot ask any more!
4. Verify Root Cause: Develop the verification method for each of the Root cause and test it based on the verification method developed.
5. Confirm the root cause: based on the verification results confirm the root cause.

Various types of causes discussed during the 8D process is explained below for the better understanding

- **Possible cause** — any cause, frequently identified on a Cause-and-Effect Diagram that describes how an effect may occur.
- **Probable cause** — a theory, based on available data that best explains the problem description.
- **Root cause** — a verified cause that accounts for the problem; verified passively and actively by making the problem come and go.

While identifying the root cause it is important to consider the following three categories and team needs to have at least one root cause in each of the category

- Why made? Why did we have the problem?
- Why did it get to the customer?
- Why did our Quality system fail?

4.2.6 D5: Select & Verify Corrective Action

A Permanent Corrective Action (PCA) is the best action(s) that eliminate the root cause of a problem. The objective of D5 is to

- Select the best permanent corrective action to remove each of the root cause identified. Remember for each problem, there needs to be minimum three different causes to be identified one each for
 - Why did we have the problem?
 - Why did it get to the customer?
 - Why did our Quality system fail?

So, for all these a permanent corrective action must be established.

- Verify that the selected PCA is effective in addressing the root cause & escape point.
- Verify that the selected PCA is not causing the negative effect on the product or process.

4.2.6.1 Select PCA

The first step is to identify all the possible solutions available to remove the root cause and other causes related to systemic failure and escape points. Suggested steps to be followed for selecting the PCA is to

1. Identify all the possible solutions
Brainstorm with all the 8D team members and develop the solutions which can remove the root cause, if required invite additional people or subject matter experts for the discussions.
2. Decide the criteria for selection: Some example criteria are
 - a. Less Implementation time,
 - b. Low cost for implementation
 - c. Effect on the root cause (success rate)
 - d. Ease of implementation
3. Rate each PCA against the criteria as a team
 - a. Rating scale of 1-5 can be used where 5 is most significant and 1 is less significant
 - b. Rating for each identified PCA can be performed and total for each PCA to be calculated.
4. Select the best PCA based on the significant ratings.
5. Conduct additional checks that the selected PCA should
 - a. Fix the problem at the root cause level
 - b. Generate no additional problems
 - c. Be verified to work

PCA selection involves a clear decision making; the decision-making process is really a technique for prioritizing options. It requires consensus from the team. All team members should come to an agreement on a selected action through discussion and learning rather than through compromise. The members support the decision that benefits the team as a whole. How well the decision-making process works depends on the experience of the decision-makers and the criteria that is applied.

4.2.6.2 Verify PCA

Before implementing the PCA, it still needs to be verified that it will work. The verification can be done in one of the following ways.

- Tests: Specific prototype test or offline test can be conducted to verify that the PCA will be effective
- Audit: Conduct the Audit of the simulation results etc
- Visual Check
- Measurement
- Review: review the trial etc to verify
- Comparison: Compare the similar actions on other issues and effectiveness

4.2.7 D6: Implement & Validate Corrective Action

The next step in the 8D is to implement the verified permanent corrective action and validate the effectiveness of the permanent corrective action by monitoring the actual implementation and the results of the same. Once the permanent corrective action is implemented and validated to be effective, the ICA implemented during D3 is to be removed.

4.2.7.1 Implement PCA

In this step implement the selected and verified PCA to eliminate the root cause of the problem. For the successful and smooth implementation, it is required lot of careful planning and execution along with the resources. When you plan effectively, implementation will go smoothly because:

- No one is caught by surprise by any detail or unexpected event.
- Problems are prevented before they occur.

For this purpose, an implementation plan along with the timeline can be developed and monitored by the 8D leader. Well known PDCA cycle can be used to run the entire phase.

4.2.7.2 Validate PCA

There is a fundamental difference between verification and validation

- Verification: is an action to test the corrective action before implementing PCA to ensure that it will be effective in addressing the root cause (test/pilot condition).
- Validation: is an action to monitor the effectiveness of the permanent corrective action in a production/normal process condition for a long period of time to ensure the effectiveness in removing the problem at its root cause.

After you've successfully implemented the PCA, you need to validate it. Remember: validation is the confirmation that the PCA removes the problem at its root cause. When validating the PCA, ask the following questions:

- Has the problem been totally eliminated?
- How can we prove it? If we cannot prove that the PCA removes the root cause, it cannot be taken as effective.

Before validating the permanent corrective action, make sure to remove the Interim Containment Action implemented in D3. The reason to remove the ICA is

- The PCA removes the root cause of the problem, so the ICA is no longer required to be in place.
- Continuing the ICA would be a waste to valuable resources.

Deciding the validation method depends on the issue and the PCA implemented, the followings are the common validation methods

- Tests: Specific test can be conducted to verify that the PCA will be effective
- Audit: Conduct the Audit of the inspection reports
- Visual Check
- Measurement
- Review: review the product performance
- Customer feedback: Follow up with the customer, when you follow up directly with customers, you:
 - Make sure the customer is satisfied with your problem-solving efforts
 - Check that the problem is really solved
 - Customer can be internal or external

To monitor the effectiveness trend charts, check sheets etc can be used and attached to 8D as appropriate.

4.2.8 D7: Prevent Reoccurrence

The objective in D7 is to

- Modify the necessary systems including policies, practices, and procedures to prevent recurrence of the identified and similar problems.
- Identify the other similar products, same product produced in other locations etc and implement the proven PCA to eliminate the root cause.
- Update the relevant documents like PFMEA, Drawing, PWI etc to prevent the recurrence of the issue.

Prevent recurrence" refers to any actions taken to prevent the present problem, a similar problem, or a systemic problem from occurring again. It's really a matter of identifying the "root cause of the root cause."

4.2.8.1 Ask "Why" on the processes

To narrow down the root cause of the root cause, you and your team need to answer the following questions:

- Why did the planning process not predict the defect?
 - DFMEA, PFMEA
 - Control Plans
- Why did the manufacturing process not prevent the defect?
 - Standardized work, Operator Description Sheets

- ❑ Error proofing, Poka-Yoke
- ❑ Why did the quality process not protect the customer from the defect?
 - ❑ Quality process ability to detect
 - ❑ Quality process responsiveness
 - ❑ Inspection or calibration etc

4.2.8.2 Steps to correct systems flaws

The following guideline will help to correct the systemic failure

1. Identify the system of process involved
2. Identify the champion or process owner
3. Form a team - involve all stakeholders
4. Map current process
5. Identify waste and structural flaws
6. Re-structure or Re-engineer the process
7. Verify the improvements
8. Develop an implementation plan and measurable
9. Communicate the new process
10. Implement the new process
11. Measure and record the improvement

4.2.8.3 Update the Documents

The documents which are required to be updated needs to be established and all the relevant documents to be updated to reflect the changes, these documents are included but not limited to the followings.

- Mistake Proofing - poke yoke List or Instruction
- Work Instructions (PWI)
- Material identification instruction
- Documented Training records
- Documented information
- Process Checklist
- Boundary Samples
- Calibration instruction
- Changeover Instructions
- Standard Operation Procedures
- Flowcharts (material /Layout)
- DFMEA
- PFMEA
- Control Plan
- Incoming Inspection (PII)
- Specifications (TS, PS, TPS, TSS)
- Drawings

One of the best practices is to attach the revised documents as evidence in the 8D report package.

4.2.9 D8: Reward the Team

The objective of the D8 is to recognize the significant contribution to the problem solving by the team or individual. Apart from this formal 8D closure will happen in this stage. This will include

- Complete the documentation package which includes but not limited to the following
 - 8D Report
 - Cause & Effect Diagram
 - IS-IS Not work sheet
 - Implementation plan (Gantt Chart)
 - Action Plans
 - All Validation and verification reports
 - Copy of all the revised documents
 - Process map/flow
 - Trend charts etc

- Store all the documents in appropriate place: 8D report to be store in the NCR system if it is associated with the NCR and share the 8D package with Vestas.
- Communication plan to other required people (Final presentation)
- Discuss the takeaway points (lessons learned) from the exercise.

Recognizing the significant contribution and celebrating the team effort in solving the problem by applying the Vestas 8D problem solving is very important for the management as this will improve the motivation of the team as well as the individuals who are part of the 8D team.

5. Documentation

Document	
8D Report template	https://www.vestas.com/en/about/our-partners/Suppliers