SNS COLLEGE OF TECHNOLOGY

Department of Mechanical Engineering

19MEE307 Additive Manufacturing

UNIT I INTRODUCTION

Theory:

Overview – Need - Development of Additive Manufacturing Technology -Principle –AM Process Chain- ***Classification*** –Rapid Prototyping- Rapid Tooling – Rapid Manufacturing – **Applications Benefits –Case studies.**

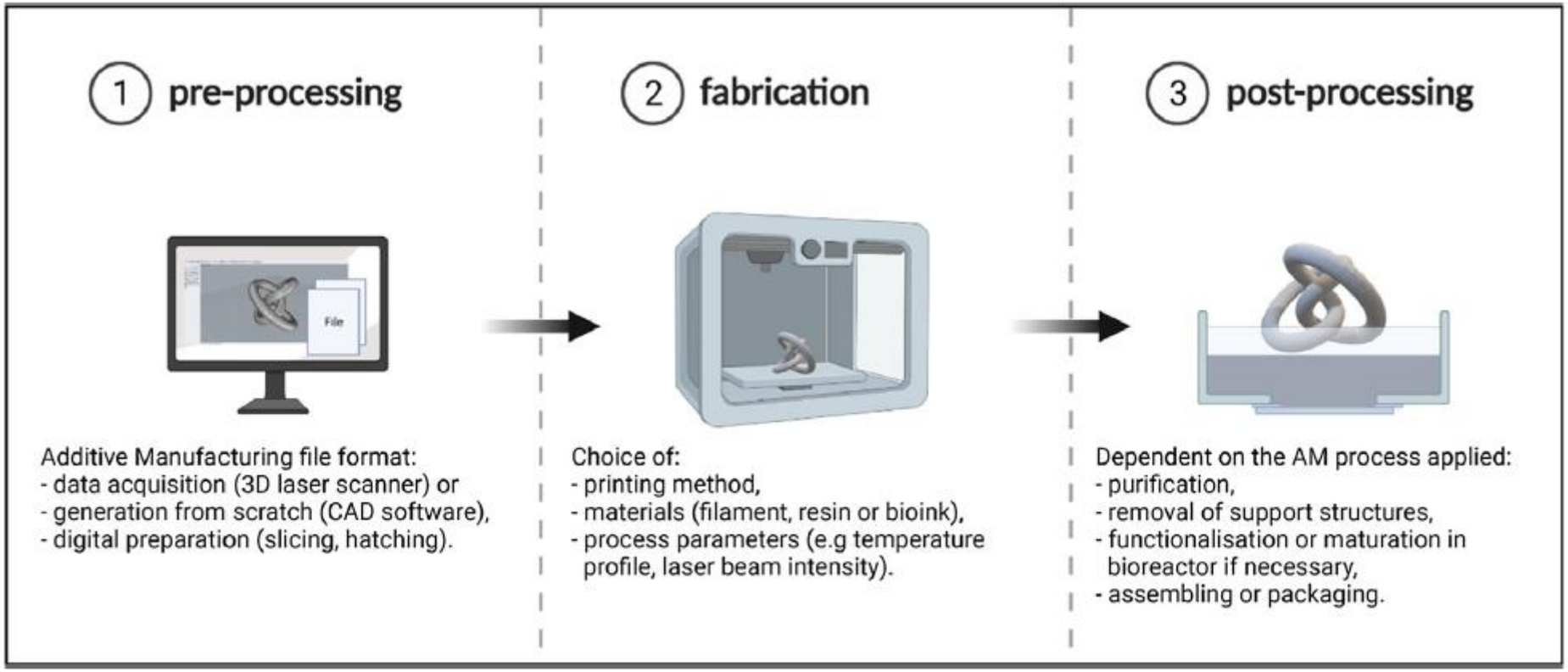
Practicals :

1.Study on various RP machines and its features available in the market

2. Survey on the Materials used in AM process

Prof.Dr.MSUBRAMANIAN

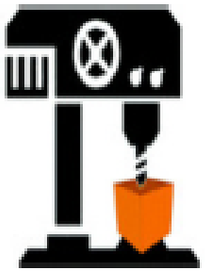
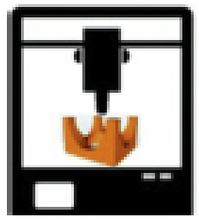
Additive Manufacturing Applications Benefits –Case studies

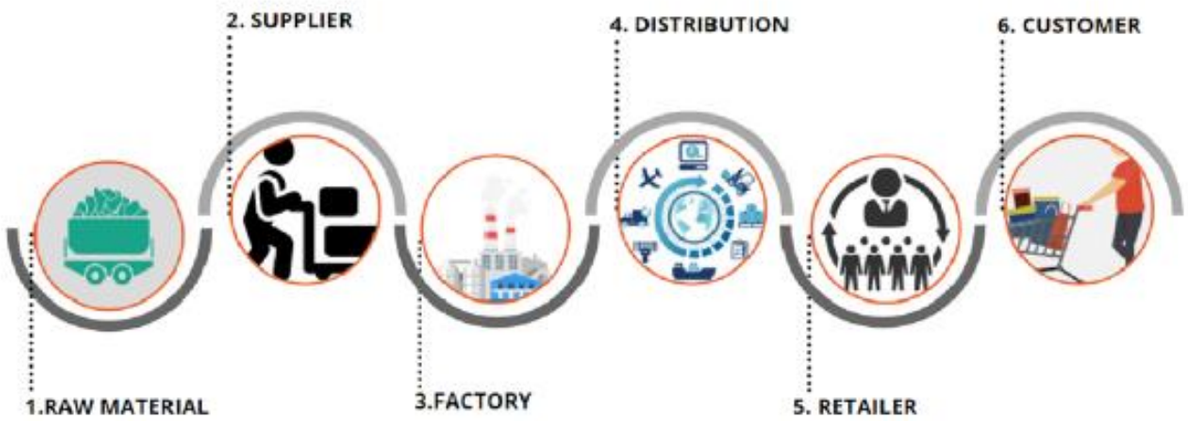


The process chain of AM comprises pre-processing, fabrication, and post-processing.

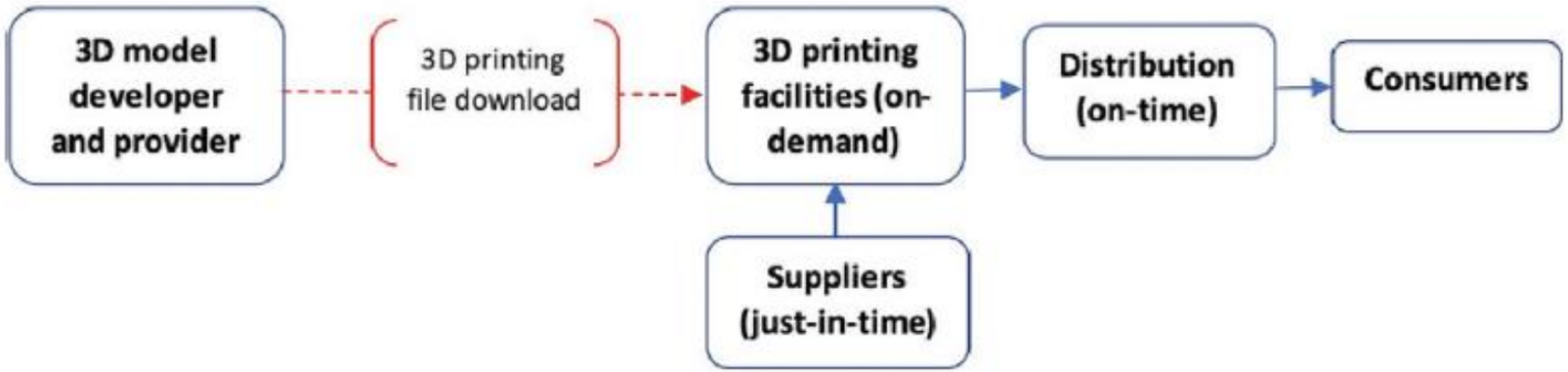
Role of additive manufacturing in medical application COVID-19 scenario: India case study

Traditional Manufacturing vs AM.

Methods	Volume	Cost per unit	Time to market	Cost of complexity
Traditional Manufacturing 	Large batch, Not customized	Low variable costs, High fixed costs	Very slow to moderately slow	Much higher than simple parts
Additive Manufacturing 	Small batch, Highly customized	High variable costs, No fixed costs	Very fast (≤ 1 day)	No higher than simple parts

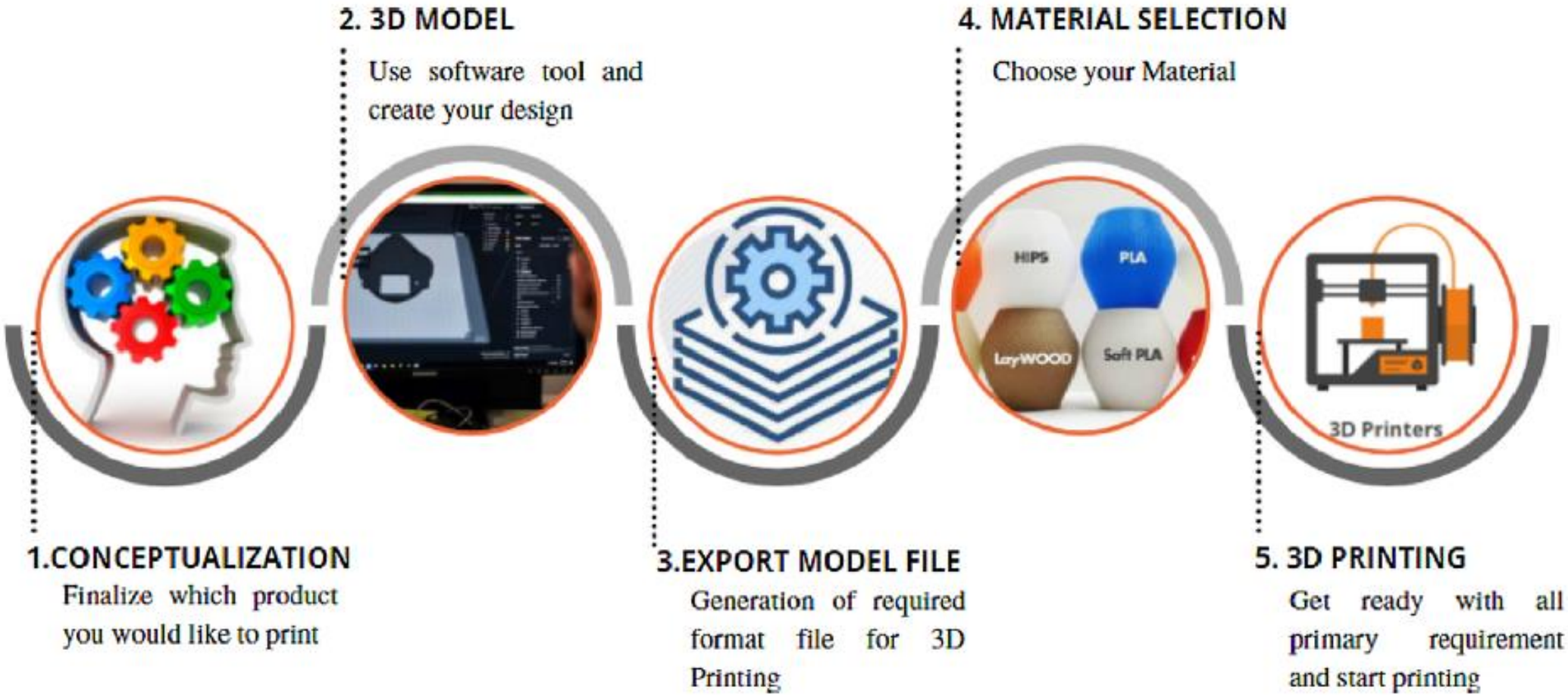


(a) Traditional Supply chain



(b) 3D Printing supply chain

Traditional versus 3D printing supply chain . (a) Traditional Supply chain. (b) 3D Printing supply chain.



3D Printing process flow.

Use of additive manufacturing to fight COVID-19

The AM industry played a key role in stopping the spread of the virus to the health crisis caused by COVID-19

3D Printing apparatus give concrete solutions for healthcare workers and all those exposed in this time of crisis of lack of medical equipment shortages

Hospitals around the globe confronted disturbing deficiencies of clinical apparatus basics like face shields and covers, testing swabs, ventilators, and more.

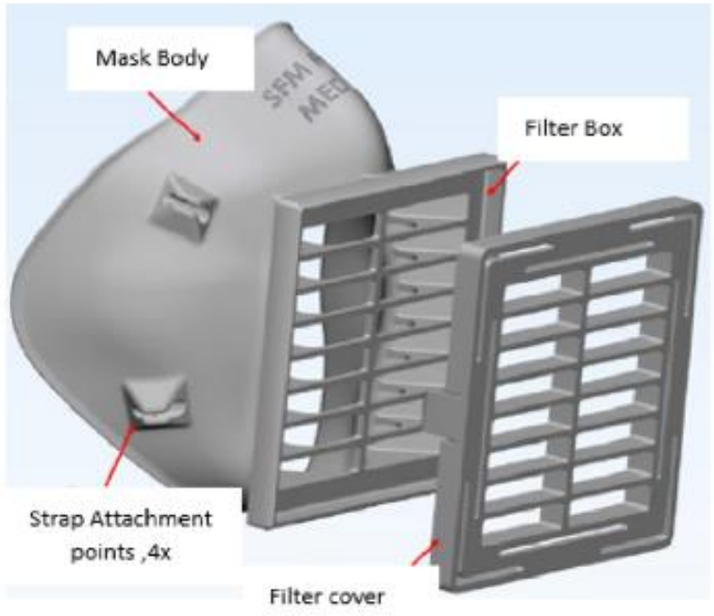
Face shields are personal protective equipment devices that are utilized by numerous specialists for protection of the facial zone and related mucous membranes (eyes, nose, mouth) from sprinkles, splashes, and scatter of body liquids.

In common surgical masks and N95 masks, the assurance is only for nose and mouth, yet eyes are uncovered.

Fig. 3D Printable Face shield

Indian Institute of Technology Madras-bolstered new businesses has created PPE, such as face shields (Fig.)from 3D Printers just as generally accessible materials besides to protect healthcare professionals fighting COVID-19

b) **Stopgap Face Mask**



The Stopgap Face Mask (Fig.) is created as an emergency action to protect frontline workers and secondary support service health care professionals.

Fig. 3D Printable Stopgap Face Mask

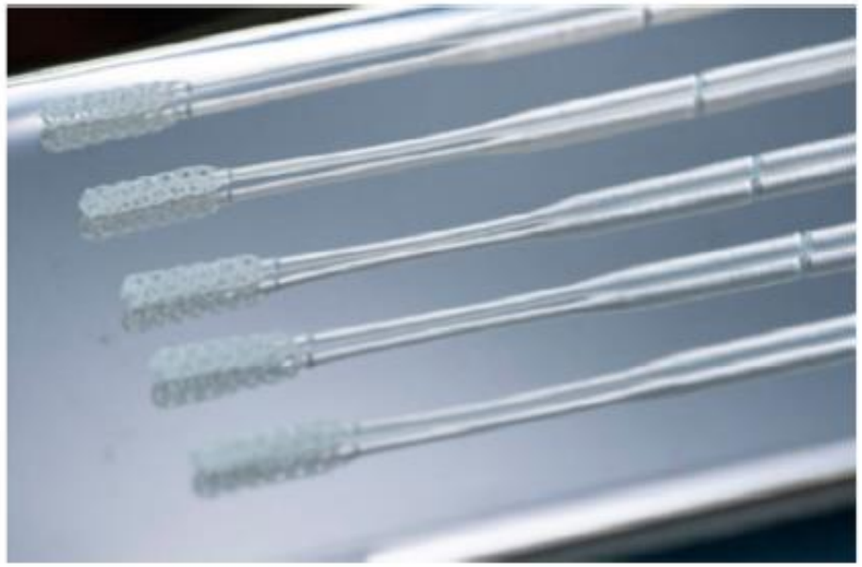
c) **Mask Adjuster**

Mask adjuster (Fig.) plays an important role for hospital staff who need to wear a face mask for an extended period

A designer is fabricating thousands of 3d printed buckles to improve comfort and alleviate associated ear pain for medical workers treating coronavirus patients.

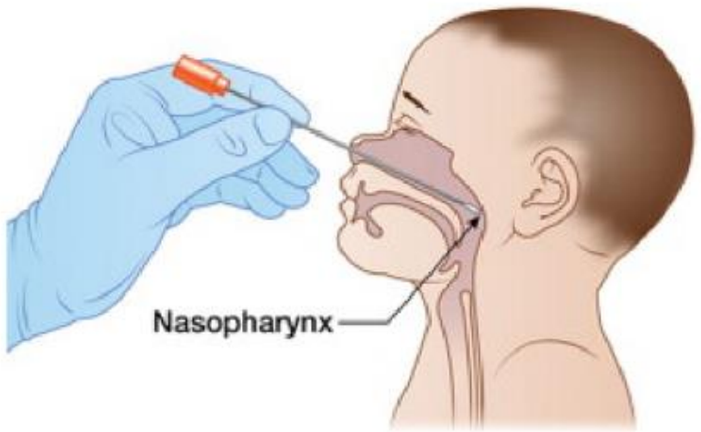
3D Printable mask adjuster

d) **Swabs**



The 3D-printed swab (Fig.) design is thin at the top and gets gradually thicker throughout the neck and handle. It has a well-designed tip for efficacy in sample collection for a medical professional, and also for patient comfort and safety

3D Printable swab



(a) Manually

(b) Automatic

But for large-scale testing (Fig.), medicinal services experts get tired and exhausted of tedious work. The robot has extraordinary potential for mass screening for COVID-19 in the healthcare sector. So to fulfill these gap Robotics researchers from the University of Southern Denmark have built up the world's first completely programmed robot to do throat swabs for COVID-19

Swab testing. (a)Manually (b) Automatic

e) Ventilator parts

HP has declared achievement in empowering frontline workers and communities to react to the difficulties of COVID-19 through 3D printing. HP has collaborated with Redington 3D in India, to effectively create 120,000 ventilator parts for AgVa Healthcare (Fig.). As a major aspect of this activity, 12 classes of parts have been 3D printed, to make 10,000 ventilators

These ventilators are being sent across India for the treatment of COVID-19 patients. The parts incorporate breathe in and breathe out connectors, valve holders, oxygen nozzles and solenoid mounts among others.

Fig. 3D Printable Ventilator Parts.

f) Hands-Free 3D-Printed Door Opener

The infection that causes COVID-19 can live on surfaces for a long time which implies it may infect yourself by reaching a contaminated surface. People often have to enter and exit rooms so it may be possible to infect yourself by touching the door handle.

To shield from such kind of polluted surface a 3D Printable Door Opener (Fig.) can be fitted onto entryways in clinics and organizations, permitting individuals to open entryways without hands.

Fig. 3D Printable Door Opener

g) **Quarantine Booths**

coronavirus isolation wards

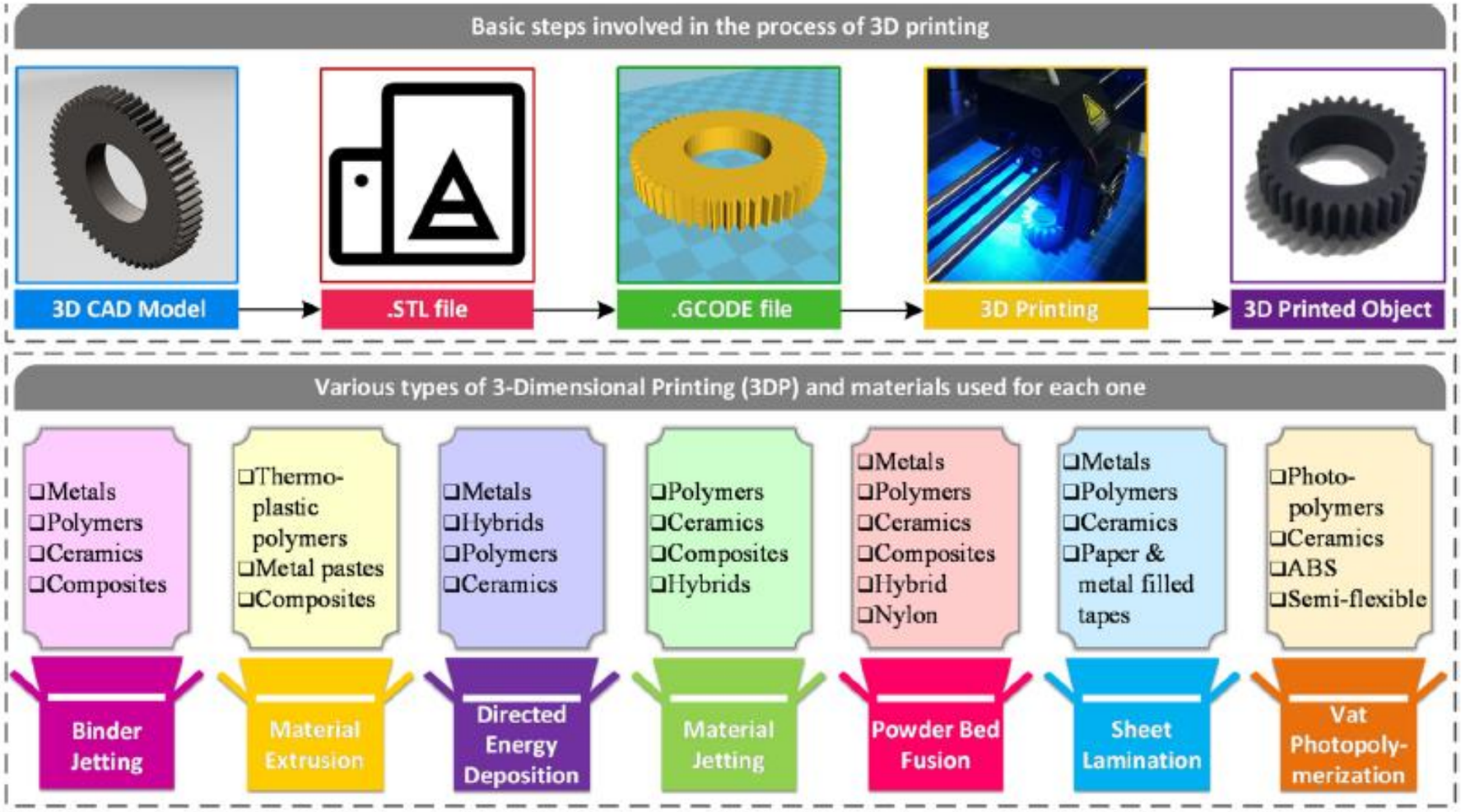
h) **Drone Technology**

The FICCI Drone Committee comprehend that drones (Fig.) are playing a huge job in a battle against the coronavirus in help to the accompanying activities undertaken by Police, healthcare and municipal authorities like Surveillance and lockdown enforcement, public broadcast, checking monitoring body temperatures, medical & emergency food supplies delivery, surveying & mapping, spraying disinfectants, etc

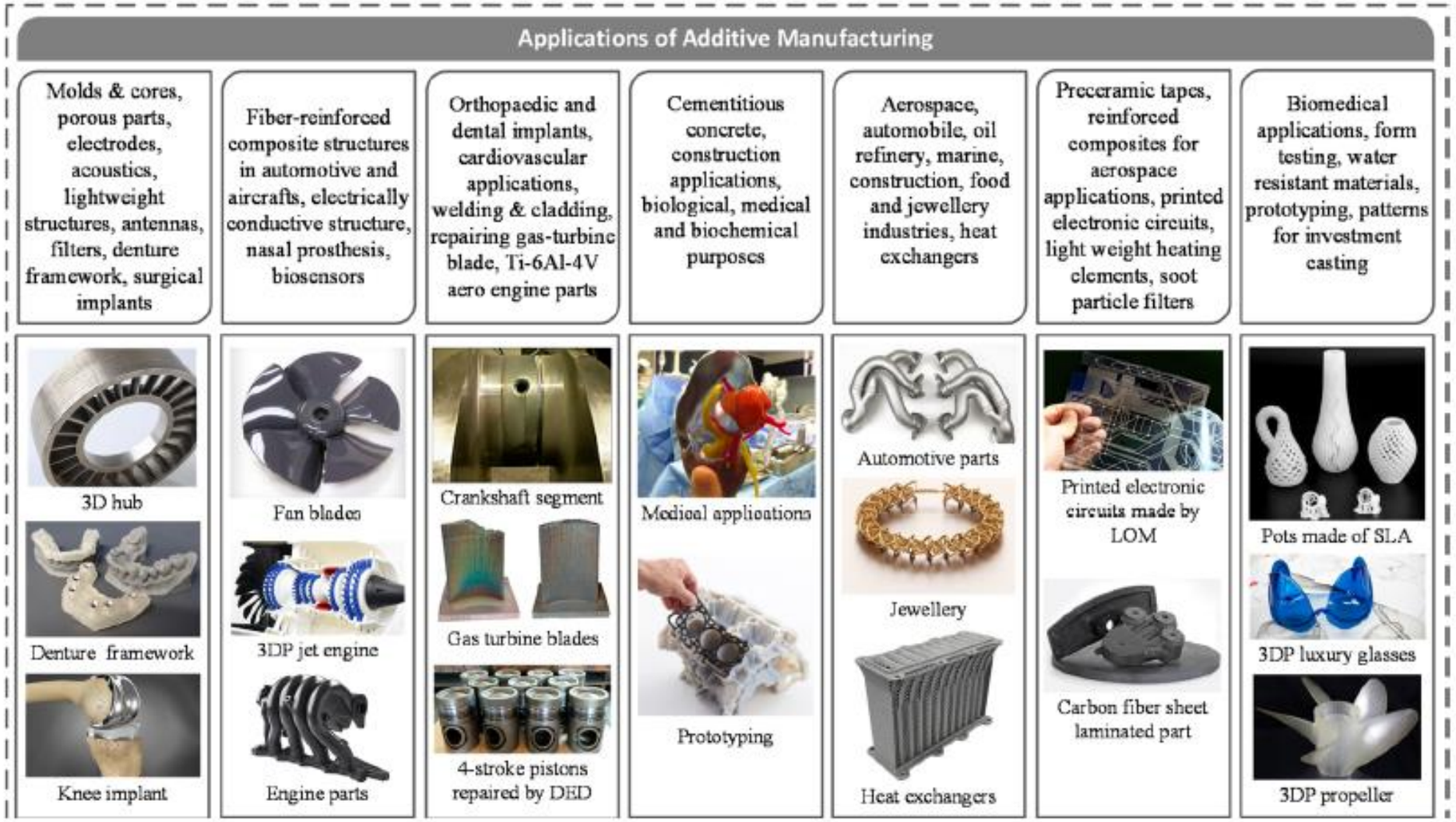
Drone for COVID-19

To fight the spread of the COVID-19 contamination with a 99 % cleansing rate.

Indoor Disinfection Drone



Schematic, classification, functional materials, and applications of 3D printing.



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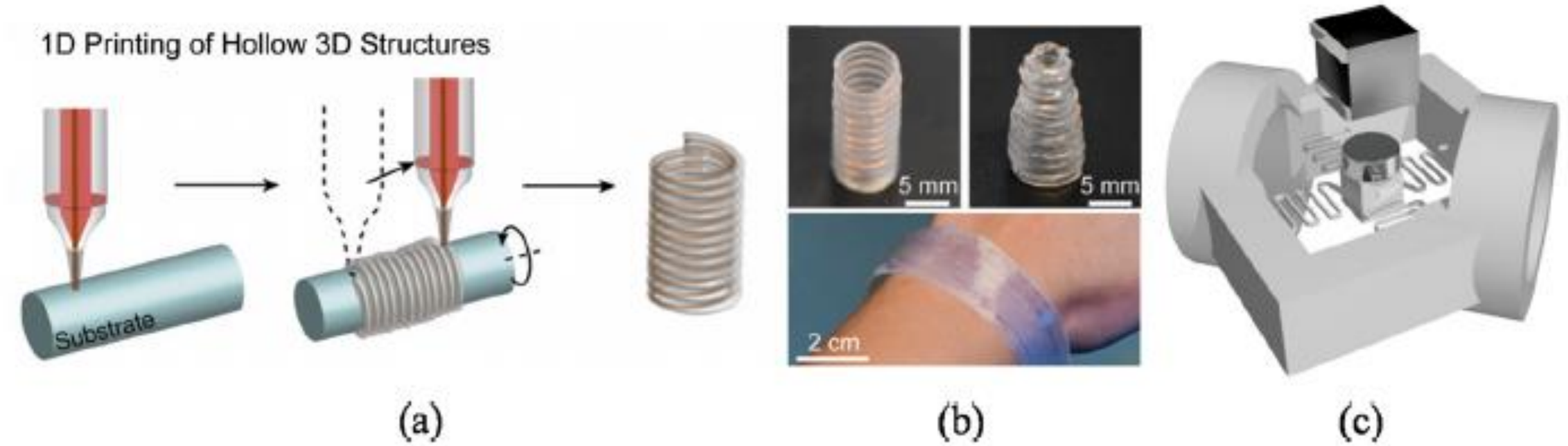
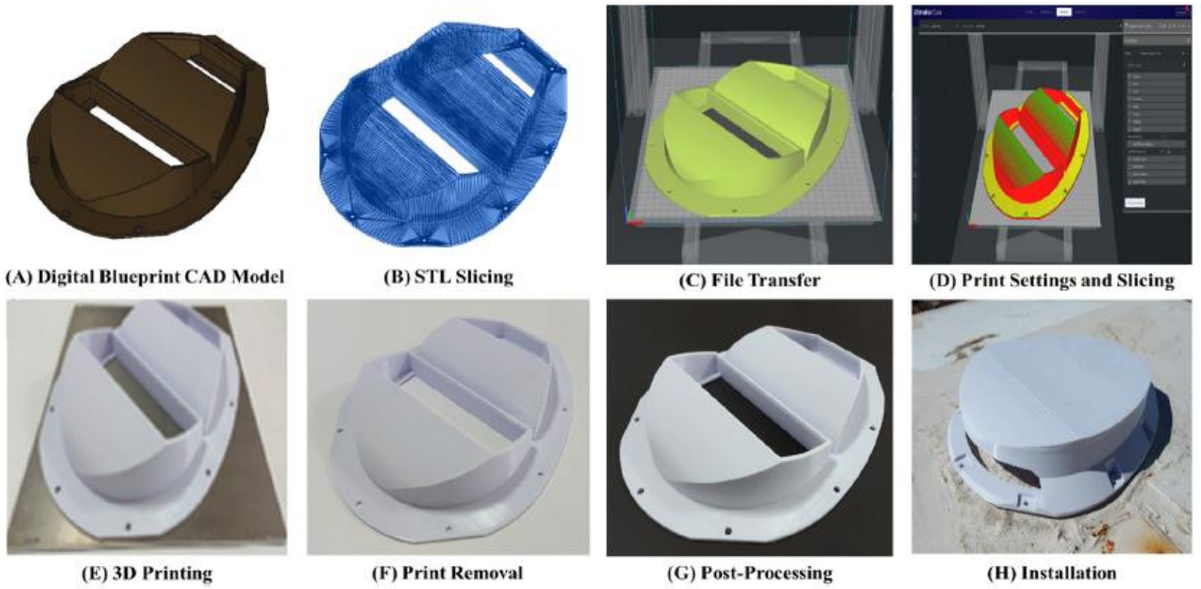


Fig. . Applications of 3DP in energy harvesting (a) micro-extrusion of silicone-Cu fibres for triboelectric energy harvester (b) scalability of triboelectric TENG-based wristbands [] (c) A 3D-printed vibrational energy harvester with assembled magnet coupled with one miniature coil

(A) Railway Inspection Vehicle (B) Railway Inspection Vehicle (C) CAD Model of the Inspection Vehicle

Fig. 9. Railway Inspection Vehicle



(A) Digital Blueprint CAD Model (B) STL Slicing (C) File Transfer (D) Print Settings and Slicing

(E) 3D Printing (F) Print Removal (G) Post-Processing (H) Installation

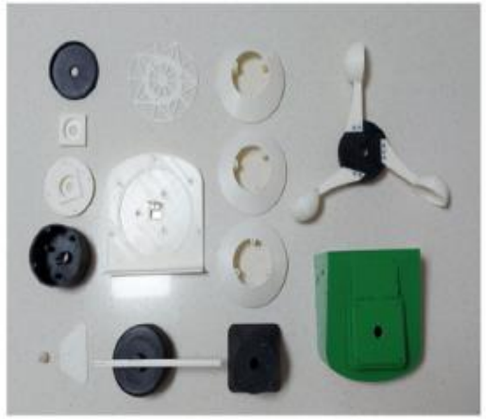
Additive Manufacturing Process Used to 3D Pri

(A) Aerial View of Coastal Railway

(B) Sand Sedimentation on Track

(C) Sand Build-Up on Heavy Haul Line

(D) Digital 3D Model



(E) Build of Materials 3D Printed

(F) Assembled Weather Station

3D Printable Low-Cost Weather Station for Track Specific Measurements

Thank you