Owens Corning's eLUGant Designs

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Sponsor: Byron L. Bemis, Owens Corning

Background

Owens Corning has several fiberglass fabrication plants across the US. As part of the fiberglass manufacturing process, the molten glass must be extruded through a bushing which is held against the molten glass channels by a frame supported with 8 lugs. Due to the design of the frame and the sensitivity of the bushing, lugs can easily be overtightened, resulting in expensive repairs.

The eLUGant Designs team's mission is to design a fastening system that will secure the frame with an easy and consistent application. For this project, the team used several techniques such as material and environmental simulations to come up with iterative designs that will lead to the best solution.

Objective and Requirements

The design work on this project will yield a working prototype that may be used by Owens Corning in order to improve their manufacturing processes and save money on annual repairs caused by over tightening on the current lugs.

The new design must meet the following requirements:

- Apply 200-300 pounds of force on the frame
- Withstand temperatures up to 1100 F^{o}
- Resist corrosion from high humidity
- Easy to integrate with little to no skill
- Cost less than $30 each

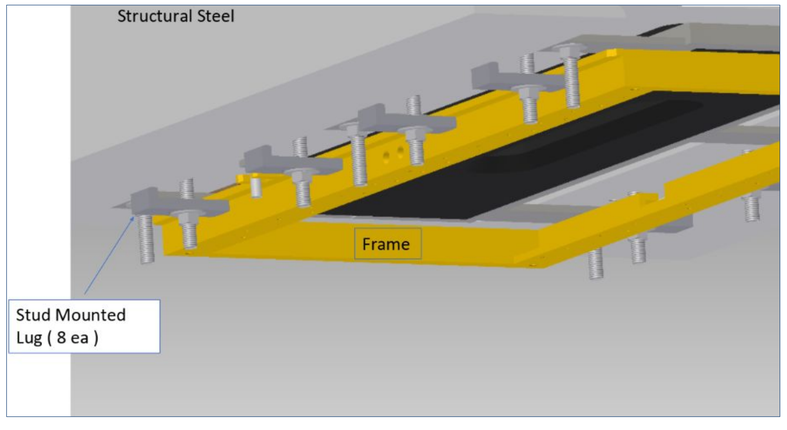

Figure 1. Current lug and frame system within the Owens Corning manufacturing plants.

Methods and Materials

For the design of this new lug, the team had to iterate through many different design options in order to find the best design to meet the requirements. We are following the test and production plan outlined below:

1. Modeling and Simulation - adjusting a base model until force requirements are met

2. Design optimizations - adjusting design to meet cost and environmental requirements

3. Design Implementation - send design to a machine shop and produce prototypes for implementation

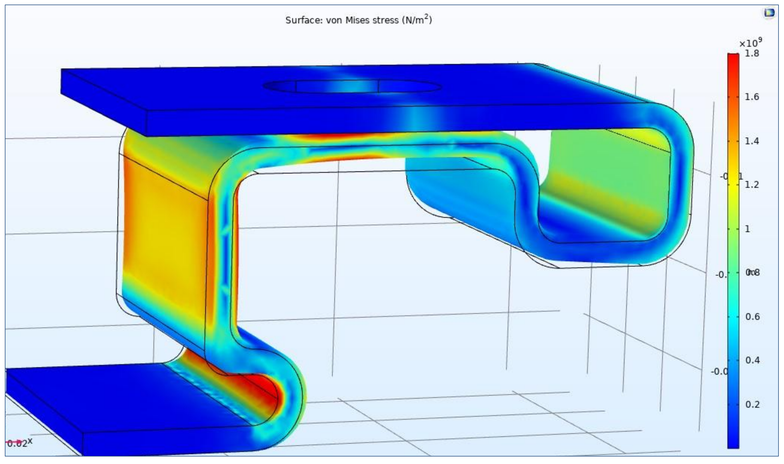

Figure 2. FEA for a feasible design, used to observe stresses on the component so that design adjustments can be made. For this design, the red indicated that the component is well above its allowable stress.

Results

After working closely with our sponsor, the team has worked on phase 1 of the testing and production plan by using finite element analysis. Finite Element Analysis (FEA) is an environmental simulation for 3D models to understand how a piece of hardware will perform under stress or other external factors.

The design seen in *figure 2* is the current design concept for the project and has demonstrated that as force is increased into this new lug, more force is alleviated from the frame, therefore removing the force from the sensitive bushing. *Figure 3* demonstrates this relationship and proves that the design concept is functional.

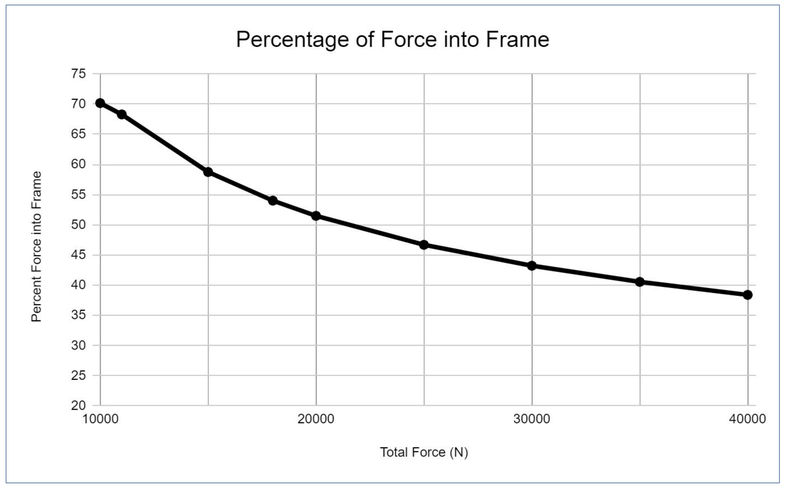

Figure 3. FEA results for design in figure 2, plot demonstrates that more force is alleviated from frame as more force is input to the new lug.

Conclusion

The team has iterated through several different designs and has proven the usefulness of tools such as FEA in order to get closer to the optimized design.

For this semester, the team, has created a feasible design concept that demonstrates its ability to meet the force requirements. The current FEA results indicate a need for a more robust design that will withstand the great input force.

Future Directions

The next step in this design project is to finish and develop the design until the remaining requirements are satisfied. The material and force requirements can both be met by continuing to use simulation and modeling software.

Once both of these are met, the design must be adjusted to be cost efficient in production. Owens Corning has expressed their plans to manufacture thousands of the new lugs in order to replace old ones within their plants across the world.

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