

Application of Additive Manufacturing In the clothing industry

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Introduction

Clothing is a fundamental aspect of human life, serving both practical and symbolic purposes. It provides protection, comfort, and style, reflecting personal preferences, cultural identity, and societal norms. From functional attire designed for specific activities to fashion statements that express individuality, clothing plays a crucial role in our daily lives, contributing to our sense of self and how we interact with the world. Here we are trying to use additive manufacturing in the clothing industry.

Sustainability aspect:

The clothing industry contributes to environmental harm through excessive textile waste, pollution from production processes, resource depletion, and the environmental impact of fast fashion. These practices harm ecosystems, contribute to climate change, and strain valuable resources. Transitioning to sustainable and eco-friendly practices is crucial for minimizing these environmental impacts.

i) Harmful Chemicals:

- Toxic dyes and chemicals: The use of hazardous chemicals in textile production can harm workers, consumers, and the environment.

ii) Fast Fashion Culture:

- Overconsumption: The promotion of frequent clothing purchases encourages overconsumption, leading to excessive waste and unsustainable practices.
- Short-lived trends: Rapidly changing fashion trends contribute to clothing obsolescence and further waste.

iii) Pollution:

- Textile production involves the release of harmful chemicals and dyes into the environment, contributing to air and water pollution.

It is to be concluded that there is a need to reduce the consumption of clothing and without compromising our needs.

Our idea: INFINITY WEAR

Aim:

Address the issue of excessive textile waste and overconsumption in the fashion industry, by promoting logo customization and Transformation. Reduce the consumption of cloth by altering logos rather than purchasing new.

Materials: Any Eco-friendly material like R-PLA

Procedure:

- Make a **CAD model** according to the requirement.
- Save it is an **.stl file**
- Convert the .stl file into **g-code** {used cura software to convert. stl into g-code, also add material also diameter and other features. }.
- Upload it to the desktop and print.
- Attach it to the T-shirt.

Any additive manufacturing technique can be used.

- Vat polymerization can make the material flexible, which will fit well to our idea.

Product:



CAD MODEL

Fig 1.



3D PRINTING

Fig 2.

IMAGES



Fig 3.

An attachable and detachable logo is prepared, which can be used on various cloths and various logos can be used on the same cloth. Ultimately reducing the consumption of excess cloths.

Attachment and detachment can be done in many ways like using Velcro, making small slots to insert, gummy substance to stick, Badge type ...etc.,

Advantages:

- Versatile.
- Cost efficient.
- No Harm to the environment.

Cost Analysis:

Additive Manufacturing offers advantages in inventory and transportation costs as well as supply chain management. Build time, energy consumption, and labour are also important factors that affect the cost.

Case – Assume we need 5 types of t-shirts for 5 events

Traditional Manufacturing - $5 \times (\text{cost of each T-shirt} = 250) = 1250$ Rupees

Additive Manufacturing - Machine Purchase (one time investment – ideally) – 2 Lakh

Material consumed=20 g (May vary with size)

The material spool cost=Rs 80/kg.

Other expenses (Electricity, labour costs, etc.) =60 Rs.

The cost of one logo= $(1.6) + (60) = 62$, Cost of 5 logos=310 Rs.

Time to produce 5 logos= 4 hours (may vary with size)

From this cost analysis, we can conclude that our idea of using replaceable logos is not only environmentally sustainable but also cost-effective. It reduces the cost of branding for five events from 1250 Rs to just 510 Rs, demonstrating a significant cost saving.

Future Scope:

- Modify our technique using different materials, colours, designs.
- Using this idea in jewellery and footwear manufacturing.
- More eco-friendly materials can be identified for making logos and products.
- Application in the Aerospace & Defence suits.

Conclusion:

In summary, our project promotes sustainability in the fashion industry by replacing the traditional t-shirt manufacturing approach. Through the use of additive manufacturing, we have introduced replaceable logos on our t-shirts, reducing overproduction and waste.