AI Log

Brayden Chipman 4:56 PM Used CHATGPT to come up with title for a slide

**Standards to Meet**

* ANSI/BHMA A156.15-2021: This standard pertains to door closers, outlining specifications and requirements for their design, testing, and performance. It ensures the reliability and safety of door closer mechanisms in various applications.
* IEC 60601-1-8 Ed. 2.2 b:2020: This standard relates to medical electrical equipment, specifically focusing on the alarms and alarm systems used in medical devices. It provides guidelines for the design, testing, and implementation of alarm systems to ensure their effectiveness and reliability in alerting healthcare professionals to potential issues.
* DIN EN ISO 3747:2011: This standard details methods for determining the sound power levels and sound energy levels produced by noise sources in situ, particularly in reverberant environments. It provides engineering and survey methods for accurately measuring and assessing noise levels, which is crucial for various industries to comply with noise regulations and ensure a safe working environment.
* IEC 63356-2 Ed. 1.0 b:2022: This standard focuses on low-voltage switchgear and control gear, specifically addressing electromechanical contactors and motor-starters. It outlines requirements and testing procedures to ensure these components' reliability, safety, and performance in electrical systems.

Given the emphasis on electrical safety and reliability in medical devices and electromechanical components, a similar product with comparable use cases could be refrigerators equipped with alarm systems. In this context, such refrigerators would need to meet stringent standards for electrical safety, alarm functionality, and reliability. Additionally, they would require features to ensure waterproofing to protect against potential leaks or spills, and detailed verification processes to confirm proper functioning, particularly regarding the activation of alarms and temperature control mechanisms.

**FMEA Summary**

To restate again, the Failure Mode Effects Analysis (FMEA) conducted for our device provides valuable insights into potential hazards and their associated risks. Using scales for Occurrence (OC), Severity (SV), and Detectability (DT) ranging from 1 to 10, the Risk Priority Number (RPN) is calculated as the multiplication of SV, OC, and DT. An RPN value below 27 (based off a 3^3 score) indicates an Acceptable Risk, 27 to 64 (based off a 4^3 score) represents a Moderate Risk, while an RPN exceeding 64 signifies an Unacceptable Risk.

Several high-risk scenarios have been identified through this analysis, warranting immediate attention and mitigation strategies. These include instances such as False Negative and False Positive alarms, where the occurrence of these events is relatively rare (OC = 4) but could lead to severe consequences such as compromised security or safety (SV = 8 to 10). Detection of these issues may not always be straightforward (DT = 4 to 8), contributing to elevated RPN values well above the threshold for Unacceptable Risk.

Furthermore, failure modes related to structural integrity, electrical malfunctions, and battery issues also pose significant risks. Instances such as Rust formation, Short Circuits, and Battery Exposure to Moisture exhibit varying degrees of severity and detectability, but their occurrence rates and potential impacts necessitate thorough preventive measures. These measures may include regular inspections, enhanced quality control during assembly, and design modifications to improve resilience against environmental factors.

In addressing these high-risk scenarios, it is imperative to implement robust mitigation strategies. This could involve rigorous testing protocols during production, comprehensive user training to enhance the detectability of issues, and proactive maintenance schedules to mitigate potential failures before they escalate. Additionally, clear documentation outlining troubleshooting procedures and emergency protocols can empower users to respond effectively to unforeseen circumstances, reducing the likelihood of catastrophic outcomes.

By prioritizing risk mitigation efforts for high RPN value items identified in the FMEA, we can enhance the safety, reliability, and functionality of our device, ensuring optimal performance and user satisfaction while minimizing potential liabilities and hazards.

Design Updates

The design integrates a weighted mechanism with a spring and sensor for reliable door closure and incorporates a PIN pad lock for secure access, activating a sound and light alarm if opened without the code. This mechanism doubles as a failsafe, closing the door automatically as well as addressing concerns about unauthorized access. Version 1 of the design depicted a rough design with a PIN pad, speaker, LED, and hidden sensor, while Version 2 refined the design on Solidworks and aluminum, incorporating hydraulic closers and detailed alarm placements. Version 3 introduces further improvements such as a larger PIN pad housing for a battery holder, wire channels, and a servo-hook locking mechanism to prevent accidental openings, enhancing user accountability without requiring high security measures.