Critical features study of new standard Helmets for firemen

Overview
Tyco (China) Investment Company tasked our group to develop a firemen helmet that complies with the new Chinese standard GA44-2015 released last year. Additionally, the sponsor tasked us to develop a comparison between the American, European and Chinese helmet standards.

Objectives
- To understand the standards and write comparison paper about them
- To understand the market and gather customer needs
- To develop a concept helmet that satisfies needs and complies with standard.

Approach
- Penn State team did market research obtaining data from 700+ firefighters
- Shanghai Jiao Tong University team conducted interviews to firefighters in China
- A comparison paper was develop to understand the requirements of each standard
- Customer needs were develop from research data
- Different patents and current helmet were reviewed
- The team generated multiple concept ideas
- The final two concepts were selected into the design phase
- The chosen concepts were an American style helmet and a European style helmet
- CAD models for the two models were develop
- A material selection process took place considering manufacturability and function of the helmet
- A Finite Element Analysis (FEA) and heat transfer was performed
- Material injection was chosen as the manufacturing technique
- An alpha and an beta prototype were produced using additive manufacturing
- Testing was performed on materials samples to confirm FEA and heat transfer results
- The team created a list of recommendations for TYCO to continue developing the helmet considering both the Chinese and U.S market

European Style

American Style
Outcomes

- The sponsor will be able to access helmet standard information faster
- The sponsor will have a better understanding of the helmet market in the U.S and China
- The sponsor will be able to further develop the helmet using our project as a their starting point which will save money and time