Bachelor thesis (BT) on Additive Manufacturing (AM) processes

Introduction

There are many terms like Additive Manufacturing, 3D printing, rapid prototyping and more, that are used to describe specific technologies. Although they are not precisely synonyms, all of them are related to a specific way of product manufacturing. Nowadays, we are still used to making machines and parts from solid blocks of raw material, and then machining away material until desired shape if acquired. Also casting, forming, welding and other technologies are used in the classical process chain, in order to make a specific part.

However, since 1980s there were new and different manufacturing technologies being developed, that used vastly different approach. This trend still continues with more and more interest being paid to this field. Those technologies are commonly named Additive manufacturing technologies (hereinafter AM). The main underlying principle of all AM technologies, that will be listed later, is making part by adding material, instead of removing it. This approach has many advantages over previously mentioned conventional technologies, but it also brings different problem sets that need to be solved.

As mentioned, AM technologies are on a rise. It is now more than 30 years since humble beginnings of the first AM technology, Stereolitography. Since then, AM industry developed rapidly and is today worth several billions of dollars on the market. Its significance can’t be stressed out enough, and I think that sometimes we are not paying as much attention to AM as we should. It probably takes a lot of time to fully realize, how big difference in terms of parts production AM means. Sometimes we might not realize, that some parts we are used to make using classical approach, could be made using AM much faster and without perfectly planned pre-production planning, post-production and with less waste material. AM technologies were developed not to replace conventional technologies, which will probably always have its place on the market. Still, conventional processes can be supported by AM when possible in order to increase manufacturing speed, simplicity and reduce product price. There are even available machines, trying to merge CNCs and AM into a single functional production machine.

For the problematics of AM machines is very complex, choosing a single technology and fully describing it into detail would be sufficient for diploma thesis. Therefore it is simply out of scope of this BT, to give detailed description of all technologies. There are many intricate processes included, related to heat and mass transfer, material processing and properties, precise positioning systems, careful regulation of build environment conditions and much more.

The main goal of this Bachelor thesis (BT) is to make research on the AM field and available technologies. Then, make a brief, but complete and understandable summary and describe ongoing processes. This BT should give the reader an opportunity to understand essentials of individual technologies - know their strengths, weaknesses, main working principles and for which applications are they suitable.

The future of AM market is still to unfold, but various statistics are showing that AM machines will be more and more commonly used in production process - especially with the trend of available materials improvement or development of new materials and price reduction of all key electronic / mechanical parts. It is therefore likely that in future AM machines will be commonly used during production planning and prototyping phase. I believe that knowledge of AM technologies should be part of basic mechanical engineering university education. Since I think it is not the case, may this thesis serve as a guideline for those, who want to step in the world of AM and make use of understanding its basics.

This BT also contains a practical part. Choosing specific topic for this part is still in progress

1) Introduction

Scope of bachelor thesis, goals and intentions

Importance of AM today and possible future development

General research on AM technologies and related topics

Practical part of BT