

Summary

Use of polymers have become increasingly popular in the recent decades due to advancements in the field of composites. Few applications have production quantities of very less units due to which, machining is the only way to create the part. Polymers are challenging to machine due to their weak mechanical properties and molecular arrangement.

The problem statement of this thesis involves machining six different types of plastics (based on monomers) on a machine called a lathe. The plastics(polymer) samples procured have similar geometry (cylindrical shaft) and involved plastics like nylon, poly vinyl chloride, poly propylene etc. The project is done in collaboration with a company called Carlsson and Moller which is based in Helsingborg, Sweden and has expertise in machining of clear polymers with no additives. The goal is to see which set of cutting parameters, these plastics can generate the smoothest surface finish. The different cutting parameters are denoted by different machine speed, lateral translation of tool over the workpiece using different cutting tools etc. The surface which is machined is then observed under an optical microscope to determine the surface finish or quality of the cut surface. There are standard methods which we will use for this surface measurement like the Ra value(roughness average) for example. The study also includes to investigate the nature of the surface formed after the machining. The end result will be in the form of recommendations for which cutting combination generates the best surface for each of the six plastic materials. The recommendations depend on the material characteristics for all different materials used for the study. In these recommendations material removal rate was also studied to improve the machining time and productivity. We also have a secondary scope for this project which is to investigate how fast we can remove or cut the material under different cutting combinations and to also check the tool damage under a microscope. We will add comments about the secondary observations.

We have investigated the surface for the standards of medical and food grade certifications.