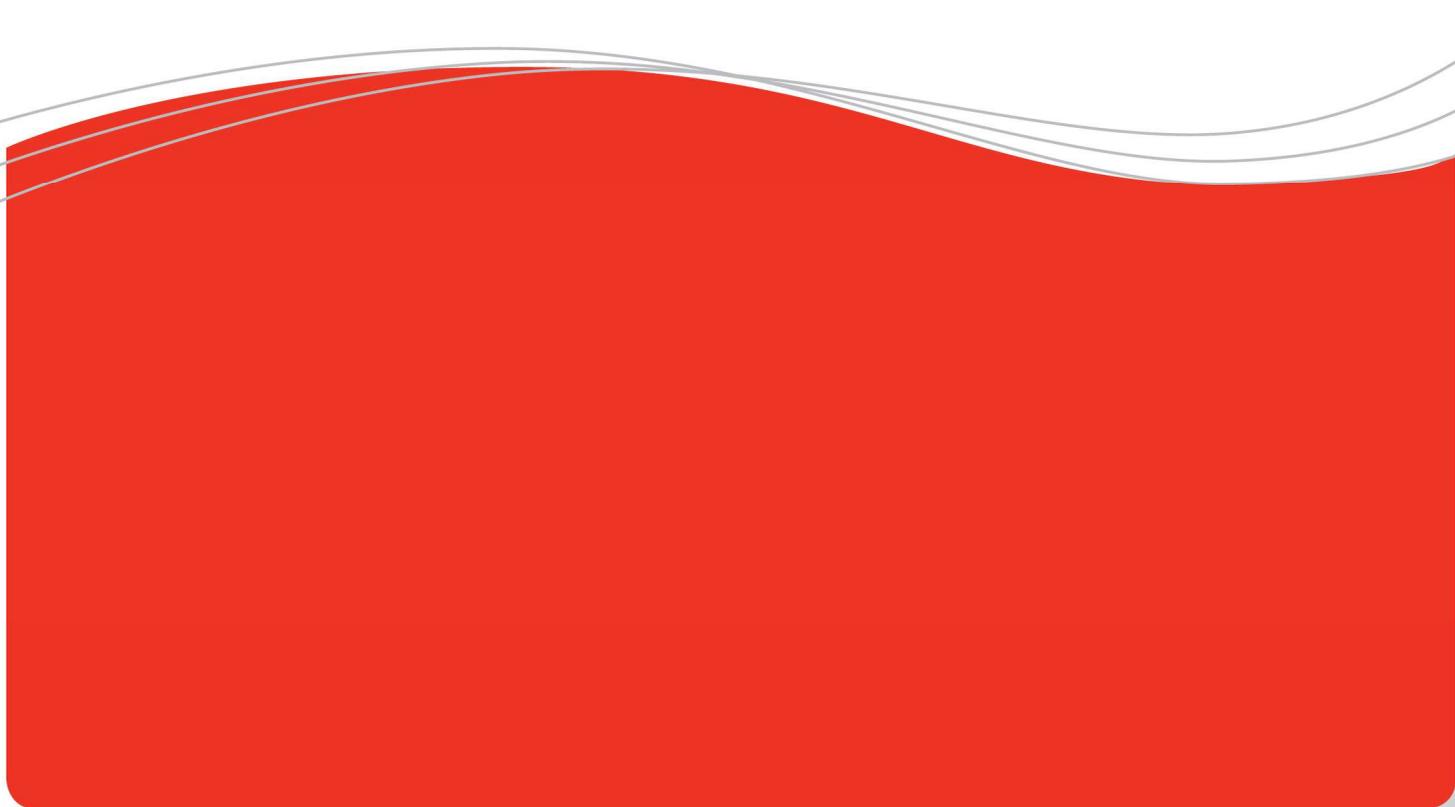




## Capturing process knowledge using standard FMEAs



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## Optimizing the FMEA process by using standard FMEAs

### Introduction

A customer requesting a FMEA requires a specific FMEA. Part numbers, classification symbols etc should all be according to the customer's requirement. This means that we have to make specific FMEAs per customer while a large part of the FMEA is similar between FMEAs.

In other cases we may have different machines or production lines – maybe in different locations – with slightly different production or inspection methods. This means the FMEAs must be different for the different locations.

In this document we will explain how you can use standard FMEAs to capture process knowledge and to minimize the efforts to create a specific FMEA.

### Different methods to standardize

Everybody who needs to make a FMEA will use existing FMEAs as a starting point. There are a few methods to standardize as much as possible:

1. Create a standard and copy from the standard
2. Link a standard FMEA to a specific FMEA
3. Link a standard FMEA with an option to customize the standard after linking

#### *Ad 1: Copy from a standard*

With this method a standard is defined and when a new FMEA needs to be created people start by making a copy of the standard. If an improvement is made to the standard process the standard FMEA will be updated and future FMEAs will use this new standard.

The advantage of this method is people have maximum flexibility after they have made the copy. They basically work with a clean document and can make any change they want. The biggest disadvantage is that if a change is made in the standard process then all existing FMEAs need to be revised.

With this method you will quickly find in practice that people will make changes in the latest FMEA and also don't go back to the standard to update the standard according to the change made in the latest specific FMEA.

A second disadvantage is that it is more complicated to make different people responsible for a specific process. People are responsible for the complete FMEA so they can also make changes in parts of the FMEA related to standard processes. It requires discipline to make sure people work according to what is agreed.



Method 1 is for example used when people create FMEAs using Excel

**Ad 2: Link a standard FMEA to a specific FMEA**

In the second method it is possible that a standard FMEA is linked to a specific FMEA. In that case people only need to select the FMEA and all information is integrated. The standard FMEA can be highlighted in a different color to indicate it is part of a standard.

Step / Function	Requirement	Failure Mode	Effect	Severity	Potential Cause of Failure	Current Process			Recommendation	Responsibility / Target Completion Date	Action Results					
						Controls Prevention	Controls Detection	RPN			Action taken / Completion Date	Occurrence	Detection	RPN		
Op. 60 / Clean door	Surface needs to be clean of particles, dust and grease	Grease is not removed	Wax can not be applied properly	5	Not enough cleaning agent used	3	Visual check	6								
		Dust is not removed	Wax will not cover door completely	4	Door not cleaned completely	5	Visual check	5								
Op. 70 / Manual application of wax inside door panel	Cover inner door lower surfaces with wax to specification thickness	Insufficient wax coverage over specified surface	Allows integrity breach of inner door panel	7	Manually inserted spray head not inserted far enough	None	Variables check for film thickness	5	280	Add positive depth stop to sprayer		Stop added, sprayer checked online / 29-7-2011	7	2	5	70
			Corroded interior lower door panels		Deteriorated life of door leading to: unsatisfactory appearance due to rust through paint over time	Spray head clogged	Test spray at start-up and after idle periods and preventative maintenance program to clean heads	5	Variables check for film thickness	5	175	Use DDE on viscosity vs temperature vs pressure		Temp and press limits were determined and control limits have been installed. Charts show process is in control with ppk = 1.85	7	1

Figure 1: Specific FMEA with link to standard FMEA

In figure 1 you see that the standard process clean door is added to the specific FMEA. The linked process cannot be edited. If a change needs to be made extra steps/functions can be added or the standard FMEA needs to be incorporated in the specific FMEA.

The advantage of this method is that the FMEA can be created very quickly. People only need to select the standard processes and add customer specific issues.

Another advantage is the responsibilities are clearly assigned. The standard FMEA cannot be changed and can only be changed by the people responsible for the standard. If improvements are required this needs to be communicated.

A third big advantage is that if a change is made in the standard it will automatically be updated in all FMEAs using the same standard. People don't need to update all existing FMEAs separately. Of course this might not be required in some cases but it is up to the person responsible for the standard FMEA to decide if the FMEA improvement will be valid for all FMEAs using the standard



Although this method will work if you have similar products this method might not work if you have similar processes at different locations. For example you have similar processes in 2 countries but in one country you have added camera inspection. It means the detection control will differ between the 2 countries so also the standard FMEA needs to be changed.

The solution to solve this under option 2 is to create a second standard or to incorporate the standard into the specific FMEA and then we are back in the same situation as under option 1: Copy the FMEA

**Option 3: Link a standard with an option to customize after linking**

The third option is a more advanced solution. A standard is linked to a specific FMEA but where applicable differences between processes are added to the standard FMEA. In figure 2 you see how this looks in practice.

Step / Function	Requirement	Failure Mode	Effect	Severity	FM Class	Req Class	PIC	Potential Cause of Failure	Current Process				Recommend Action	
									Controls Prevention	Occurrence	Controls Detection	Detection		RPN
010 / Standard process	Standard Requirement	Standard Failure Mode	Standard Effect	6	CC			Cause in standard process specific for this location	Prevention in standard process specific for this location					
020 / Process step 20	Req 20	Fail Mode 20	Effect 20	6				Cause 20	Prev 20	7	Det 20	6	252	
030 / Process 30	Req specific	Failure mode specific	Effect specific					Cause process step 20 specific for this location						

Figure 2: Link standard FMEAs with changes to the standard in DataLyzer FMEA

What you see in figure 2 is that the red cells are part of the standard FMEA and cannot be changed. But specific cell contents for a location can be added to the standard and are shown in black.

The advantage is that this option gives you maximum flexibility while you can still standardize wherever this is required and this will minimize the work needed to create the FMEA. Opening the FMEA also shows quickly where deviations from the standard are applied. This gives you a powerful tool to compare processes and to maximize standardization.

The disadvantage might be that people minimize the number of cells in the standard so it is important that rules are defined how to define standards and communicate about the processes.



The third option requires an extremely flexible database structure because it is essential that no additional setup is required. This process of customizing standard FMEAs needs to go completely automatically and users should not be bothered with setup options per cell.

## **Conclusion**

Using standard FMEAs is a powerful tool to capture process knowledge. If an option is added to allow changes in the standard FMEAs whenever a standard FMEA is adopted in a specific FMEA the tool even becomes more powerful because differences will become clearly visible.