

Master Document: 8 – D Problem Solving

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*) At the three-year review confirmed to be valid until further notice is given.

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New Containment list inserted in Template

Changes in relation to previous issue are written with red, alternatively for figures and tables with a red frame around.

Introduction

This **8-D Problem Solving** standard has been developed to help you solve complex problems for which the cause is unknown. It is designed to help guide problem solving teams through the 8-D process by providing some structure and a detailed explanation of each step.

This standard will introduce each of the eight steps, identify the pieces of each step, provide some tools that are helpful in completing each step, and hopefully provide some helpful thoughts and experiences along the way. It is intended to be flexible so teams can understand the objective of each step and decide what process is most appropriate for their particular problem.

Scope

This standard introduces the topic **8 – Discipline Problem Solving** and gives a general guidance in the application of the technique. **8 – D Problem Solving** can be described as a group of activities intended to systematically plan, track and document the activities critical to efficient, structured problem solving.

Field of Application

This document is a standard. The 8-D is applicable not only in product design and manufacturing processes, but also in business, marketing, HR, and other disciplines where choices and mistakes occur.

Responsibility

In general the party responsible for performing the 8-D is the owner of the process which produced the problem or reject. For a manufacturing quality or a delivery issue, this is usually the product team leader for the rejected or not-on-time product. This process owner is responsible for ensuring that the 8-D process is performed effectively and in a timely manner. He / she is also responsible for ensuring that the results are communicated appropriately.

General

Step 0: Become Aware of the Problem

We may become aware of a problem through notification from a customer of a reject or not-on-time shipment or through self-discovery. Problems which require an 8-D include:

- Nonconformities which could cause a serious incident according to GS-0045, Product Liability Review
- Customer line rejects involving more than a single unit;
- A customer line reject which is a recurrence of an earlier problem;
- A field issue involving a high warranty rate;
- A field issue resulting in a retrofit
- Internal issues which are complex and require a team effort.

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In the case of problems that we become aware of through customer notification, part of becoming aware of the problem involves responding to the customer within 24 hours of notification that we are aware of the problem and are looking into it.

Step 1: Assemble a Team if Necessary

Form a small team (4 or 5 people) with the interest and necessary skills to effectively work through the 8-D Process. The 8-D team should bring in temporary members to perform specific tasks as needed. Consider the following roles when forming the 8-D team:

Champion: The champion is normally not a member of the 8-D team. This individual would be someone who has an interest in the team success, but has delegated the actual problem solution to a group of appropriately skilled and knowledgeable individuals. The role of the champion is to meet at regular intervals with the team leader, monitor progress of the team, garner resources the team does not have authority to use, and remove barriers that the team may encounter.

8-D team leader: The 8-D team leader is the owner of the problem solution and responsible for the process that leads to the solving of the problem. He/she is responsible for scheduling most of the meetings, documenting team assignments, tracking action items, leading team meetings and reporting team progress to the Champion. The 8-D team leader, the technical experts and 8-D team members are responsible for the technical aspects of the discussion.

8-D Team members: These individuals will be involved with the problem-solving process from start to finish. They are usually directly involved in the process where the problem was found and know best how the process actually works.

Technical resources: These individuals would be temporary members of the team. They would be consulted during specific discussions and/or investigations and leave the team when their topic of expertise is concluded.

Facilitator: If the 8-D team leader needs help in focusing on the 8-D process, a facilitator can participate in the team. The facilitator will guide the 8-D team in the understanding of the elements in each of the steps to complete an 8-D Problem Solving Process. The facilitator will focus on the completion of each of the 8-steps of the process, and very little on the technical investigation and analysis.

Develop ground rules

The team should develop a set of ground rules at the beginning of the process. These rules should reflect procedural and relationship considerations. The ground rules should be reviewed and modified if necessary, at the beginning of each meeting.

Step 2: Describe the Problem and the Expectation

A complete and accurate problem statement is arguably the most important element in determining the root cause. Most teams that have trouble finding a root cause don't have an adequate problem statement.

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Specify the internal/external customer problem by identifying in quantifiable terms the (5W2H) for the problem:

- Who (Customer name)
- What (Part name & number and serial number)
- When (Date, hours of use)
- Where (In plant, in field, on machine)
- Why (Assumed failure of part)
- How (How did the failure appear)
- How many (Number of claimed parts)

Describe in quantifiable terms the customer expectation. A table that organizes the 5W2H for the problem may be helpful both for ensuring complete information and for communicating the issue effectively.

Part of step 2 is also to confirm the failure claimed by the customer.

Tools useful for this confirmation are:

- Failure Tree Analyses
- FMEA
- Control Plan

Step 3: Implement and Verify Interim Containment Actions

Containment definition

The purpose of Step 3 is to isolate the customer from the effect of the problem. The containment has to be implemented within the present Sauer-Danfoss goal for timing from initial problem awareness to implementation. Keep in mind that, generally, the sooner the containment is implemented, the fewer the rejects experienced by the customer and the less expensive the recovery will be. Many teams will take action to reduce the likelihood of the effect. This is not truly containment. In some cases, it is very difficult to determine a 100% containment. In this case, it may be necessary to implement several risk reducing containments in series.

Stop the process if necessary

In some cases, it is necessary to stop the process in order to stop the flow of potential problems. Stopping has a tourniquet effect. It stops the bleeding but cannot be kept in place very long.

- Stop the production process
- Stop orders in packaging and shipping
- Stop components in Factory Warehouse

Retrieve the defective product and/or output

Product that is suspected of being defective should be returned for analysis. This product can sometimes be used to gather data about the severity and frequency of the problem.

Specific, actionable information about the defect shall be requested from the customer:

- Detailed description of the problem (call the customer for further information)
- Pictures of suspected product can help
- Expedite return of suspected product
- Confirm problem by analysis of suspected product.

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Retrieve / isolate any defective product

Products that are suspected of being defective should be returned for rework. These products can sometimes be used to gather data about the severity and frequency of the problem. Be sure to consider/check all suspect products including:

- Work in progress (WIP)
- Finished goods inventory in house
- Products in transit to the customer
- Products in customer inventory
- Products on the customer's production line.

Verify that the system is in control

Verify that the defined processes are being followed and if the defective component followed the production process.

- Did the defective component pass the production test
- Is MRP (Material Resource Planning) system according to specification
- Are work instructions and control plan present and followed
- Is operator sufficiently trained
- Is failure identified in FMEA
- Is failure detected according to control plan
- Is Gage R&R according to specification

Develop a list of possible containment actions

This is an expanding task. Many ideas should be generated and the team should consider bringing in temporary members. Brainstorming is a good tool to use for this task.

Following should be factored into the decision:

- Safety issue
- Frequency of occurrence (repeated failure, occur in groups or individual)
- Customer sensitivity to defects including other SD problems
- Risk of containment compared to problem (contamination)

Important containment steps are:

- Inform production personnel about the defect and get feed back on possible occurrence of defect and root cause
- Check all parts "upstream" in the supply chain (production, internal stock, in transit, supplier stock, work in progress)
- Check at other products/customers if same or similar problem could arise
- Make decision about containment marking of parts and/or packaging and for how long time

Consensus on the best possible containment action

Consensus is reached when a team decides on a solution and all members of the team agree to support the decision. Not all team members have to agree that the solution is the best.

Containment examples are:

- 100% inspection (only 95% effective).
- Multiple inspections.
- Reduce acceptance limits
- Add additional process detections
- Limiting who can perform the action

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Test the containment

The containment must eliminate the effect of the problem from the customer. The containment can be verified by analytical or experimental methods. Test if possible the containment with a defect component.

Implement the containment

Once containment has been decided upon, it is time to implement it. This process needs to happen quickly. Maintain the decided actions until a permanent corrective action is in place.

Document the containment

One of the most overlooked parts of containment is the proper documentation of what was done. The reason is that it seems so obvious at the time the containment was done. The 5W's and 2H's are a good way to ensure that enough documentation has been done. Examples of documentation are written instructions, deviations, and engineering changes. Whatever the documentation is, it must be thorough and easily retrieved and can be understood at a later time when the details of the containment have been long forgotten.

Measure the Effectiveness

Develop a method of measuring the effectiveness of the containment. Some problems require weeks or months to determine the root cause and implement corrective actions. During that time, our customers will expect 100% effectiveness of the containment. We need to measure this to understand how well we have met our customer's expectation.

Step 4: Define and Verify Root Cause(s)

Identify all potential causes that could theoretically explain why the problem occurred. Isolate and verify the root cause by mental and/or physical test of potential causes against the problem description and data.

Review the problem statement

It is a good idea to review the problem statement often, but it is necessary to do it at the beginning of Step 4. Update the problem definition with any new facts that have been gathered since Step 2.

Identify failure by analyzing the defective product(s)

If defective product(s) are available, analysis is made to identify the exact problem.

If needed, test the defective product(s) on production equipment, on laboratory test stand or on the machine itself to experience if performance, function values and dimensions are according to specifications.

Use appropriate tools to brainstorm potential root causes and select the real root cause

In order to find the true root cause, it is important to use the appropriate tools. Tools which should be considered during this step are:

- Is / Is Not table
- Fishbone / Cause and Effect / Ishikawa diagram
- Chronological lists
- Statistical methods such as paired comparisons, variables search, DOE
- 5 Whys
- Failure Tree Analysis

Step 5: Define and Verify Permanent Corrective Actions

It is tempting to look at this step as re-stating the obvious because the solution often seems obvious once the root cause is defined. But it is important for the team to find the best possible solution, and that is not always so obvious.

Develop a list of possible corrective actions

The team should develop a long list of possible corrective actions. Brainstorming is a good technique for this task. Don't be afraid to bring in other people, especially the people who will be affected by the solution. There will be much greater ownership if they are part of the solution.

Verify that the corrective action is effective and that there are no adverse side effects

This is an action that is taken "off line" before the implementation. The permanent corrective action must eliminate the root cause as well as the effect. At the same time, the team must verify that the proposed solution does not cause any other problems.

Timing target for corrective actions

The target timing for planning / implementing permanent corrective actions is 2 weeks from problem awareness. Prior to the corrective action being implemented, the customer is only protected by containment. If the permanent corrective action will take several weeks or months to implement, the team should look for some interim corrective action to relieve the pressure on those performing the containment.

Step 6: Implement Permanent Corrective Actions

Define and implement the best permanent corrective actions (PCA's). Choose controls to ensure the root cause is eliminated. Once in production, monitor the process and results.

Develop an implementation plan

The plan needs to include the detailed steps that need to be completed to implement the chosen solution. Special attention should be given to areas which are high risk. The team should try to anticipate where problems are going to occur and make an attempt to prevent them.

Review the process, design, or system FMEA and control plan

The team should review the appropriate FMEAs and control plans and determine what, if any, changes need to be made to those documents. Teams or individuals affected by the FMEAs and control plans may need to be part of the review process.

Execute the plan

Follow the team's plan to implement the permanent corrective action. Complete PPAP when appropriate.

Monitor the results

Put appropriate controls in place to ensure that the corrective action is functioning as planned. Determine the method and the frequency of these checks.

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Remove the containment

The containment that was implemented in Step 3 likely included some inspection or mistake proof process. There is often a large amount of data generated as a result of the containment. If this is the case, the effectiveness of the corrective action should be noticeable. If so, remove the containment.

Step 7: Prevent Recurrence

Everything the team has done so far has been reactive. This step requires that proactive work be done to share what the team has learned so that this problem and similar problems can be avoided in the future. ***This step is absolutely critical in preventing repeat problems and improving quality.***

Identify the system that allowed the problem to occur

Problems are connected to or influenced by the process or system that contains them, whether that process is manufacturing, administrative, or otherwise. This is an opportunity for the team to “close other doors” or a similar problem might walk through.

Think beyond this problem

Think about where this problem might show up

Think about other people who might benefit from what you have learned

Use communication technology (voicemail and e-mail)

Go global.

Change the system or systems that allowed this problem to occur

This task may or may not be beyond the scope of the team. Remember, it is the role of the Champion to expand the sphere of influence of the team. The team should identify what changes are necessary to prevent this problem from ever occurring again anywhere at Sauer-Danfoss or their suppliers, take that knowledge to the Champion, and with his/her help, plan the spread of the new knowledge and actions to leverage that knowledge. Management’s monthly Quality Problems meeting would be an excellent opportunity to implement this step. Also, consider as a minimum updating the control plans and process FMEAs for similar processes.

Step 8: Celebrate Your Success

Unfortunately, this is a commonly overlooked step, partly because many teams never get this far in the process and partly because many people don’t think it is important. But it is **very** important to celebrate and recognize success. The 8-D team leader, in consultation with the Champion, is responsible for ensuring that this activity occurs. The managers’ monthly Quality Problems meeting is an opportunity to create a culture of success recognition, and do so for each of the Problem Solving teams.

References

Academy Classes

D-FMEA

P-FMEA

CEDAC (Cause/Effect)

Error Proofing

DOE

Statistics

Kepner-Tregoe

All Academy trainers appear from the [Academy Trainer/Course Matrix](#)

CHANGE HISTORY:

Revision	Released	Description of Change(s)
A	2004-04-21	NA
B	2004-12-22	Standard revised from a template format to provide more clear instructions on use.
C	2005-09-30	Step 3 Containment expanded to provide more clear instructions on use. New Containment checklist in template.