

## **In-Depth Understanding Of Additive Manufacturing**

### *The Subortus Project*

Aghoghotobore Oghenekaro (Author) Glen Burnie High School

**Key Words:** Additive Manufacturing, Manufacturing, 3D Printing, Bioceramics, Process Technology, Subtractive Manufacturing

### **Abstract:**

Additive Manufacturing is a topic that has been often overlooked. Although rarely heard of, Additive Manufacturing is, according to MIT, the process of creating an object by building it one layer at a time (Linke, 2017). A Form of technology that has the potential to compose entirely new business strategies, while also changing the way conventional manufacturing processes (ScienceDirect, n.d.). Additive Manufacturing the umbrella term of 3D printing. 3D printing is being used across the world in nearly every nation's manufacturing industry. Being different from Subtractive Manufacturing, that is the composing of an object through the cutting away of material until the final product is created. This review will provide an in-depth understanding of the technology of Additive Manufacturing and what is its purpose.

### **Introduction:**

#### *Additive Manufacturing*

Being introduced in the early to mid 1980s, Additive Manufacturing is the Umbrella term for 3D printing. Additive manufacturing is the layering of material on top of one another to produce and complete a 3D object; 3D printing. The industry of Additive Manufacturing has become well known having its mark and presence in many manufacturing industries in different nations.

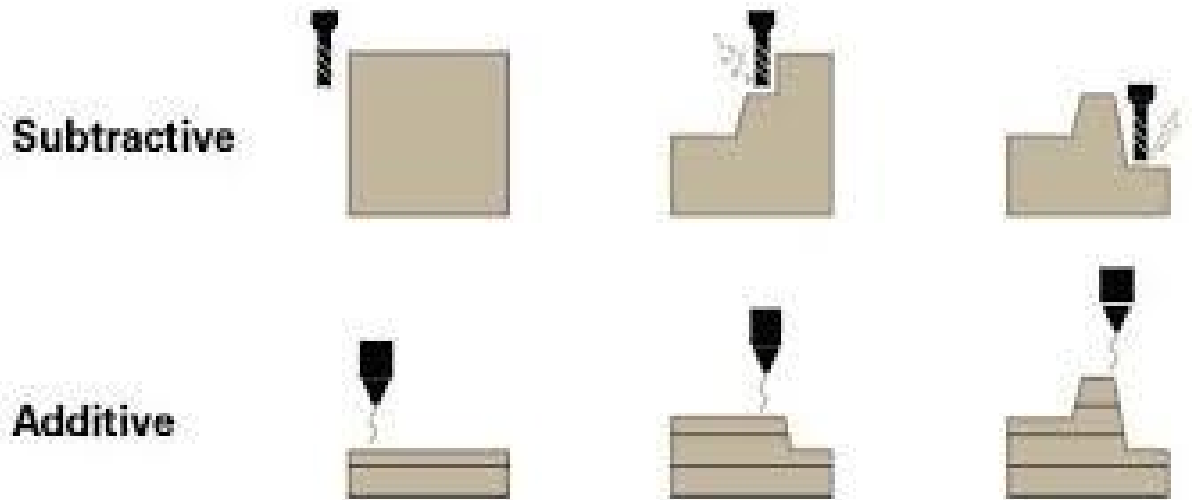
### **Discussion:**

#### *History Of Additive Manufacturing*

Additive Manufacturing was introduced in the 1980s. Towards the end of the Cold War in the United States, military funding for exploring science and industrial technologies increased. Leading to the discovery of industrial innovations, eventually to that of additive manufacturing. In the early 1980s, an inventor by the name of Dr. Hideo Kodama, who took the knowledge from 3D scanning as well as the layering pattern from the 3D topographical maps, to compose the prototyping machine (Markforged, n.d.). In 1984, Charles Hull went on to establish the first 3D printing company in the year 1986, going on to then produce the first 3D printing machine a year later in 1987, which consisted of layer by layer printing using Stereolithography Apparatus (SLA) (Markforged, n.d.).

### ***Additive vs. Subtractive Manufacturing***

Subtractive Manufacturing is the opposite of Additive Manufacturing. In additive manufacturing, layer by layer material is added one on top of another to build the wanted 3D product. While in subtractive manufacturing layer by layer material is removed from a solid block in order to fabricate a 3D product. The primary difference is revealed in their names. Adding material as its name is “Additive”, and subtracting material as its name is “Subtractive”.



This image reveals the significant difference in both Additive and Subtractive Manufacturing, as one is to add and the other subtract. (3D E-SHOP, 2021)

<https://www.3de-shop.com/post/additive-vs-subtractive-manufacturing-difference-pros-cons/.htm>

### ***Progress of Additive Manufacturing***

Over the years progressive manufacturing has changed in various different aspects; including size, production & efficiency. Aspects such as the material design of gladding layers, etc have contributed to the progression of additive manufacturing since its creation.

### ***Conclusion:***

Although relatively unknown, the technology of Additive Manufacturing is significantly important within the industry of manufacturing. By removing the limits on design, spurring innovation, and making these potential innovations possible, the field of additive manufacturing is yet to become what it has the potential of being. But as of now its impact has been extremely effective within the manufacturing industry and beyond.

## References

Linke, R. (2017, December 7). *Additive manufacturing, explained*. MIT Sloan. Retrieved September 8, 2023, from <https://mitsloan.mit.edu/ideas-made-to-matter/additive-manufacturing-explained>

Markforged. (n.d.). *Additive Manufacturing History: From the 1980's to Now*. Markforged. Retrieved September 8, 2023, from <https://markforged.com/resources/blog/additive-manufacturing-history>

PTC. (2019, September 24). *Why Is Additive Manufacturing Important?* PTC. Retrieved September 8, 2023, from

<https://www.ptc.com/en/blogs/cad/why-additive-manufacturing-important>

RapidPSI. (n.d.). (...) (...) - Wiktionary. Retrieved September 8, 2023, from

[https://rapidpsi.com/high-volume-production/?msclkid=92f506976a80175030f0626c16828ec2&utm\\_source=bing&utm\\_medium=cpc&utm\\_campaign=2023%20%7C%203D%20Printing%20Services&utm\\_term=additive%20manufacturer&utm\\_content=Additive%20Manufacturing%20%7C%20Search](https://rapidpsi.com/high-volume-production/?msclkid=92f506976a80175030f0626c16828ec2&utm_source=bing&utm_medium=cpc&utm_campaign=2023%20%7C%203D%20Printing%20Services&utm_term=additive%20manufacturer&utm_content=Additive%20Manufacturing%20%7C%20Search)

ScienceDirect. (n.d.). *Additive Manufacturing*. ScienceDirect.

<https://www.sciencedirect.com/science/article/abs/pii/B9780128035818120818>

3D E-SHOP. (2021, April 28). *Additive vs Subtractive Manufacturing: Difference*. 3DE-Shop.

Retrieved September 8, 2023, from

<https://www.3de-shop.com/post/additive-vs-subtractive-manufacturing-difference-pros-cons/.html>

