Assess & improve the dust extraction system for a robotic linishing cell for Zimmer Biomet

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Aim of the Project

The purpose of this project was to assess the performance and make improvements to the dust extraction system of a robotic linishing cell in Zimmer Biomet.

Background

Dust collection is a necessary process in the production of medical devices to have a clean production environment, maintaining high quality products from being contaminated from foreign particles as well as unfiltered air. It is important to distinguish dust collectors from other systems such as industrial vacuum systems, whiles there are ideal for precision cleaning and material conveyance, dust collectors are designed for full-scale facility or process filtration.

During my summer internship in the Zimmer Biomet, I worked in the facilities department. At the end of the summer, I proposed this project to assess and improve the performance of the extraction in one of the linishing cells.

Figure 1: Camfil Dust Collector

Current System

Figure 2: Acme Robotic Linishing Cell

The machine that this project is based around is an ACME robotic polishing machine, it has one robot that feeds independently linishing and polishing knee femoral replacements. The Acme runs 24 hours a day, 7 days a week linishing Oxford femoral knee replacements.

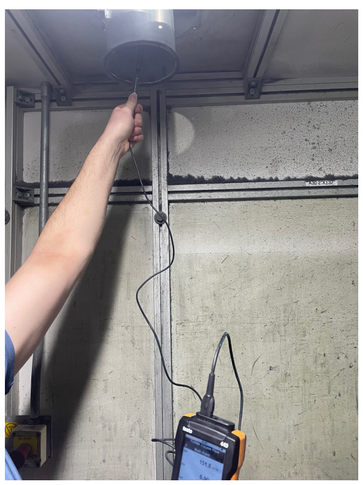
The current extract system has a centralised dust collector that extracts debris from many equipment including the Acme robot. It is found that the current extracting system is not performing efficiently regarding collecting debris. The current dust collector is a Camfil Gold Series X-Flo ATEX Classified Dust Collector. The Camfil runs 24/7 filtering dry, abrasive dust particles from linishing cells.

Figure 3: Inside of Acme Cell

Performance Issues

- When I measured the air flow in the ducts using a pitot tubed anemometer , I found the air velocity to only be 7.01m/s. The minimum velocity needed to remove material at point of use is 24 m/s.

- Another issue was how clogged the ducts were with debris.
- Finally, I found the positioning of most of the ducts to be poorly chosen.



Solutions

- Increase the VDF motor to increase the air volume flow rate which will increase the the air velocity to the spec needed
- Get the all ducts in the cell unclogged and serviced. Once this is done, I propose to introduce PMs to clear the ducts 2-3 times a year. This will be confirmed with the maintenance department
- Experiment with possible positions for more ducts and change position of existing ducts.

Fourth Year Project

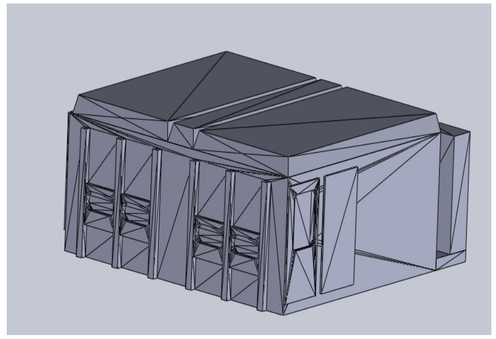


Figure 2: CAD model of Acme

To conclude, I plan to experiment with different duct positions and airflow rates using 3D software such as Solidworks or Revit. I hope to do this as my final year project in fourth year when I do my Facilities level 8.