Lucien Wallace, A-B23 Stockholm MQP, Particle Concentrator

Broader Impacts Chapter

The entire project which I worked on was centered on positive impact in the community. It particularly focused on studying the toxicity of ultra-fine particulate matter air pollution in subway tunnels. This research is intended to be used to inform those who are developing methods of reducing air pollution exposure to people. This strongly connects with Fundamental Principle 1 of the engineering code of ethics: " using their knowledge and skill for the enhancement of human welfare". The research conducted and described in this report is directed to improving the health of people who utilize public transit.

The main intended impact of this project is to better understand, and ultimately improve the quality of air which people breathe in during their daily commutes. The directly impacted party is the research group at Stockholm University who received the particle concentrator which we designed and manufactured. It impacted them by allowing for research to be conducted on-site, thereby improving this effectiveness. The broader impacted party is the people who use public transit daily. Our work, combined with other researchers', will improve the daily health of these commuters.

This project is environmentally focused at its core, focusing specifically on air pollution research. It will have a positive environmental impact by allowing for more in-depth research on nanoparticle air pollution, which allows for better solution development. The environmental impact of the actual manufacturing of the machine is quite low since it would not need to later be mass-produced. As a research instrument, it will also be continuously reused and was built to be modified, therefore protecting it from becoming quickly obsolete.

The final product cost is relatively high. Due to the complexity of international parts ordering and approval, an exact number is not possible to obtain, however it is likely to be around 6000-8000 USD. This cost may seem relatively high for a single machine, however as a one-off prototype, the parts required high-precision and customization. Additionally, when possible, individual parts like the virtual impactor were designed by ourselves and manufactured at a lower cost than market price. Some considerations like the design and tolerancing of the virtual impactor design were made to reduce the costs. Since the project goal was to create a novel particle concentrator for further research, the high costs of the project were anticipated, and the end cost was well within these estimations. Additionally, this research will likely cause a large indirect reduction in healthcare costs later on.