3D Printed Machine Parts & Attachments

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Traditional Industry

- Machinery industry is concentrated in China (the technology provider)
- Apparel Manufacturing industry is concentrated in Asia (the technology user)
- All current researches in 3D printing is towards manufacturing of different Apparel Products

Traditional Technology Exploit

- Machines are bought from agents
- The original spare parts are often not stocked by the machine seller
- Alternative spare parts and attachments are mostly manufactured in China (by different companies) and stocked by different agents.
- For business sense only frequently used components are stocked and special purpose parts/attachments are NEVER available.

Traditional Scenario

- Difficulty in Sourcing some special parts, e.g. presser foot for light weight fabrics, curled teeth feed dog, etc.
- No possibility of having customised machine parts, e.g. presser foot with custom hinge position, feed dog with custom teeth pitch, Customised attachments based on fabric type.
- Unable to find the right part at right time
- Result: Either compromised quality
  Or Change of design specification (compromised design)

What if

- No need for inventory management! (stock, maintain record, find the correct piece from stock when required, maintain issue record, retrieve after use and store at right place).
- Industrial engineers can search the right part from digital library and order print online!
- Production managers receive the style and design specific customised 3D printed machine part along with cut parts and accessories.

Why 3D Printed?

- Make only when you require (No hassle of complex inventory management)
- You can custom make . . . as you may require.
- Postpone the conversion in equipment supply chain

The Novelty Factor

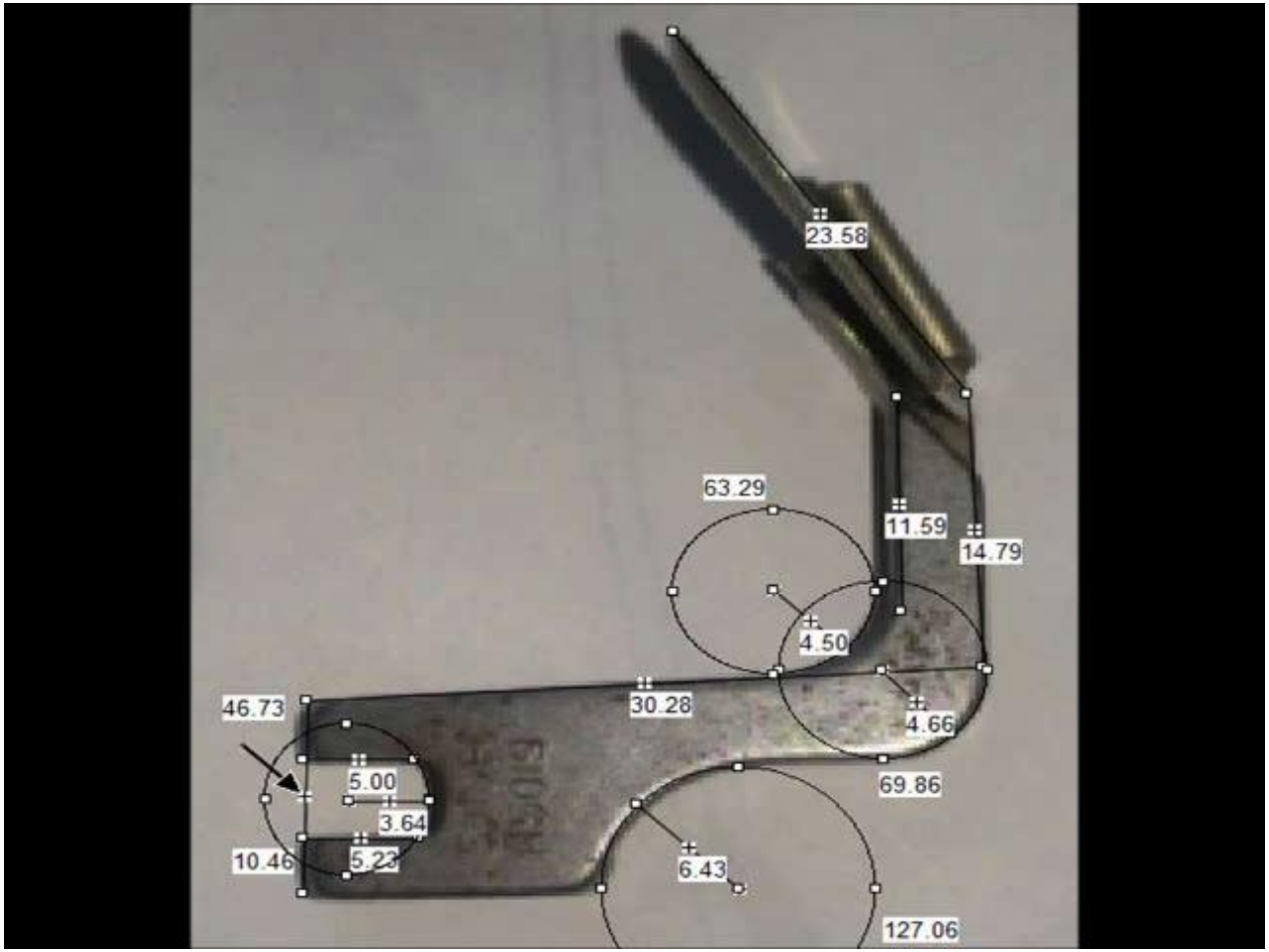
Here we are talking about 3D printed machine parts and attachments, but not by the machine and equipment manufacturer, but by the machine user and near the point of consumption.

Project Objectives

- Parts/attachments should be available to user JIT at point of consumption
- The cost of 3D printer should be affordable to SME (around $3000)
- The time required for producing any part should be less than a hour
- The parts should be ready to use without any post-treatment
- Cost of manufacturing should be reasonable, though price is not a parameter
- The parts should perform with equal ease and quality
- The operation of the 3D printer should be simple and plug n play type (as the printer to be operated by apparel manufacturer)

Project Parameters

- A basic hinged presser foot is selected for experiment
- 3D drawing is generated using AutoCAD
- STL (STereoLithography) file is generated
- A basic sub $3000 FDM (Fused Deposition Modelling) printer is selected for the experiment
- The parts are printed simply by plug and play operation.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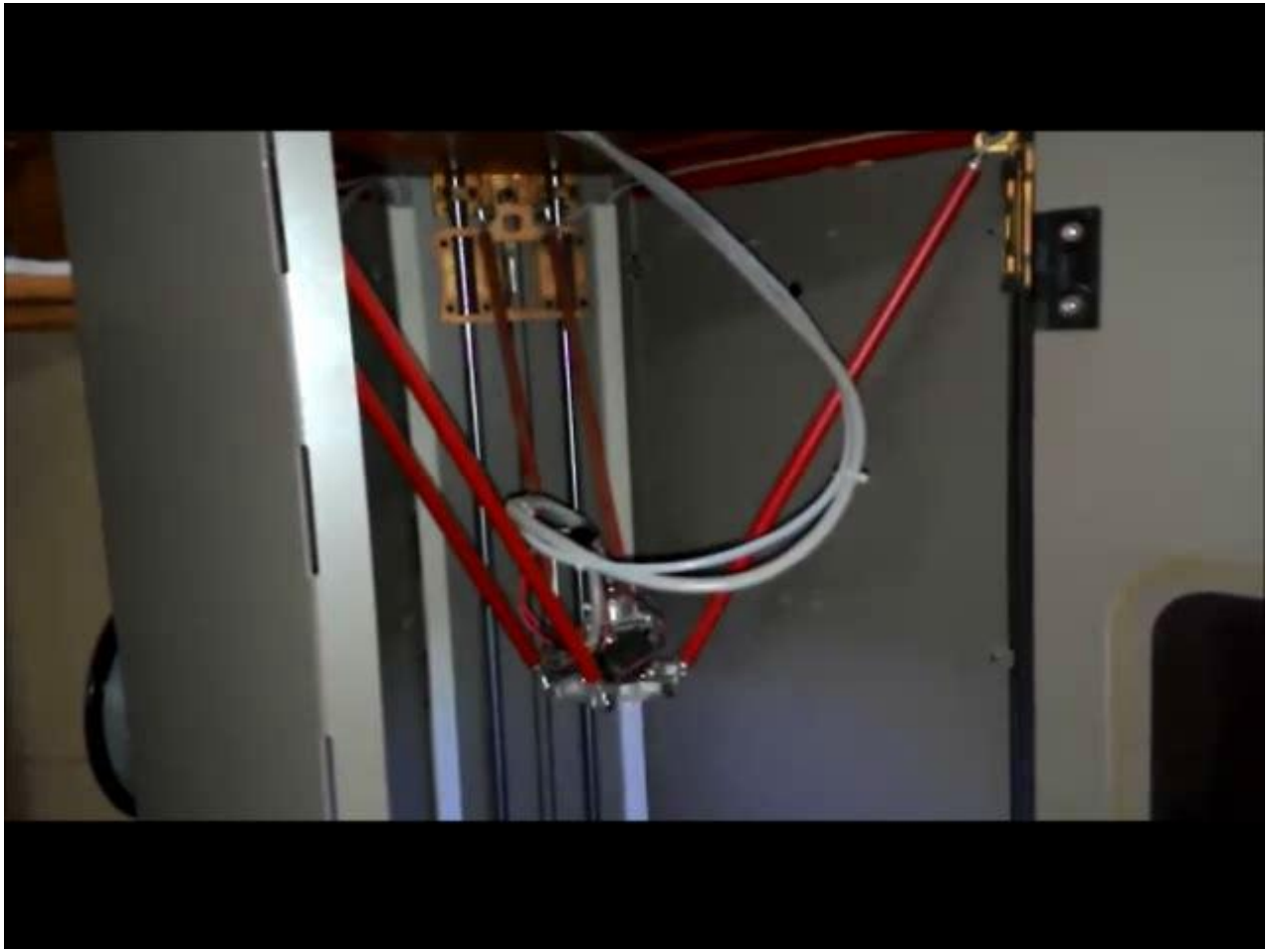


Project Deliverables

- Product 1-Presser foot:

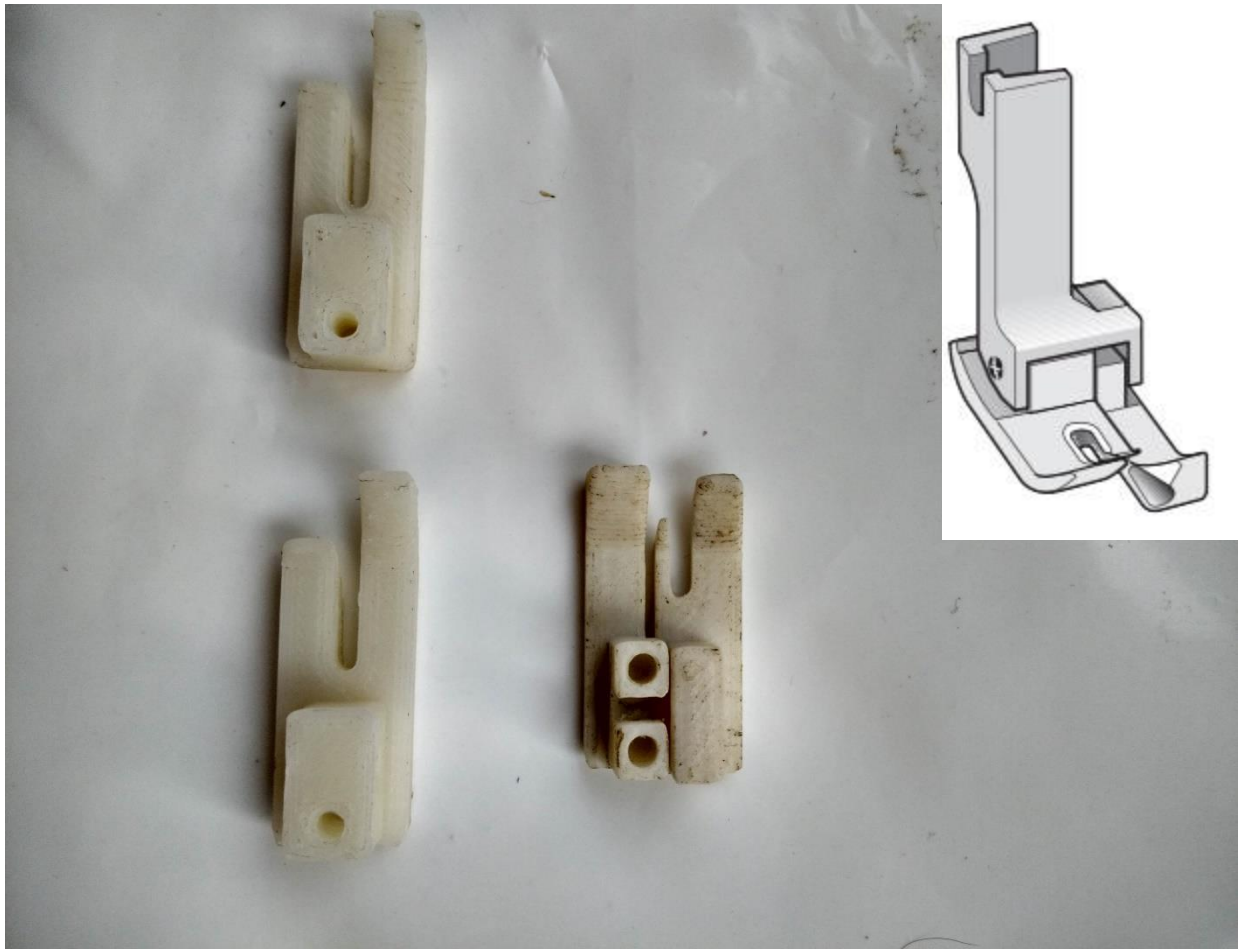
  After initial iterations of creating 8 designs and testing under various scenarios it was evident that this is the most versatile part that can be 3D printed to gain various advantages.

  Single piece without hinge, single piece with flat spring design, hinged presser foot with only lower portion 3D printed (upper body metallic) and several designs developed, tried and tested successfully..

Customised Single piece presser foot

Regular Shirring Presser Foot

Lower part of Ordinary and Compensating Presser foot



Project Deliverables

- Product 2-Feed Dog:

  After initial iterations, brainstorming and testing it was found that the best option would be to 3D print the teeth portion of the feed dog and that can be fixed on the metallic base.

- Product 3-Folders and attachments:

  Currently two pieces are being made and being tested for feasibility.

- Product 4 – Thread Guide:

  Currently being tested for feasibility

Hub & Spoke Model

- NIFT will act as hub and Garment manufacturing SMEs (Small & Medium Enterprises) will be connected to NIFT for design and development input. NIFT will continuously design & develop a library of parts and attachments in digital form in cloud. Manufacturers will have in-house 3D printer and will be able to download the necessary part/attachment and print to use in real time.
- In mature stage large multi-location organisations will be able to replicate the same hub & spoke model between their central planning unit (hub) and manufacturing locations (spoke) across world .
- The objective of the business model is centralizing the design-development; no additional cost to user.

Current Challenges

- Experiment is limited to ABS (Acrylonitrile-Butadiene-Styrene)
- Poor frictional abrasion resistance to sewing thread (for ABS material)
- Accuracy range 100 micron +/-
- The ABS parts can melt in acetone solution.

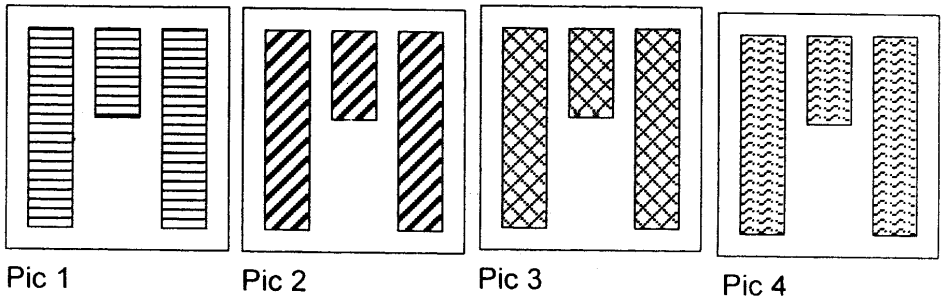
The Way Forward for SMEs

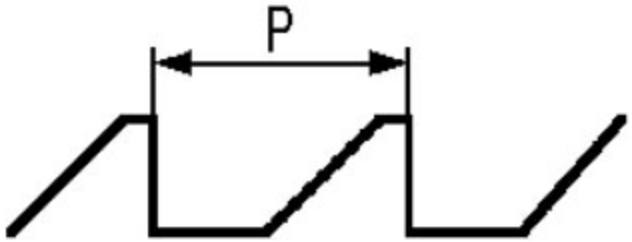
- Small & Medium Enterprises (SMEs) will be able to select the right machine part/attachment from the digital repository and get the required one printed Just in Time (JIT).
- SMEs will be able to upload style details and technical specification; operation name, seam width, seam type, stitch type and appropriate part/attachment will be custom-developed.
- SMEs will be able to concentrate on their core strength (apparel manufacturing). No more employing expert machine mechanic capable of attachment development.
- The principle objective remain same – no additional cost burden to SME.

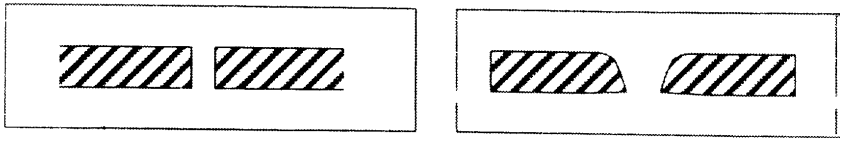
The Way Forward for Additional Advantages….

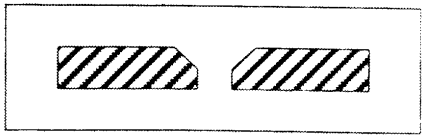
- Possibility of developing transparent machine parts and attachments, giving unprecedented advantage to sewing operator over their sewing control.
- Possibility of recycling of parts….sustainable practices

Endless Opportunities









Endless Opportunities

- **Researchers**
  - Dr. Prabir Jana
  - Dr. Deepak Panghal
- **Collaborators**
  - Design Innova, India (www.**designinnova**.com)
  - Shahi Export House, India (www.**shahi**.co.in)

Thank you for your patient listening and Questions are Welcome

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