

# The Basics of FMEA: Mark Lines and Their Importance in Failure Analysis

Failure Mode and Effects Analysis (FMEA) is a systematic and proactive approach to identifying and evaluating potential failures in a product or process design. It is a valuable tool for improving product reliability, safety, and customer satisfaction. One of the key elements of FMEA is the use of mark lines to identify potential failure modes.

Mark lines are vertical lines drawn on an FMEA worksheet to indicate the potential failure modes for a particular component or subsystem. They are used to help identify and evaluate the consequences of potential failures. Mark lines are typically drawn on the worksheet so that they intersect with the columns representing the following factors:

- Failure mode: The way in which a component or subsystem can fail.
- Failure effect: The impact of the failure mode on the overall system.
- Severity: The seriousness of the failure effect, ranging from minor to catastrophic.
- Occurrence: The likelihood of the failure mode occurring, ranging from rare to frequent.
- Detection: The ability of the system to detect the failure mode before it occurs, ranging from easy to difficult.

To use mark lines in FMEA, follow these steps:



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1. Identify potential failure modes. Brainstorm with the team to identify all of the potential ways in which a component or subsystem can fail.
2. Draw mark lines on the FMEA worksheet. Draw a vertical mark line for each potential failure mode.
3. Evaluate the consequences of each failure mode. Fill in the columns on the worksheet to assess the severity, occurrence, detection, and effect of each failure mode.
4. Calculate the risk priority number (RPN). The RPN is a numerical value that is used to prioritize potential failure modes. It is calculated by multiplying the severity, occurrence, and detection ratings for each failure mode.
5. Identify and implement corrective actions. Once the RPNs have been calculated, the team can identify and implement corrective actions to reduce the risk of the most critical failure modes.

The following table shows an example of mark lines used in an FMEA worksheet:

Component/Subsystem	Potential Failure Mode	Failure Effect	Severity	Occurrence	Detection	RPN
Fuel pump	Failure to deliver fuel	Engine stalls	8	2	4	64
Power steering pump	Failure to provide power steering assist	Vehicle difficult to steer	6	5	3	90
Brake pads	Premature wear	Reduced braking performance	5	7	3	105

In this example, the potential failure modes have been identified and mark lines have been drawn on the worksheet. The team has then evaluated the consequences of each failure mode and calculated the RPN. The failure mode with the highest RPN (fuel pump failure) is the most critical and should be addressed first.

There are several benefits to using mark lines in FMEA:

- **Helps identify potential failure modes.** Mark lines provide a visual way to identify all of the potential ways in which a component or subsystem can fail. This helps to ensure that no potential failure modes are overlooked.
- **Facilitates evaluation of failure consequences.** Mark lines help to evaluate the consequences of each potential failure mode. This information is used to prioritize potential failure modes and identify corrective actions.
- **Reduces the risk of failures.** By identifying and mitigating potential failure modes, FMEA helps to reduce the risk of failures occurring. This can improve product reliability, safety, and customer satisfaction.

Mark lines are a valuable tool for conducting FMEA. They help to identify potential failure modes, evaluate their consequences, and prioritize

corrective actions. This information can be used to improve product reliability, safety, and customer satisfaction.



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