FMEA

As a method for preventively avoiding failures the FMEA is an important tool for quality planning. Conducting a FMEA requires a consequent structuring of dependencies that are often very complex. The iQ-FMEA software module helps to keep track of these dependencies and reuse knowledge once acquired. The product is aimed to product and process FMEA as well.

Workflow

The software support provided by iQ-FMEA begins with a presentation of the system that is to be analyzed and its splitting into components. After describing the functions of the components the functions of the overall system can be described as a hierarchical structure of the single functions. The next step comprises the specification of possible failures for each function and afterwards the analyzation of the hierarchical dependencies between the failures. Based on an assessment of the effects and root causes of the failures it is then possible to perform a risk analysis to detect the critical parts of the system. Alternatively a failure tree analysis can be conducted to determine the reliability of the overall system. By applying dedicated actions the weak parts are improved until the required reliability of the overall system is reached.

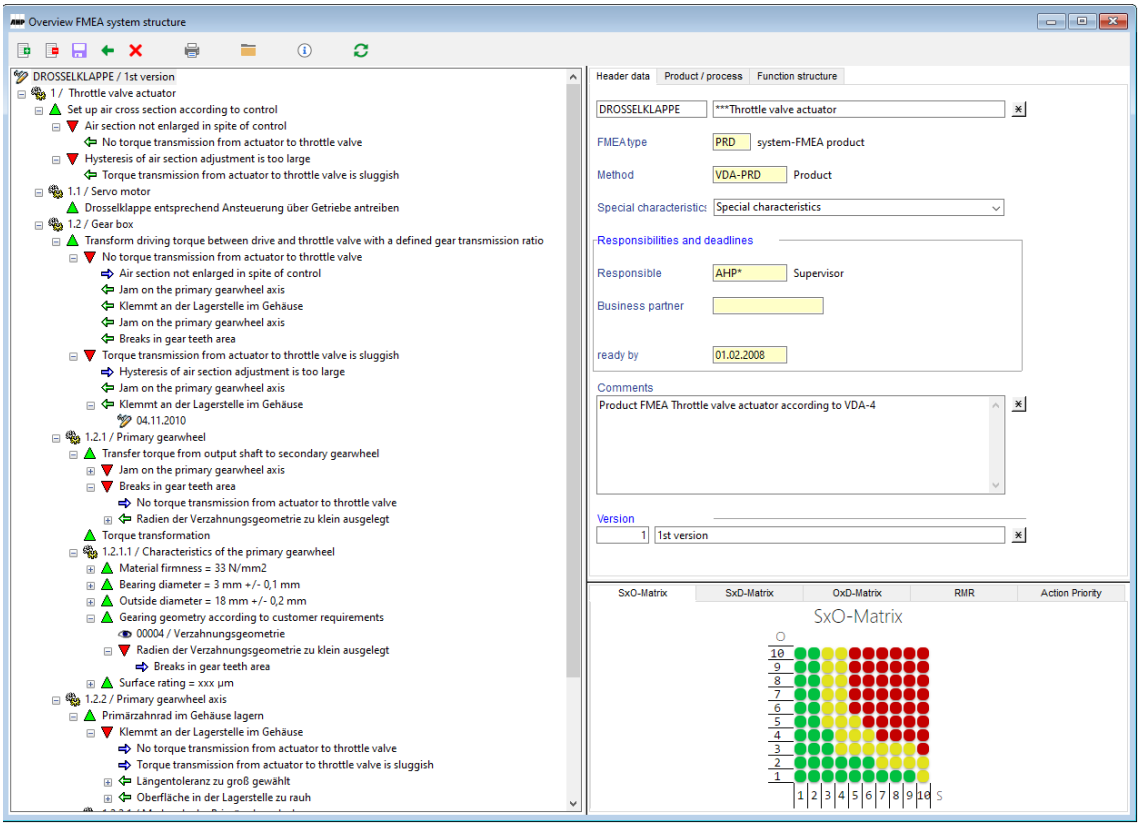
Important Features at a Glance

Fields of application
- Product FMEA
- Process FMEA

Integration in iQ-Basis
- Preparing a FMEA as quality project in *iQ-PROJEKTE*
- Availability of master data
- Action tracking and escalation using *iQ-PROJEKTE*

Editing and representation of the system's structure
- Collection and representation of any elements and partial aspects of the overall system in one single form
- Splitting into components is possible up to any detail
- Reusing components as building parts supported by a search and a copy feature
- Easy and quick conduction of several variants thanks to a smart versioning concept

Creation of a function and failure structure
- Modern graphical user interface
- Creation of different function and failures structures for various aspects of the overall system
- Automatic update of failures sequences and root causes for a maximum data consistency
- Definition of characteristics including corresponding specifications



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Risk analysis

- Assessment of the meaning of failures sequences and the probability of detection and occurrence of failures root causes
- Standardized assessment using risk priority numbers

Risk matrix

- Representation of the matrices BxA, BxE, AxE as well as the risk matrix rank and the task priority
- Visualization via the traffic light colors red (high risk), yellow (medium risk) and green (low risk)

Failures tree analysis

- Alternative way to determine critical failures from the minimum intersection and estimate the reliability of the overall system

Optimizing critical failures

- Complete overview of any optimizations that have been conducted
- Specification of detection and abatement actions including an optional action tracking using the standard in *iQ-PROJEKTE*

Reuse existing knowledge

- System elements built up by components can be reused as building parts in other FMEA's.
- It is possible to create and maintain failure and root cause catalogues to ease creation and improve comparability.

Other features

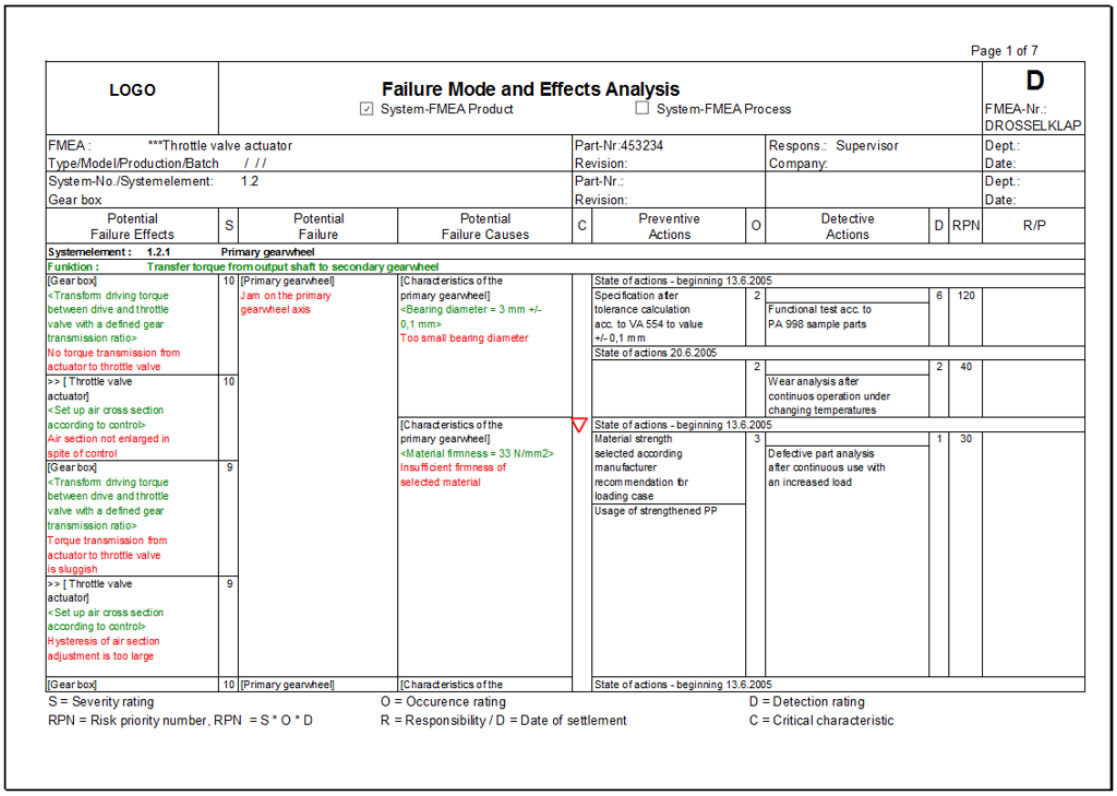
- Assignment of costs and efforts – e.g. for meetings
- Definition and processing of check lists

Documentation

- Form sheet according to VDA 4 – optionally with a complete optimization recording
- Results of the failure tree analysis

Reporting

- Pareto analysis RPN – for root causes
- Pareto analysis RPN – frequency distribution



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LOGO	Failure Mode and Effects Analysis ☑ System-FMEA Product ☐ System-FMEA Process								D FMEA-Nr.: DROSSELKLAP
FMEA: ***Throttle valve actuator Type/Model/Production/Batch / / /				Part-Nr:453234 Revision:		Respons.: Supervisor Company:			Dept.: Date:
System-No./Systemelement: 1.2 Gear box				Part-Nr.: Revision:					Dept.: Date:
Potential Failure Effects	S	Potential Failure	Potential Failure Causes	C	Preventive Actions	O	Detective Actions	D	RPN	R/P
Systemelement: 1.2.1 Primary gearwheel										
Funktion: Transfer torque from output shaft to secondary gearwheel										
[Gear box] <Transform driving torque between drive and throttle valve with a defined gear transmission ratio> No torque transmission from actuator to throttle valve	10	[Primary gearwheel] Jam on the primary gearwheel axis	[Characteristics of the primary gearwheel] <Bearing diameter = 3 mm +/- 0,1 mm> Too small bearing diameter		State of actions - beginning 13.6.2005 Specification after tolerance calculation acc. to VA 554 to value +/- 0,1 mm	2	Functional test acc. to PA 998 sample parts	6	120	
>> [Throttle valve actuator] <Set up air cross section according to control> Air section not enlarged in spite of control	10				State of actions 20.6.2005	2	Wear analysis after continuos operation under changing temperatures	2	40	
[Gear box] <Transform driving torque between drive and throttle valve with a defined gear transmission ratio> Torque transmission from actuator to throttle valve is sluggish	9		[Characteristics of the primary gearwheel] <Material firmness = 33 N/mm2> Insufficient firmness of selected material		State of actions - beginning 13.6.2005 Material strength selected according manufacturer recommendation for loading case Usage of strengthened PP	3	Defective part analysis after continuous use with an increased load	1	30	
>> [Throttle valve actuator] <Set up air cross section according to control> Hysteresis of air section adjustment is too large	9									
[Gear box]	10	[Primary gearwheel]	[Characteristics of the		State of actions - beginning 13.6.2005					

S = Severity rating O = Occurence rating D = Detection rating
RPN = Risk priority number, RPN = S * O * D R = Responsibility / D = Date of settlement C = Critical characteristic

Interfaces to Other Modules

- *iQ-PROJEKTE* for planning and monitoring the activities of a FMEA and tracking actions
- *iQ-GL* for a centralized maintenance of all master data that is relevant in other modules, too
- *iQ-DOKU* for storing and managing supplemental documents
- *iQ-QMS* to refer to a FMEA out of a quality message indicated as "originator self"
- *iQ-APQP*, to directly take over characteristics from a FMEA into the inspection characteristics of a control plan
- *iQ-INFO* for user-defined reporting – e.g. based on Crystal Reports