# ***Company Information***

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| **Company Name** | *Robert Bosch LLC* | **Date Submitted** | *11/12/2024* |
| **Project Title** | *Design and Build of a Router Bit Hammer Tester (BOSCH_HAMMER)* | **Planned Starting Semester** | *Spring 2025* |

## ***Senior Design Project Description***

**Personnel**

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

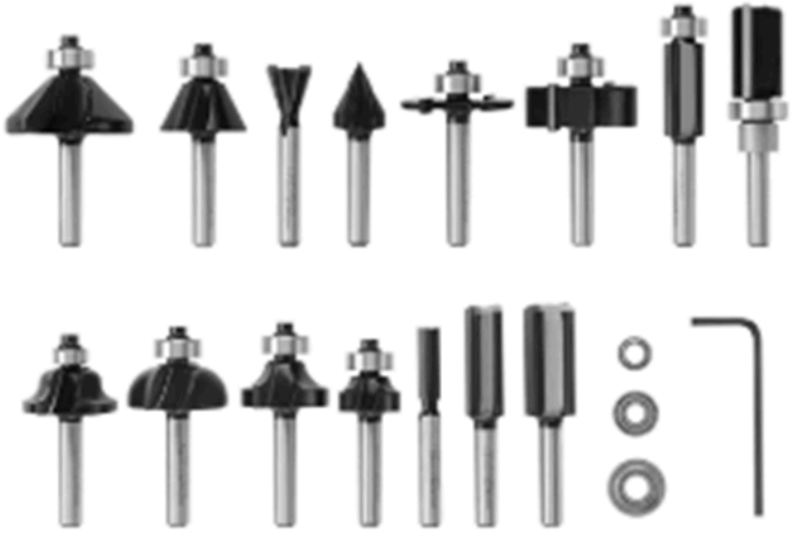
Please provide your estimate of staffing in the below table. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

| Discipline | Number | Discipline | Number |
|---|---|---|---|
| Mechanical | 3 | Electrical | 2 |
| Computer | 1 | Systems | |

**Company and Project Overview:**

The Power Tools Division of the Bosch Group is the world market leader for power tools and power tool accessories. One of Bosch's accessory plants is located in Shelby, NC, and houses a new production line that manufactures router bits (RB) for residential and commercial use. See examples below:

INDUSTRIAL SOLUTIONS LABORATORY



A critical step in the manufacturing process of these RB is a brazing operation which fuses the steel body of the bit to the tungsten carbide cutting surface (“tip”). In order to ensure proper fusion between the components, a “hammer test” is conducted on each part after brazing. This hammer test consists of applying an impact force to the tip. If the tip fractures or separates from the body, the test fails, and the parts are scrap. Part orientation and consistent impact force are critical. There are 2 tips on straight bits and each tip is struck 2-3 times.

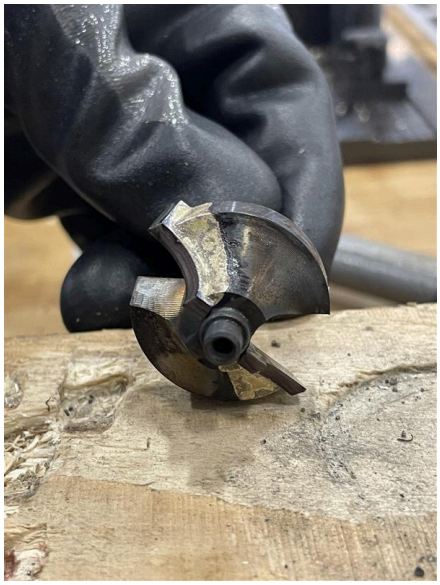
This process is being completed manually, and a home-made rig is used to help ensure consistency with each test. The goal of the project is to streamline this process via the design of a new test rig and potential automation of the testing.

**Project Requirements:**

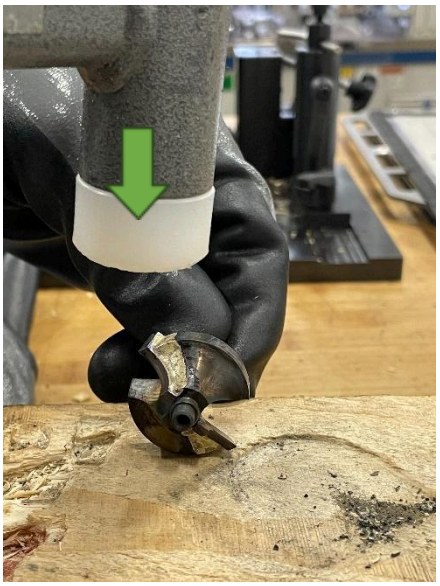
The goal of the project is to redesign the current hammer testing process in order to ensure consistent testing and streamline the process for integration into a high-demand production environment. Investigation will need to be done of the current parameters being used, as well as what parameters are needed to ensure a robust test, without damaging the sample unnecessarily. The team will need to redesign the test rig and the process to ensure consistent testing, while minimizing operator variances. The rig will then need to be automated and integrated in a way which is streamline for the production area and reduces operator time.

INDUSTRIAL SOLUTIONS LABORATORY

Current Hammer Test Rig



Direction of the force applied



Orientation of the sample

Example of failed hammer test – carbide detached

**Expected Deliverables/Results:**

- A mechanical design that will accurately and consistently perform the testing required.
- A design that is also capable of being fully automated and will fit on a tabletop.
- A working prototype that is capable of consistently
- If semi-automated, it needs to be easy to setup and use.


- Training video/instruction manual for how to operate and maintain the machine.
- All drawings, BOM's and software provided.

**Disposition of Deliverables at the End of the Project:**

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

**List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):**

- Interest in Machine Design and Controls Automation