VALIDATION OF FMEA – AN APPROACH TO JUSTIFY THE CRITICALITY OF THE PERFORMANCE PARAMETRS OF THE PRODUCT

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Abstract

In today's competitive world customers are become very choosey about their product they want reliable, easily serviceable & feasible product. The quality & reliability of product are very important factor in customer satisfaction. To achieve this kind of quality & reliable product we need to do FMEA.FMEA is most significant tool for design engineers to predict the risk of failures in product. The study of FMEA involves study of both Design failures & process failures. Normally in FMEA procedure we calculate the Risk priority number (RPN) & Also it is necessary to validate that FMEA because whether we calculated high RPN number but there is a no need in actual practises. We discuss in this paper about Failure mode effect analysis of centrifugal oil cleaner & its validation. Centrifugal oil cleaner is crucial part which is used to filter the oil in IC engines. We have to validate the FMEA for moving application like Tractors, Earth moving Equipment's

Keywords:-DFMEA, FMEA, Validation of FMEA, RPN

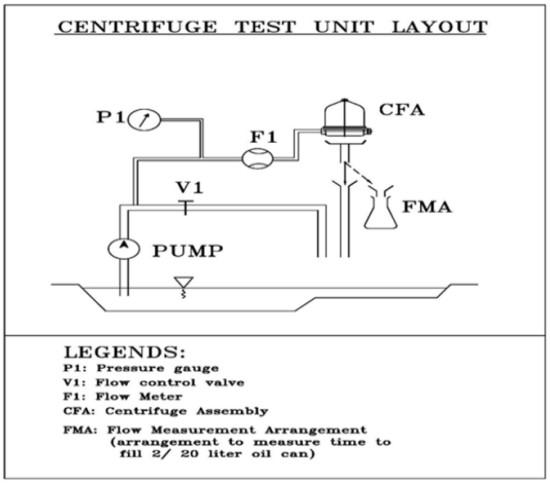
Introduction

While doing the development of a new product, it is important to carry out the exercise of FMEA and to document it. This will help to reduce the risks of failures and rejection in the future. FMEA is the technique that identifies the potential failure modes of the product during its life cycle, effect of these failures and severity of these effects on the function of a product. It was first developed by US Army in their missions. Later in the decade of 1970 it was adopted by Ford Motor in Automotive sector. And now it becomes a common practice in manufacturing sector.

In general there are three types of FMEA,

i) Design Failure Mode Effect Analysis (DFMEA):-It particularly focuses on the failures that can be caused due to the design related deficiencies. The DFMEA of the entire assembly and individual component is important in case of any product.

ii) Process Failure Mode Effect Analysis (PFMEA):-It particularly concentrates on the failures that can be caused due to process related deficiencies .FMEA can include manufacturing and assembly operations, shipping and transportations processes etc.



iii) System Failure Mode Effect Analysis (SFMEA):-It the critical analysis of entire system which is composed of different subsystems.

FMEA PROCEDURE

While performing the exercise of FMEA following steps should be taken.

i) Formulate the team/s and appoint their leaders:- The teams are formed within the organization. Members can be selected from the different departments and the expert person can be appointed as a team leader.

ii) Decide the policy of organization:- Formulate the rules, policies and boundaries to carry out the exercise and instruct the team members to work according to the formulated policies and guidelines.

iii) Take review and gather the information:- Gather the information that can help to conduct the FMEA exercise. Information related to the similar product is also important.

iv) Identify the components or processes:- It is not necessary to conduct the exercise of each and every component or process. From the information gathered in previous stage, the components or processes can be identified.

iv) Identify functions, potential mode of failures, causes and effects of the selected components or processes.

v) Calculate the Risk Priority Number (RPN).

vi) Assign the corrective actions.

The new product will be tested on centrifuge oil cleaner test rig for some parameters having RPN 100 or greater than that.

Fig.1Experimental Setup

Fig.2 Trial Photograph

VALIDATION OF RISK PRIORITY NUMBER

As said earlier it is essential to validate the values of risk priority number. By using the data regarding the rejection analysis some components and the critical parameters has been selected. The speed of filter in RPM is criteria used to be tested.

Critical Factors	Critical Parameters	Low	High
A	Bush Bottom ID	Undersize	Oversize
B	Bush Top ID	Undersize	Oversize
C	Shaft Grinding diameter	Undersize	Oversize
D	Cover Total Height	Less	More
E	Dynamic balancing - unbalance left	<0.2	>0.6
F	Bush top to bottom id height	Less	More
G	Shaft diameter hole	Undersize	Oversize

Table No.1 Critical Parameters

Factors	Conditions	Trial 1	Trial 2	Trial 3	Trial 4	Average
A	LOWER SIDE (1)	3715	4170	4920	2281	3771.5
B		3767	4273	3784	3750	3893.5
C		3771	4245	1812	4211	3509.75
D		3715	4920	3321	2936	3648
E		3715	4920	4285	3621	4135.25
F		3715	2281	3321	3621	3234.5
G		3715	2281	4285	2936	3294.25

Table No. 2 Results of Trial

Factors	Conditions	Trial 1	Trial 2	Trial 3	Trial 4	Average
A	HIGHER SIDE (2)	3321	4285	2936	3621	3540
B		4851	2841	1772	4414	3469.5
C		4740	2297	3549	3864	3612.5
D		4170	2281	4285	3621	3589.25
E		4170	2281	3321	2936	3177
F		4170	4920	4285	2936	4077.75
G		4170	4920	3321	3621	4008

Table No. 3 Results of Trial

Conclusion

As per the manufacturer's specification the speed of the filter shall not exceed the limit of 4000 RPM and shall not fall beyond 3500 .For the lower side, the parameters E, F,G, are not performing as per expectation. For the higher side the parameter B, E, F, and G are not performing as per the expectation. Hence it can be concluded that more concentration should be there on the design and manufacturing specifications of E, F, G. And while preparing the DFMEA more significance shall be adopted about the said factor. Hence it can be said that validation of the FMEA is equally important and it can put the real picture of the critical and non-critical parameters.

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