Overview:

FirstEnergy, an electrical utility company, wants to help their workers feel at ease in their gear, especially pertaining to their work gloves, by customizing the glove to maximize safety, performance, and comfort. Accordingly, First Energy has tasked us to create or develop a method to customize a glove-molds, so that each worker can have their own unique pair of safety gloves.

Objective:

The main objective of this project is to investigate/develop an efficient and effective method of customizing a hand mold. Also, further investigation is needed in order to meet manufacturing specifications of the customized hand mold. Manufacturing specifications include material selection, and geometry or shaping characteristic of the hand mold.

Approach:

In order to obtain a proper customized hand mold, there are three important steps. These steps are 3D scanning, 3D printing, and final mold itself.

3D scanning

The first step is achieved by using a method called photogrammetry. Photogrammetry is the process of converting picture into data points and subsequently, a 3D mesh. This is achieved by PhotoScan software. 3D mesh is then edited on AutoDesk MeshMixer. MeshMixer is mainly used to make improvements to the 3D hand model. Improvements include cleaning the surface finish, implementing a bell cuff, enlarging fingers, and scaling the model appropriately.

3D printing

In this project, PLA (Polylactic Acid) and ABS (Acrylonitrile Butadiene Styrene) are used as printing materials.

Final Mold

We have investigated three different options to achieve our final product. Printing the 3D hand model with ABS, green-sand metal casting, and lastly, slip casting.
Outcome:

Each option mentioned above have their own advantages and disadvantages. The ABS hand is the most effective method of producing customized molds. However, since it is not the industry standard, acceptance of this material in the industry is questionable. The porcelain hand produced via slip casting is the current industry standard for molds. But, due to its complexity in producing a customized shape, it is inefficient and time consuming. Thus, it is not preferred for our goal. The metal casting lies in the middle of the above to methods. Stainless steel molds were used in the industry before they were replaced by porcelain hands. Additionally, its process allows for customizability. However, it is also the most expensive option available.