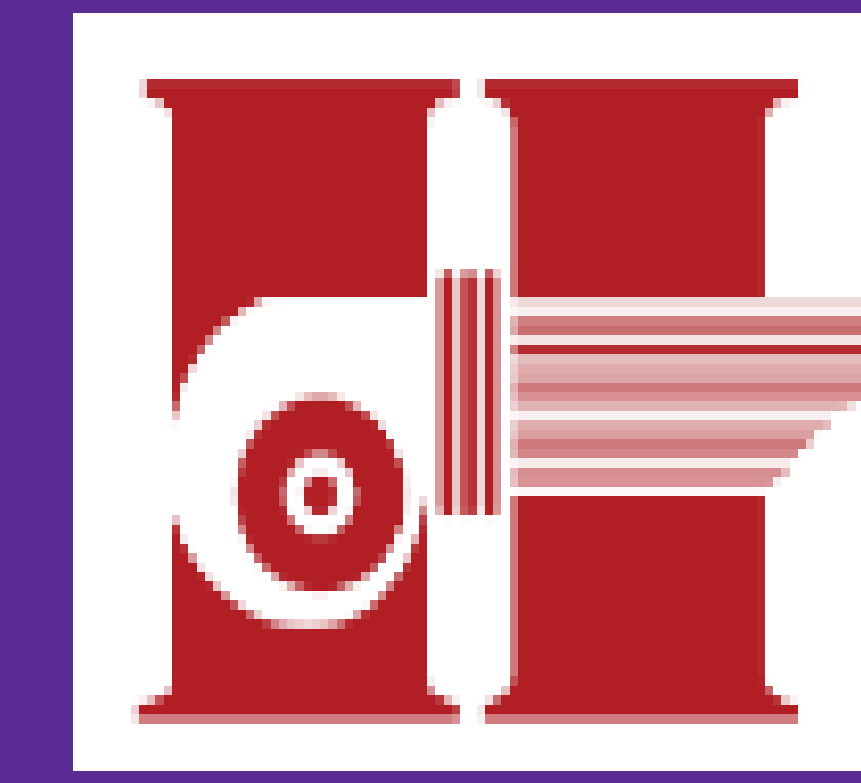


Factory Noise Reduction

Haakon Industries



Western
Carolina
UNIVERSITY

PROBLEM STATEMENT

Haakon Industries manufactures custom HVAC units which involves many noisy processes. Team 16 was tasked with developing a unique solution to mitigate the amount of sound transmitted throughout the facility to minimize strain on the employees who work within the facility.

REQUIREMENTS

- Reduce the overall noise by 30% throughout the facility.
- Identify excessive noise hotspots around the facility
- Map the sound around the facility
- Develop a portable solution that can be applied in various areas as needed specifically the E5 press
- Suggest improvements for future work
- Adhere to all codes and industry best practices

CONCEPTS

A few concepts were seen as viable solutions in the beginning. A full enclosure, hanging sound deadening curtains, and sound deadening panels were all possible solutions. After the team researched fire codes and industry best practices, the sound deadening panels were selected as the most practical solution.

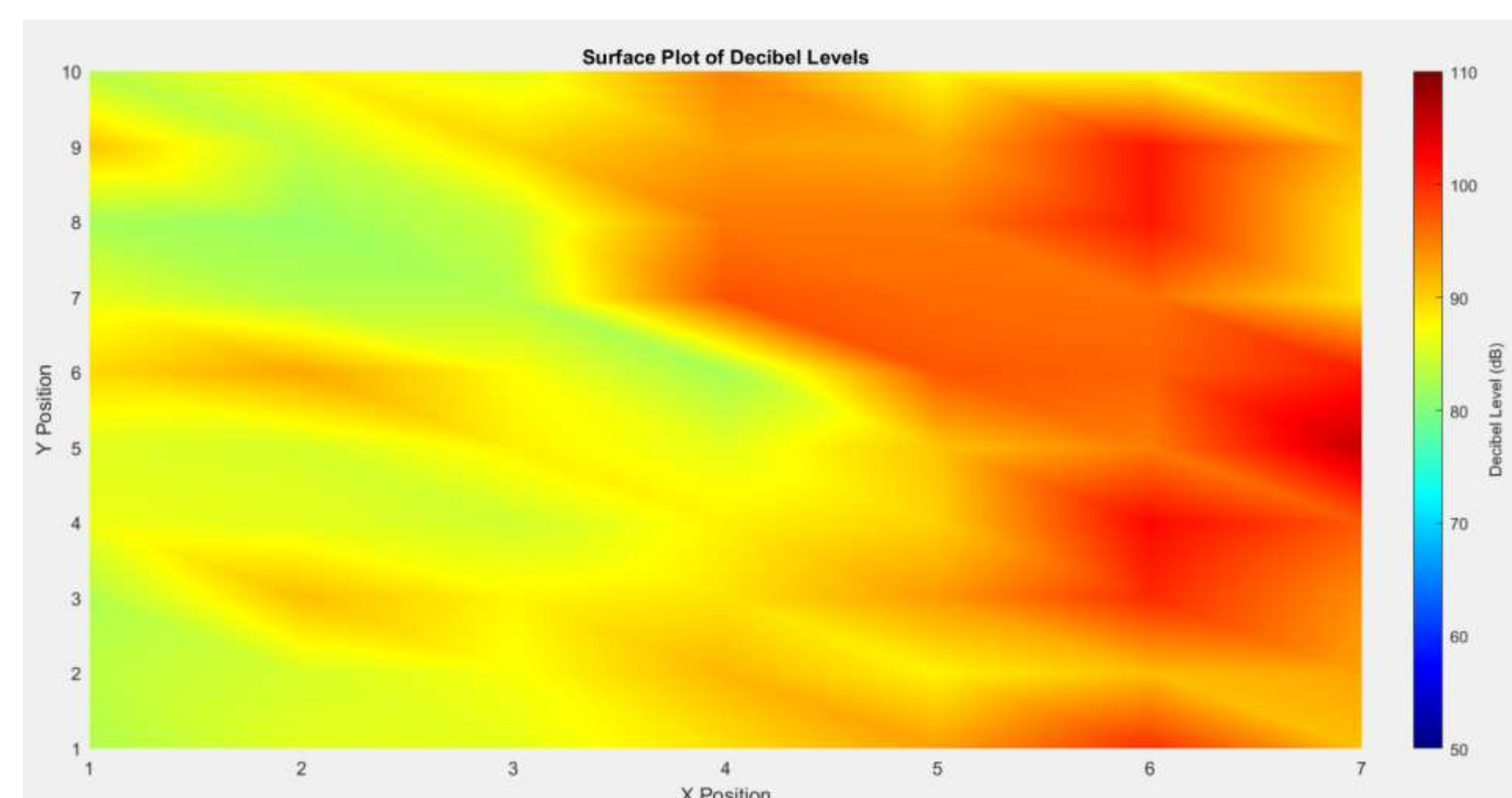


Figure 1: This is a 2-dimensional heat map of noise levels in Haakon's facility. The X and Y axis represent feet in the facility, with dB values represented by the color key to the right.

FINAL DESIGN, APPROACH, PLAN

After careful research and planning, the team designed the sound deadening panels to achieve the desired noise reduction around the E5 press..

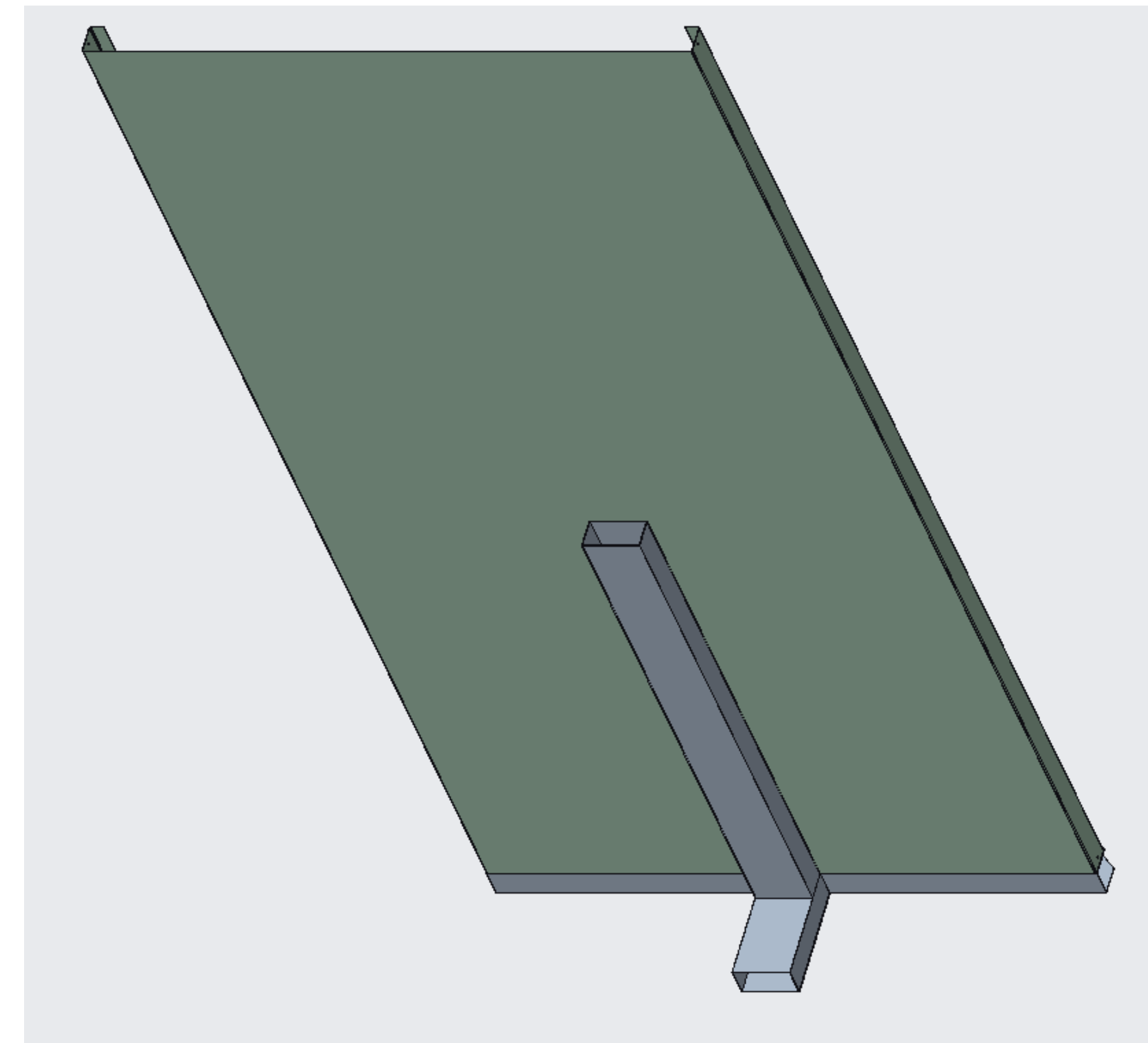


Figure 2: Panel and base design. Team 16's design utilized materials that Haakon had on site, and prioritized DFM and DFA concepts to ensure each panel was as cost effective as possible

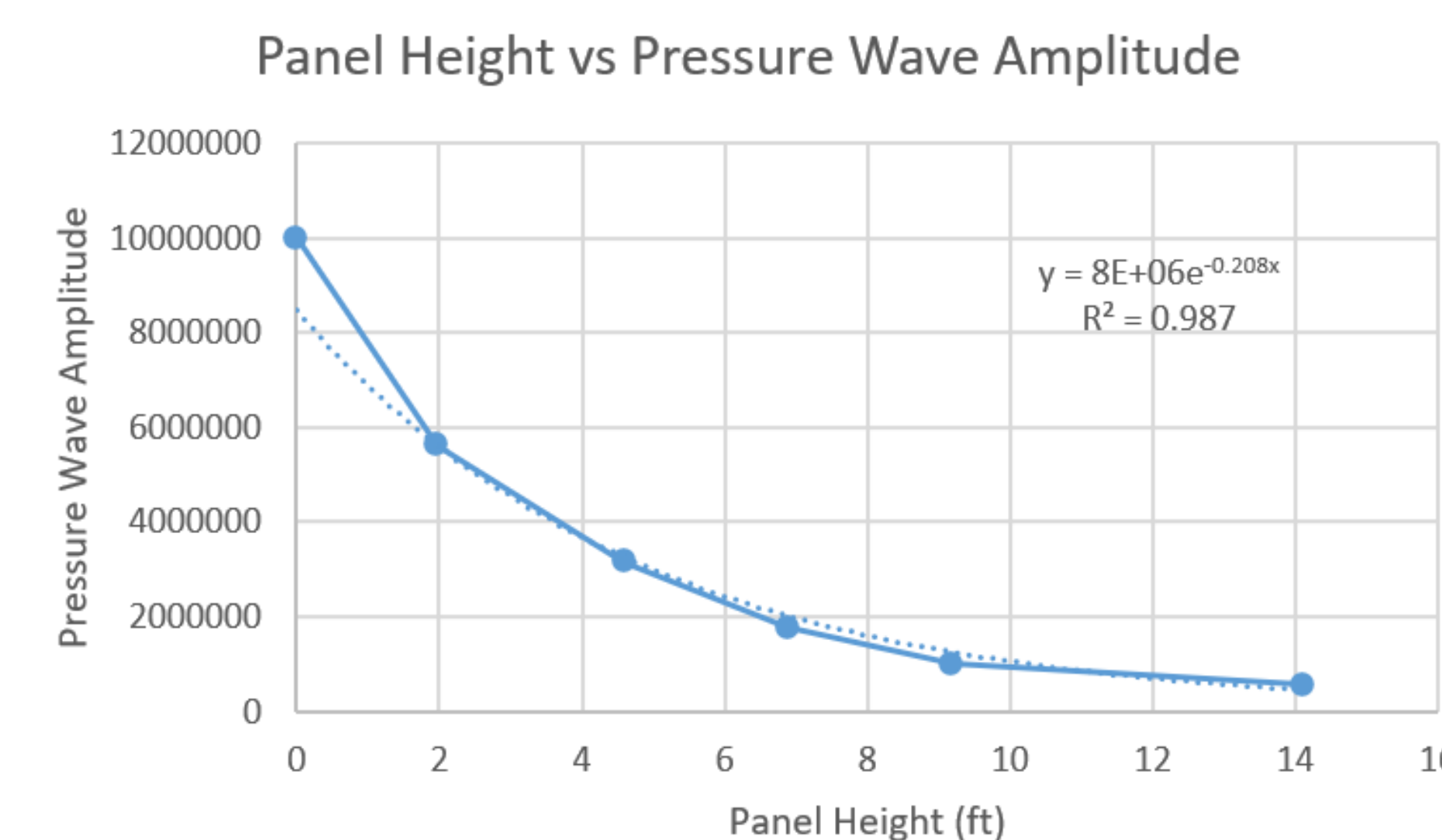


Figure 3: Comparison of Panel Height and Pressure Wave amplitudes, justifying Team 16's final panel height of 8 feet. Units are in sound pressure of μPa .

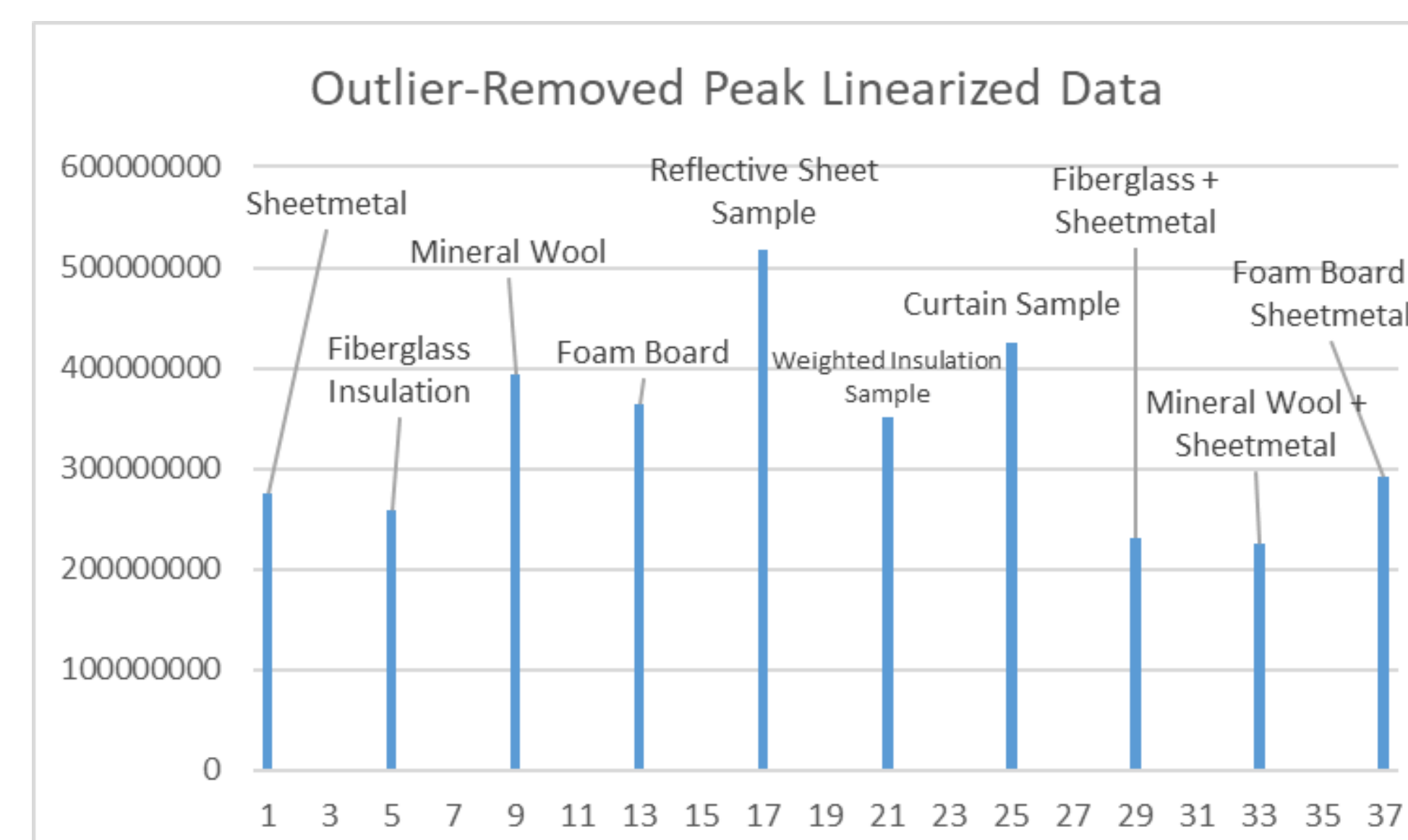


Figure 4: Comparison of different acoustic dampening materials and their transmission amounts. Units are in sound pressure of μPa

RESULTS

The team has submitted a design to Haakon industries for construction. Photos of prototype E5 sound reduction panels are included below



Figure 5: Panel and base design. See figure 2.



Figure 6: Cross-section view of sound panel (w/insulation)

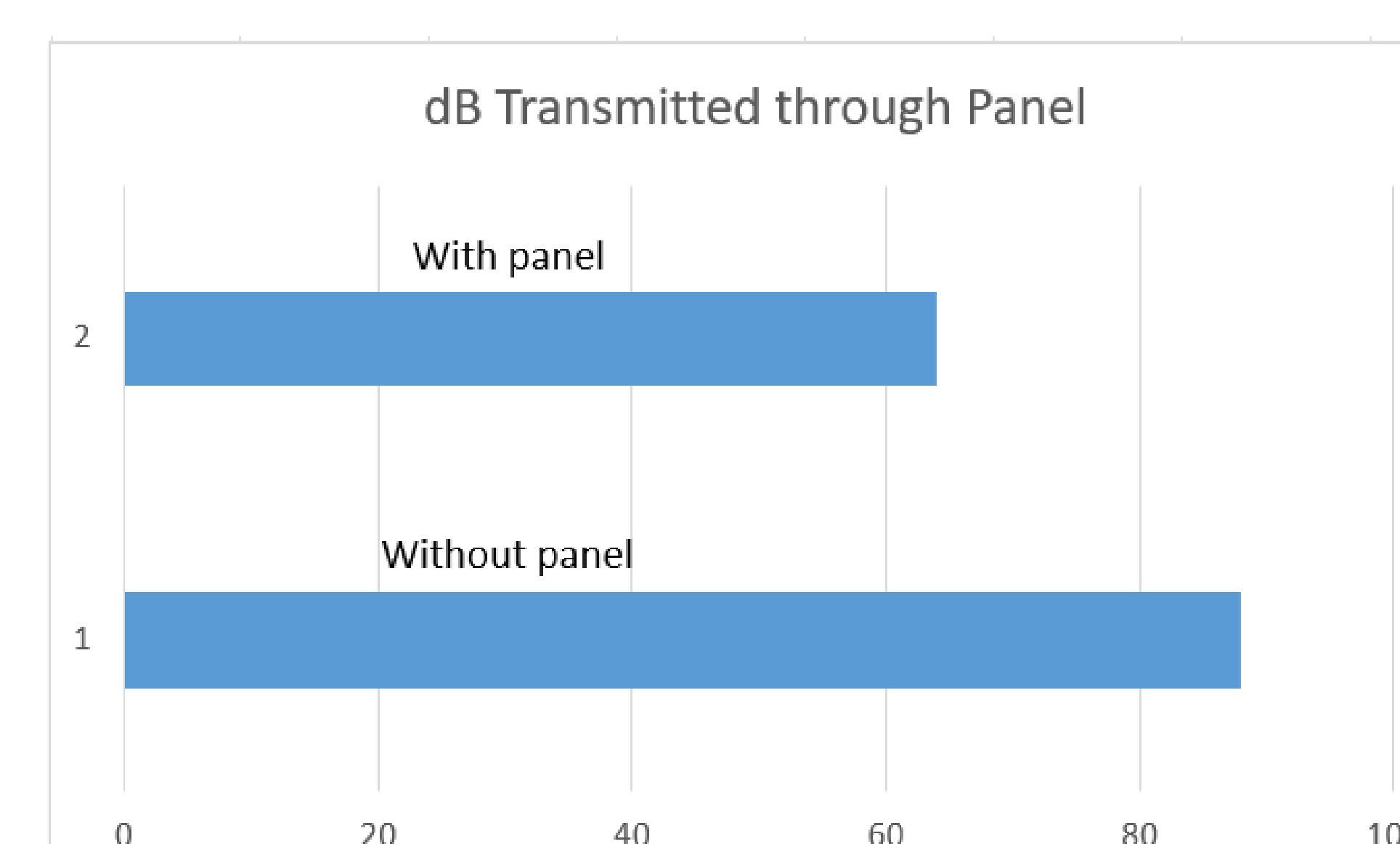


Figure 7: dB levels as measured with and without using panel as intermediary acoustic blocker.

SUMMARY AND CONCLUSIONS

Team 16 was tasked with researching ideas and implementing a solution to Haakon Industries factory noise issues. Our task was to come up with a way to target major noise areas such as the E5 (Punch press) and other potential areas. The team took the following actions:

- Obtained sound measurements around the facility both before and during active production hours
- Designed a modular and mobile panel to help accommodate multiple areas
- Tested materials and material shaping/functionality to improve sound reduction
- Tested panel prototype in a controlled environment
- Full scale panel assemblies are currently being manufactured.

FUTURE WORK

Team 16 is currently working on getting the final data of the implemented panel and its effect of the E5 location. With this we can see the true effect that our design has and how beneficial it is to Haakon Industries. Future state, the customer can implement these panels in other areas for further sound reduction

TEAM & ACKNOWLEDGEMENTS

- William Robertson, BSET
- Caleb Cook, BSME
- Ryan Williamson, BSME
- Matthew Sarkisov, BSET
- Garret Grove, Plant Manager
- Brian Deckard, EHS Manager
- Dr. Wes Stone, Faculty Mentor
- Dr. Scott Pierce, Faculty Mentor