Team Number: F25-85
Project Title: “Smart Pick” for Rock Cutting
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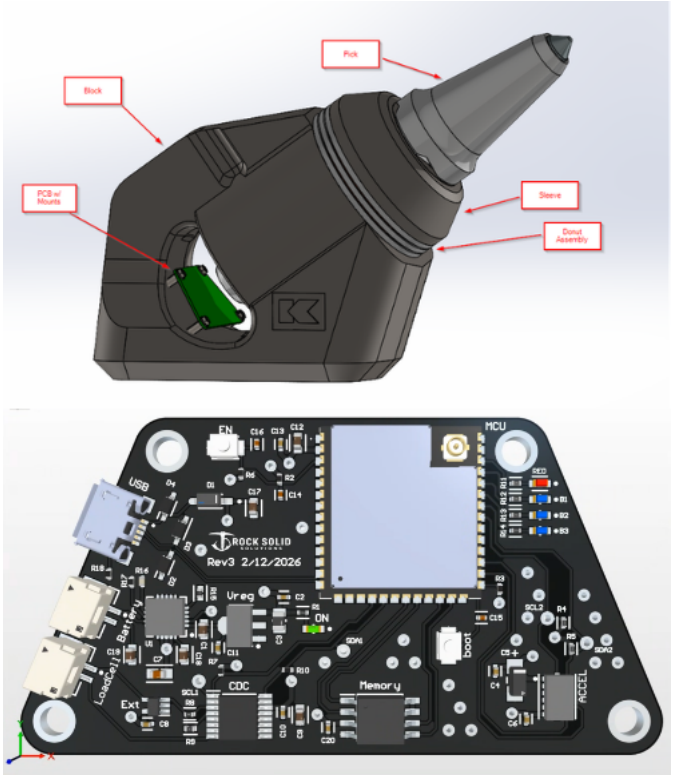

In rock mining operations, machines such as longwall shearers and continuous miners rely on conical rock picks to extract material. These picks wear over time, and when a single pick becomes damaged, it can start cascading failures that accelerate the wear of adjacent picks. This reduces the overall lifespan of the system, leading to extended downtime and thus substantial loss in operational efficiency.

To address this, our team developed a custom sensing solution that captures real-time interaction data at the rock-pick interface. The design includes a donut-shaped capacitive load cell for measuring axial loads, and an embedded high-g accelerometer on a compact, all-in-one printed circuit board. The combination of load data and acceleration data is sufficient for real-time estimation of pick wear and rock properties.

This approach is unique in its ability to combine force and vibration sensing directly, all without disrupting existing machine operation. By enabling real-time estimation of pick wear and rock characterization, the utility of every pick is maximized, and unplanned downtime is minimized, improving overall mining efficiency.