International DATALYZER
Partners in Continuous Improvement

Is Excel the right tool for FMEA ?

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Introduction

When most people start with FMEA they immediately turn to Excel to create the templates. The spreadsheet type view of a FMEA template and the calculations for RPN made it logical in the past to think of Excel to document the information.
However if you look a little bit deeper and you have to create more than a few FMEA's then Excel is certainly not the best choice. In this whitepaper we will explain advantages and disadvantages of using Excel for your FMEA process.

Relational structure FMEA layout

It is easy to be misled by the simple layout of the FMEA template. The FMEA template has a more relational structure than a simple spreadsheet has.

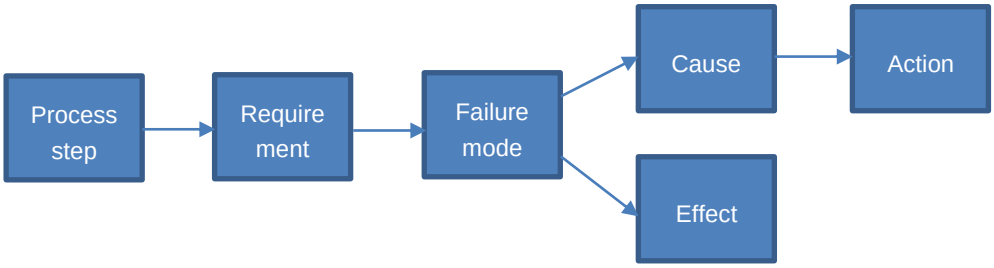

Figure 1: Relational structure FMEA layout

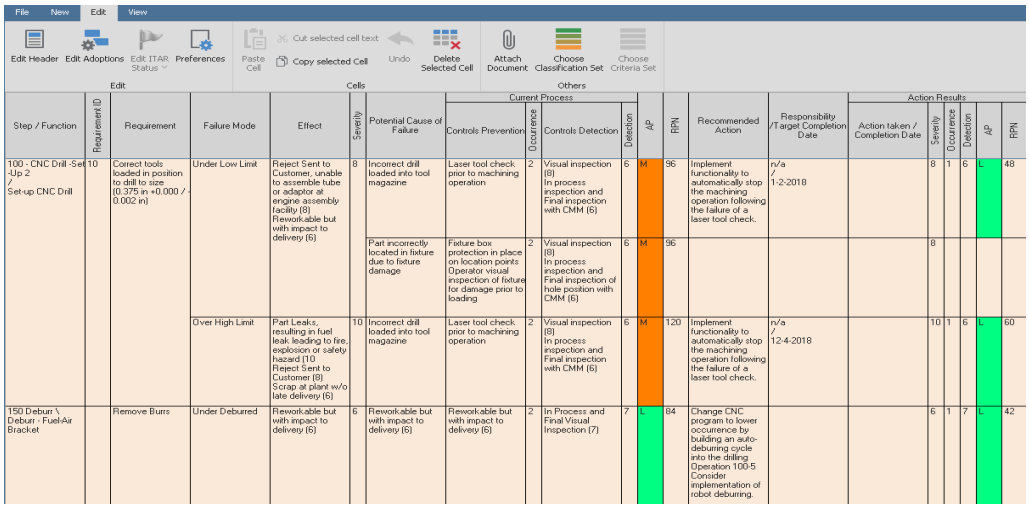

Figure 2: Relation structure shown in a spreadsheet view

The structure required to set up a FMEA is very strict. One process step has 1 or more requirements. One requirement has 1 or more failure modes etc. So, if people use Excel to create FMEA forms they must take care that the required structure is properly followed. They also must combine cells and fill cells not used with a neutral color to create the FMEA layout.

Reference and specific FMEAs

Companies often produce similar parts with similar process steps. But a customer would like to see a specific FMEA and/or control plan for their specific product. So what companies typically do in Excel is make an FMEA and then copy this FMEA for a new product. This will work fine but if there is a process change you need to change all FMEAs. In a database you can simply link to a reference FMEA and if you update the reference FMEA it is automatically updated in all specific FMEAs. But using reference FMEAs goes a lot further than a simple link. You can compare technologies, indicate where you deviate from standard technology etc etc

Linking process flow, FMEA and Control Plan

One of the most tedious tasks in an FMEA implementation is to make sure the process flow, FMEA and Control Plan are properly linked. Linkage goes beyond the process step. Typically the process requirement ins linked to the characteristic and specification in the control plan, the prevention and detection field method in the FMEA is linked to the control method in the control plan and some auditors insists that characteristics and control method are shown in the process flow.

These linkages are very hard to implement in Excel. Because some cells in Excel need to be splitted in 2 cells in the control plan and some cells need to be combined. In the database that information is stored in multiple fields and shown in 1 cell on the screen.

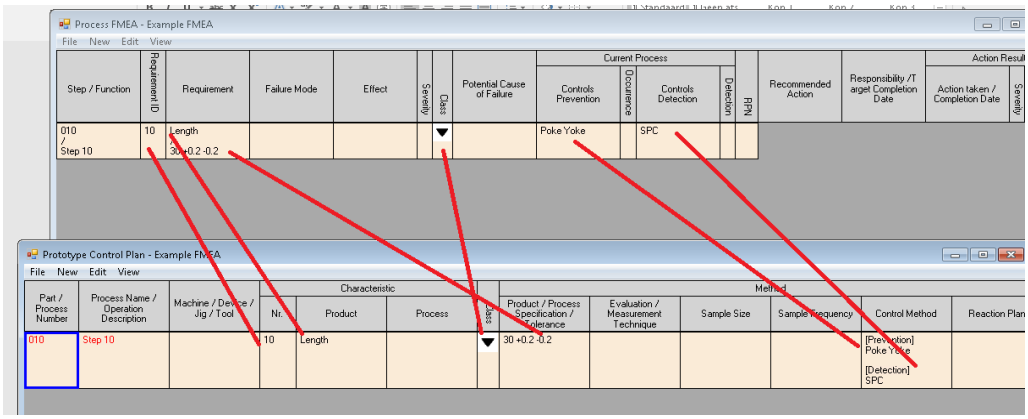

Figure 3: Relations between FMEA and Control Plan

User management

In organizations there might be distinct roles related to the FMEA and Control planning process. People might be responsible for creating a FMEA, reviewing a FMEA or are just allowed to view a FMEA. The roles for the same person might be different for different (groups of) FMEA's. Particularly if a company has various locations where similar products are developed the user management can become very complex.
If passwords are needed to access the data a company might require that user management is integrated with Active Directory.

Managing actions

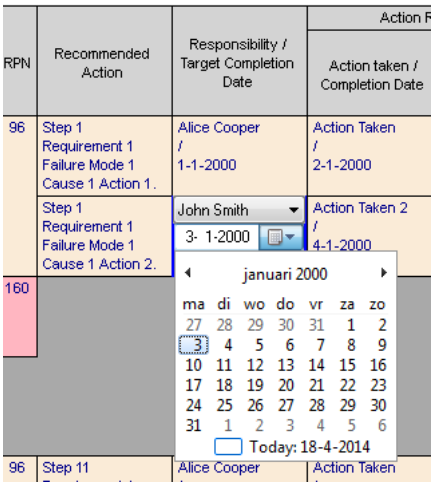

Figure 4: Actions and responsibilities

In the same way the action field actually contains 2 fields: The name of the responsible person and the completion date field. Of course when an action is added to a FMEA the action should be managed. The user needs to be able to view all the open actions and their proposed completion dates.

This type of activity can easily be realized in a relational database but is very hard to implement in Excel. Based on numerous activities you would like to receive Emails for example issuing a document, assigning an action, reminders of upcoming due dates for actions etc. This is all implemented in DataLyzer FMEA but is not possible in Excel.

Users are managed in the system and names and addresses can be taken from Active Directory.

Managing versions

Version management is an essential requirement for FMEA. Issued versions should never be changed and the data in versions already issued should still be available.
Issue dates should be stored automatically and it should not be possible to change them.
If you use Excel you will have to implement a procedure for this. Also you will have to convince the auditor that the procedure is followed by everybody. In a relational database you can automate this procedure and the correct way of working is guaranteed.

It is important you register which people are part of the core team for each version. So, in Excel you need to implement a change log where you also register who is member of the core team. DataLyzer offers an option to keep track of changes per version number and automatically the core team members are registered as well.

Action Priority

In the upcoming FMEA for automotive the RPN will be replaced by Action Priority. The Action Priority will be assigned based on the severity, occurrence and detection value and cannot be established with a calculation formula. So, in Excel you need to implement a selection based 3 fields and 31 categories. All FMEAs in Excel need to be updated with this new macro or function. In a database system this is automatically implemented.

Analyzing your FMEAs

If you combine cells in Excel, the filter and sort options do not work anymore. So, you have to make a choice: You either do not combine cells and use rows which is in principle incorrect or you do not use filtering and sorting making it harder to analyze an FMEA document.
In DataLyzer FMEA we support both methods. During data entry you see the mandatory structure where cells are combined, but DataLyzer automatically offers an analysis option where cells are uncombined.
His makes it possible to use different filtering, sort or grouping options.
In the graph below you see for example several FMEAs where all failure modes are grouped by Action Priority. This kind of analysis is not possible in Excel and certainly not across multiple FMEAs.

Old AP

Docume... Name	Step / Function	Require...	Failure Mode	Effect	Sev	Potential Cause of Failure	Controls Prevent...	Occ	Controls Detection	Det	RPN	Recom... Action	Respons... /Target Comple... Date	Action taken / Comple... Date	Sev	Occ	Det	RPN	New AP
Old AP: L																			
Old AP: M																			
FMEA Dem...	070 / Step...	Height	fal mode 70	Effect 70A	8	Action 70A		4		5	160				0			0	
Old AP: H																			
FMEA Dem...	040 / Step...	Temperature	Failure mo...	Effect 10	8			6		6	288				1			0	
FMEA Dem...	050 / Step...	Temperatu...	Failure mo...	Effect 10	8		Poke Yoke	6	Datalyzer...	6	288	Implement...	n/a /...	/ 29-08-2017	1			0	
FMEA Dem...	070 / Step...	Temperature	Failure mo...	Effect 10	8			6		6	288				1			0	
FMEA Dem...	010 / Step...	Temperatu...	Failure mo...	Effect 10 (8)	8		method A...	6	Camera (3)...	3	144				1			0	

Other items

Before we have described the most important differences between Excel and a database system. There are a more tasks which are difficult or impossible in Excel like:

- Print a Pareto of the top X steps sorted by RPN
- Show the number of actions per employee
- Automatically translate all documents (headers and content)
- Automatically import characteristics from drawings into FMEA and Control Plan
- Export control plan characteristics to an SPC system.
- Automatic feedback from production to FMEA in case of issues

User Acceptance and implementation of FMEA process

Starting FMEA in Excel was always very easy. You could download sample templates from the internet and within a few minutes you are up and running. As the user was familiar with Excel no time was required to train the user in the use of the system. Especially if users were familiar with the FMEA methodology then Excel will give them an opportunity to make a quick start.
Excel has an enormous amount of flexibility and the user can adapt the templates to their own requirements (layout, colors, line thickness and so on). Depending if you will work with Action priority advantages of Excel are becoming less and less because Action Priority is not so easy to implement.
Disadvantage of a database system might be that the way of working changes significantly and users need extensive training to use the software. To minimize this DataLyzer has implemented an Excel solution integrated in the database. The look and feel is almost the same as Excel, which will reduce the risk users will resist using the database based software.

Conclusion

In general, you can say that if a company needs an introduction to FMEA or when a company will keep the number of FMEAs limited to a few products then Excel will be adequate. If a company wants to use Process Flow, FMEA and Control Planning as an integral part of the quality planning process it is strongly recommended that they use a Process Flow, FMEA and Control planning software solution based on a real time database system.

This whitepaper is part of a series of whitepapers on FMEA. The whitepapers can be found on: https://www.datalyzer.com/white-papers/

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