AMEF

What is it?

AMEF generally refers to "Failure Modes and Effects Analysis" (FMEA). It is a systematic methodology for evaluating processes and systems to identify potential failures and their effects. The purpose is to improve reliability and safety by identifying potential risks and taking preventive measures to minimize or eliminate those risks.

When is it used?

FMEA is used at various stages and contexts within development, manufacturing, and maintenance processes. Here are some key moments when it is utilized:

1. **New Product or Process Development:**
   - During the design phase of a new product or process to identify and address potential failures before production.
   - To evaluate different designs and select the one that minimizes risks.
2. **Improvements in Existing Products or Processes:**
   - When modifications are made to existing products or processes to ensure that the changes do not introduce new failures.
   - To resolve recurring problems identified in production or in product use.
3. **Validation and Verification:**
   - During the testing and validation phase of products to identify and correct potential failures before mass production.
4. **Quality Management:**
   - As part of a quality management system, to maintain and improve product or process quality continuously.
   - In quality audits to assess the effectiveness of existing controls.
5. **Regulatory Compliance:**
   - To meet regulatory requirements and industry standards that demand risk identification and mitigation, such as ISO 9001, ISO/TS 16949 (automotive), AS9100 (aerospace), among others.
6. **Production and Operations:**
   - During the production phase to monitor and improve processes, reducing the risk of failures and defects.
   - In preventive maintenance to identify potential failure points in equipment and systems and take corrective actions before failures occur.
7. **Failure Investigation:**
   - After failures occur, to analyze the causes and effects and develop strategies to prevent recurrence.

How is it done?

A step-by-step guide on how to carry out an FMEA:

1. **Form a Multidisciplinary Team:**
   - Gather people with different skills and knowledge related to the product or process being analyzed. The team should include design, manufacturing, quality engineers, and other relevant specialists.
2. **Define the Scope and Limits:**
   - Determine the scope of the analysis: Is it for a new product, process, system, or specific part? Define the limits of the analysis to maintain focus.
3. **Identify Components and Functions:**
   - Break down the product or process into its individual components and functions. This may involve creating a block diagram or process map.
4. **Identify Potential Failure Modes:**
   - For each component or process step, identify all possible ways it can fail. A failure mode is the specific way something can go wrong.
5. **Identify the Effects of Each Failure:**
   - Determine the consequences of each failure mode. Consider how it affects the customer, the process, the final product, etc.
6. **Determine the Causes of Failure:**
   - Investigate and document the possible causes of each failure mode. This can include design errors, human errors, material failures, etc.
7. **Evaluate Severity, Occurrence, and Detectability:**
   - Severity (S): Evaluate the impact of the failure mode on a scale of 1 to 10 (where 10 is the most severe impact).
   - Occurrence (O): Evaluate the probability of the failure occurring on a scale of 1 to 10 (where 10 is the highest probability).
   - Detectability (D): Evaluate the probability of detecting the failure before it causes harm on a scale of 1 to 10 (where 10 is the least detectable).
8. **Calculate the Risk Priority Number (RPN):**
   - Multiply the scores of Severity, Occurrence, and Detectability to obtain the RPN (RPN = S x O x D). This number helps prioritize failures that require immediate attention.
9. **Develop Corrective Actions:**
   - For failure modes with high RPN, define corrective actions to reduce severity, occurrence, or improve detectability. Assign responsible individuals and deadlines for these actions.
10. **Implement and Verify Actions:**
    - Carry out the corrective actions and verify their effectiveness. This may include additional tests, process or design changes, and updating procedures.
11. **Review and Update the FMEA:**
    - Regularly review and update the FMEA when there are changes in design, process, or new information is obtained. The FMEA is a living document that should be kept up to date.

Advantages of having it done by an engineering consultancy:

Hiring an engineering consultancy to carry out an FMEA offers several advantages. Here are some of the main ones:

1. **Experience and Expertise:**
   - **Subject Matter Experts:** Engineering consultancies have highly trained professionals with extensive experience in conducting FMEAs. This ensures a deeper and more accurate analysis.
   - **Knowledge of Best Practices:** Consultants are usually up-to-date with the best practices and latest industry standards, which can enhance the quality of the analysis.
2. **Objectivity and Impartiality:**
   - **External Perspective:** Being external to the organization, consultants can provide an unbiased and objective view, identifying issues that internal personnel might overlook.

- **Elimination of Biases:** They reduce internal and political biases that could influence the analysis and decision-making.

3. **Efficiency in Time and Resources:**
   - **Time Savings:** Consultants can carry out the FMEA more quickly and efficiently, allowing internal personnel to focus on their primary tasks.
   - **Efficient Use of Resources:** Without the need to train internal staff to conduct the FMEA, resources can be allocated more efficiently.
4. **Access to Advanced Tools and Technologies:**
   - **Specialized Software:** Consultancies often have access to specialized software and tools to perform FMEA more effectively and in greater detail.
   - **Advanced Methodologies:** They use advanced and proven methodologies that may not be available or known to internal staff.
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5. **Knowledge Transfer:**
   - **Internal Staff Training:** Consultants can train internal staff during the process, improving the organization's capabilities for future FMEAs.
   - **Documentation and Procedures:** They can provide detailed documentation and establish procedures that the organization can use long-term.
6. **Improvement in Quality and Risk Reduction:**
   - **Comprehensive Risk Identification:** Thanks to their experience, consultants can identify a greater number of possible failures and their causes, improving the quality of the product or process.
   - **Effective Action Plans:** They can develop more effective action plans to mitigate identified risks, based on their previous experience and similar cases.