# Surface characteristics and microbiological analysis of powder bed fusion additive-manufactured parts – the correlation between surface roughness and biofilm formation.

This master thesis project introduced here is part of the Competence Centre Additive Manufacturing for the Life Sciences Competence Centre in collaboration with Cytiva, the Department of Medical Biochemistry and Microbiology at Uppsala university and the department of Fibre and Polymer Technology at KTH Royal Institute of Technology. The student will work in a multidisciplinary environment where interaction with different disciplines and professionals from both industry and academia are acquired throughout this project.

The benefit of using Additive Manufacturing (AM) is triggering a new industrial revolution where novel manufacturing techniques has led to the fabrication of simplified products with less components than those produced by conventional techniques. This is of high interest for the bioprocessing industry where equipment and processes are complex and made up of hundreds of different parts.

*Figure 1. Bioprocessing filtration unit manufactured by Cytiva*

However, strict requirements and regulations when using biopharmaceutical equipment makes it important to understand how AM influence the products and also evaluate different technical aspects.

The aim of this master thesis is to develop a better understanding of how three dimensional (3D)-printed parts interact with bacteria, find the correlation between surface roughness, hydrophobicity and biofilm formation. [1] **Powder bed fusion** combined with different **postprocessing** techniques will be used to produce polymer samples. The surface roughness will be carefully characterized while the focus will be to understand which surface property that influence the bacteria adhesion the most

The student will have the opportunity to gain hands-on experience by working alongside experts in **biofilm evaluation** within a microbiology lab and build a flexible project based on cutting-edge technologies. Furthermore, different characterization techniques like confocal laser scanning microscopy (CLSM), fluorescence microscopy or scanning electron microscopy (SEM) will be used to evaluate surfaces.

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## References

1. Tan, L. J.; Zhu, W.; Zhou, K., Recent Progress on Polymer Materials for Additive Manufacturing. *Adv. Funct. Mater.* **2020,** *30* (43), 2003062.