

POTENTIAL FAILURE MODE AND EFFECTS ANALYSIS
(MACHINERY FMEA)

___ System
 ___ Subsystem
 Machinery/System
 Model Year(s)/Program(s): /
 Core Team:

Design Responsibility:
 Key Date:

FMEA Number:
 Page of
 Prepared by:
 FMEA Date (Orig.): (Rev.):

Subsystem Function Reg'ts	Potential Failure Mode	Potential Effect(s) of Failure	Severity	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Design/ Machinery Controls - Prevention - Detection	Detect	R. P. N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results														
												Actions Taken	Severity	Occur	Detect	R. P. N.										
<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;"> <p>What can go wrong?</p> <ul style="list-style-type: none"> No Function Partial/ Over/ Degraded Function Intermittent Function Unintended Function <p>What are the Functions, Features or Requirements?</p> </div> <div style="width: 30%;"> <p>What are the effect(s)?</p> <p>How bad is it?</p> <p>What are the Cause(s)?</p> <p>How often does it happen?</p> <p>How can this be prevented and detected?</p> <p>How good is this method at detecting?</p> </div> <div style="width: 30%;"> <p>What can be done?</p> <ul style="list-style-type: none"> Design Changes Process Changes Special Controls Changes to Standards Procedure or Guides </div> </div> <div style="margin-top: 20px;"> <p>Seven big Losses</p> <table border="1" style="font-size: small;"> <thead> <tr> <th>Break down and adjustment</th> <th>Setup and change over</th> <th>Waste</th> <th>Capacity</th> <th>Energy losses</th> <th>Defective Parts</th> <th>Tooling</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table> </div>													Break down and adjustment	Setup and change over	Waste	Capacity	Energy losses	Defective Parts	Tooling							
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MACHINERY FMEA

Suggested MFMEA Severity Evaluation Criteria

Suggested MFMEA Occurrence Evaluation Criteria

Suggested MFMEA Detection Evaluation Criteria

Effect	Criteria: Severity of Effect	Ranking	Probability of Failure	Criteria: Possible Number of Failures within Hours of Operation	O R	Criteria: The Reliability based on the User's Required Time*	Ranking	Detection	Criteria:	Ranking
Hazardous without Warning	Very high severity ranking – Affects operator, plant or maintenance personnel, safety and/or affects non-compliance with government regulations, without warning.	10	Failure occurs every hour	1 in 1		$R(t) < 1\%$: MTBF is about 10% of the User's required time.	10	Very Low	Design or machinery Controls cannot detect a potential cause and subsequent failure, or there are no design or machinery controls.	10
Hazardous with Warning	High severity ranking – Affects operator, plant or maintenance personnel, safety and/or affects non-compliance with government regulations, with warning.	9	Failure occurs every shift	1 in 8		$R(t) = 5\%$: MTBF is about 30% of the User's required time.	9		(Teams are free to use a ranking of 9 as needed)	9
Very High	Downtime of more than 8 hours or the production of defective parts for more than 4 hours.	8	Failure occurs every day	1 in 24		$R(t) = 20\%$: MTBF is about 60% of the User's required time.	8		(Teams are free to use a ranking of 8 as needed)	8
High	Downtime of between 4 and 8 hours or the production of defective parts for between 2 and 4 hours.	7	Failure occurs every week	1 in 80		$R(t) = 37\%$: MTBF is equal to the User's required time.	7	Low	Design or machinery controls do not prevent the failure from occurring. Machinery controls will isolate the cause and subsequent failure mode after the failure has occurred.	7
Moderate	Downtime of between 1 and 4 hours or the production of defective parts for between 1 and 2 hours.	6	Failure occurs every month	1 in 350		$R(t) = 60\%$: MTBF is 2 times greater than the User's required time.	6		(Teams are free to use a ranking of 6 as needed)	6
Low	Downtime of between 30 minutes and 1 hour or the production of defective parts for up to 1 hour.	5	Failure occurs every 3 months	1 in 1,000		$R(t) = 78\%$: MTBF is 4 times greater than the User's required time.	5	Medium	Design controls may detect a potential cause and subsequent failure mode. Machinery controls will provide an indicator of imminent failure.	5
Very Low	Downtime of between 10 and 30 minutes but no production of defective parts.	4	Failure occurs every 6 months	1 in 2,500		$R(t) = 85\%$: MTBF is 6 times greater than the User's required time.	4		(Teams are free to use a ranking of 4 as needed)	4
Minor	Downtime of up to 10 minutes but no production of defective parts.	3	Failure occurs every year	1 in 5,000		$R(t) = 90\%$: MTBF is 10 times greater than the User's required time.	3	High	Design controls may detect a potential cause and subsequent failure mode. Machinery controls will prevent an imminent failure and isolate the cause.	3
Very Minor	Process parameter variability not within specification limits. Adjustment or other process controls need to be taken during production. No downtime and no production of defective parts.	2	Failure occurs every 2 years	1 in 10,000		$R(t) = 95\%$: MTBF is 20 times greater than the User's required time.	2		(Teams are free to use a ranking of 2 as needed)	2
None	Process parameter variability within specification limits. Adjustment or other process controls can be done during normal maintenance.	1	Failure occurs every 5 years	1 in 25,000		$R(t) = 98\%$: MTBF is 50 times greater than the User's required time.	1	Very High	Design controls almost certainly detect a potential cause and subsequent failure mode, machinery controls not required.	1