Implementation of metal 3D printing at TUS

TUS
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Ollscoil Teicneolaíochta na Sionainne: Lár Tíre Iarthar Láir

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Aim of the Project

The primary goal of this project is to integrate metal 3D printing technology at TUS's new campus. The project's complete strategy seeks to construct a new cutting-edge metal printing facility on campus, allowing students and lecturers to expand their expertise in metal 3D printing. Implementing this technology will create opportunities for hands-on learning and practical experience with modern production procedures.

- In-depth literature review into 3D printing, particularly Metal Additive Manufacturing
- Detailed comparison of the types of technologies
- Research health & safety
- Cost analysis for on-site installation

Background / Lit Review

A comprehensive overview of Metal Additive Manufacturing covering key areas such as literature review, technology comparison, and the health & safety aspects associated with implementation and the concerns relating to providing access to undergrads. It explores the evolution, applications, and post-processing intricacies of metal Additive Manufacturing technology. Compares various technologies like SLM, DMLS, EBM, DED, LMD, and MBJ. By addressing these aspects, the project aims to enhance understanding and awareness of Metal Additive Manufacturing within an academic setting.

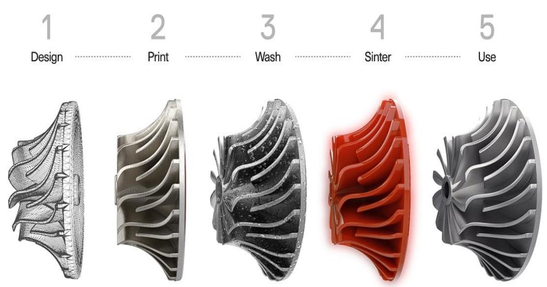

Figure 1: Post Processing (metal AM)

Methodology

- Case studies: Implementation of Metal Additive Manufacturing within Universities.
- Interview: James Wall, Director of 3D Technology Limited.
- Cost analysis for on-site installation

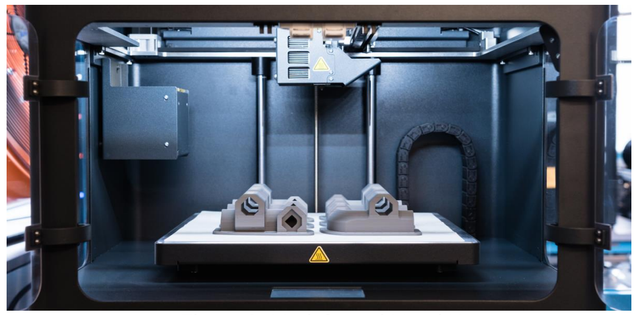

Figure 2: Mark forged Metal X

Case Study

The integration of metal 3D printing technology at UNC Charlotte, facilitated by the Desktop Metal Studio System, enhanced student projects by allowing for the creation of complex geometries, improving structural integrity, streamlining manufacturing processes, and contributing to continued success in competitions such as the NASA Student Launch Initiative.

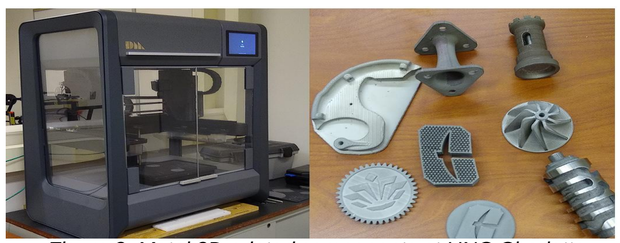

Figure 3: Metal 3D printed components at UNC Charlotte

Findings

Comparing printers for suitability and cost-effectiveness revealed multiple outcomes of implementing Metal Additive Manufacturing within the university. Integration of this technology enhances student learning outcomes, research opportunities, and promotes collaborations with industry partners. Challenges such as curriculum development, faculty training, and facility requirements also emerge, highlighting the need for comprehensive planning and support mechanisms. Various printers were considered, including the ExOne Innovent+ and the Markforged Metal X. While the ExOne Innovent+ offers precise and flexible printing but with a smaller build volume, the Markforged Metal X provides a larger build volume and cost-effectiveness, though with a longer post-processing duration. These insights aid in selecting the most suitable printer for the university's needs.

Figure 4: ExOne Innovent+ and the Markforged Metal X.

Interview

	Questions
Q1.	What are the layout costs associated with setting up the metal 3D printing centering oven in our designated space?
Q2.	Does your company offer training programs for operating the equipment? Is the training conducted on-site, or would our staff need to travel to your facility?
Q3.	Upon purchasing and installing the machine, is there a period of trial or testing to ensure it meets our requirements and expectations?
Q4.	Could you provide insights into the cost of materials for the metal 3D printing process, specifically for the Markforged Metal X printer?
Q5.	What kind of ongoing support services does your company provide, such as technical assistance, maintenance, and software updates?
Q6.	What are the ongoing operational costs associated with maintaining and using the metal 3D printing centering oven?
Q7.	What health and safety considerations should we keep in mind when operating the metal 3D printing equipment? Are there any specific regulations or guidelines we need to adhere to?
Q8.	What recent developments or initiatives has your company undertaken in the field of additive manufacturing, particularly the implementation of metal 3D printing in institutions?
Q9.	Do you conduct inspections to determine the most suitable rooms for installation based on health and safety considerations? If so, could you provide a list of procedures you follow during these inspections?
Q10.	If we are interested in purchasing only the printer and washing station separately, is that possible, or do they come exclusively as part of the full packages?
Q11.	What printers are available, and which one would be the most suitable for an academic setting?

Table 1: Interview Questions

Conclusion

The integration of metal 3D printing technology at TUS's new campus presents an exciting opportunity to advance education and research in additive manufacturing. By constructing a cutting-edge metal printing facility, students and lecturers will have the chance to expand their expertise and gain practical experience with modern production procedures. This project includes in-depth research into 3D printing, including a detailed comparison of various technologies and a comprehensive overview of Metal Additive Manufacturing. Case studies and interviews further highlight the benefits and challenges of implementing this technology within academic settings. Overall, the integration of Metal Additive Manufacturing enhances student learning outcomes, research opportunities, and promotes collaborations with industry partners. Through careful planning and support mechanisms, such as cost analysis and printer suitability assessment, the most suitable printer can be selected to meet the university's needs.

References

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Acknowledgments

I would like to thank my supervisor, Dr. Richard McEvoy, for his guidance throughout the project. His expertise has played a crucial role in assisting me in overcoming challenges and obstacles encountered during this project.
I would also like to extend my thanks to James Wall, the Director of 3D Technology Limited, for graciously participating in the interview and providing insightful answers to my questions. His input has greatly contributed to the progress of this project.