

# ADDITIVE MANUFACTURING

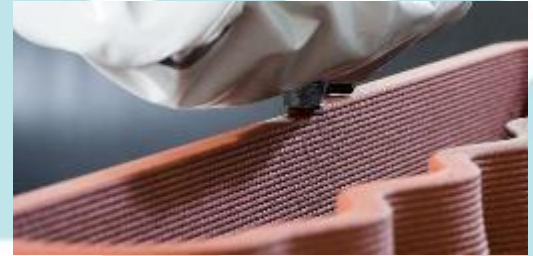


## HOW THIS WILL TRANSFORM OUR INDUSTRY?

# Additive Manufacturing Definition



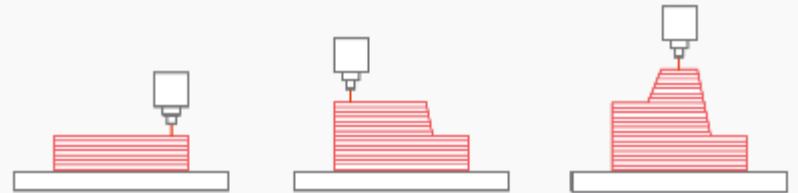
**Additive manufacturing** is defined as the process of joining materials to make objects from **3D model data**, usually layer upon layer, as **opposed to subtractive manufacturing** (ASTM F2792)



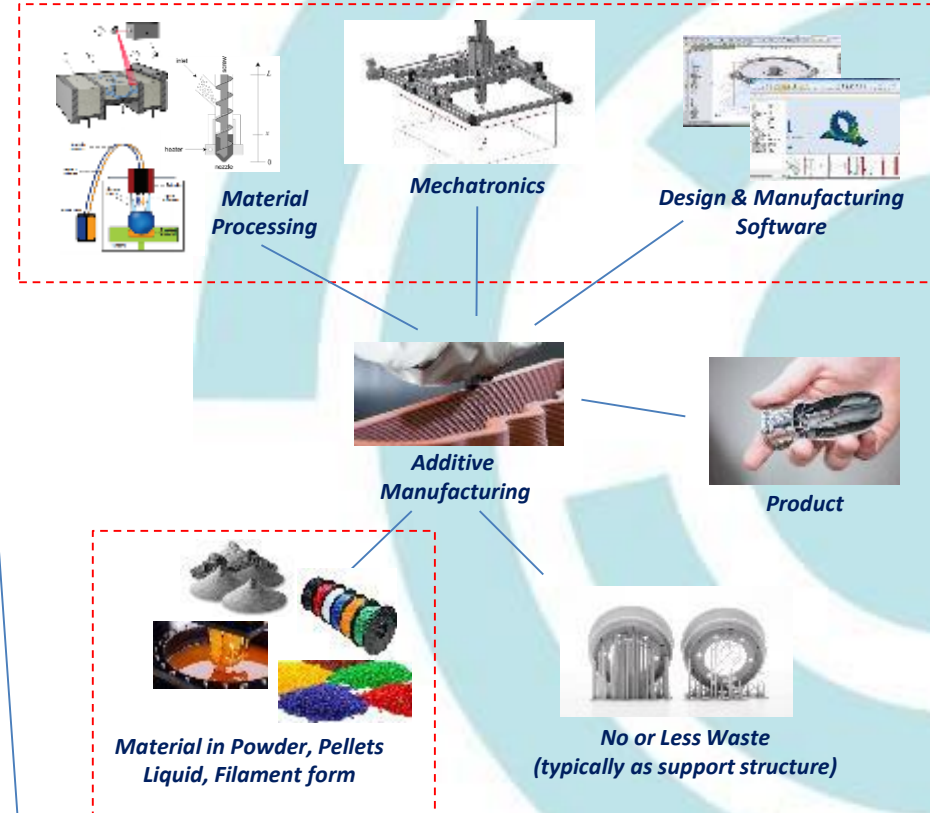
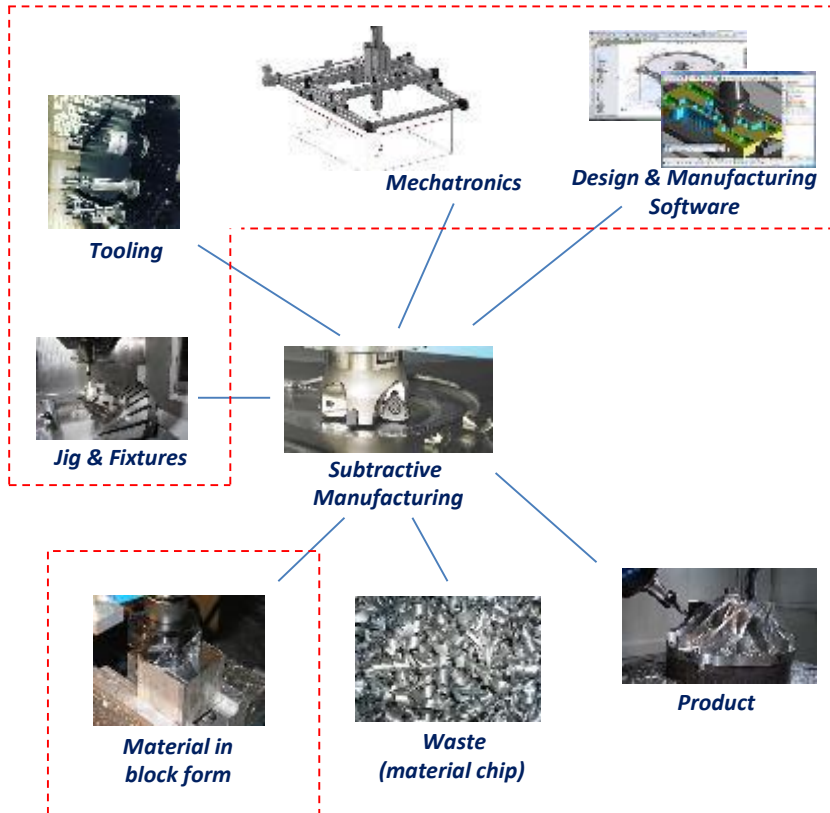
Subtractive manufacturing



Additive manufacturing

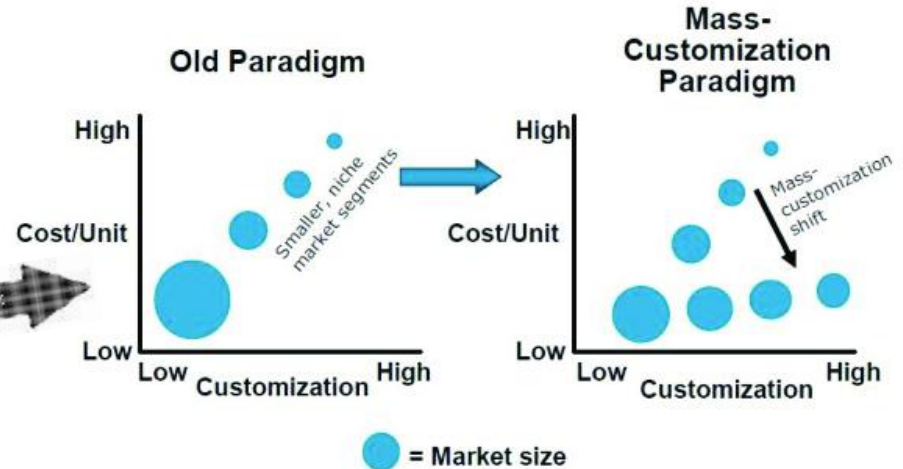
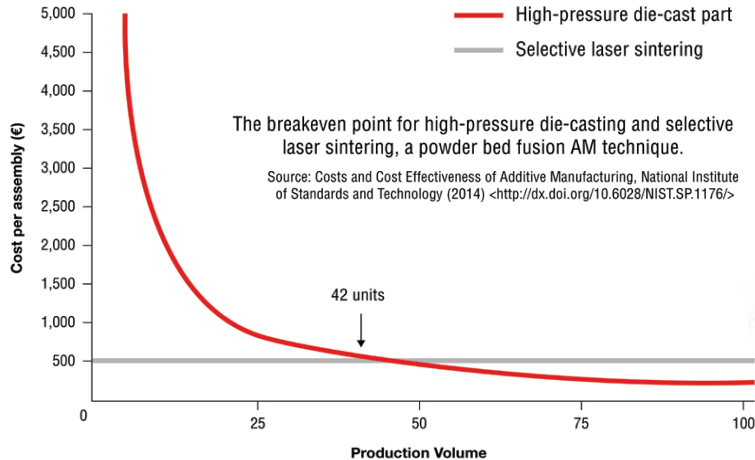


# Subtractive vs Additive Manufacturing Core Technologies Transformation



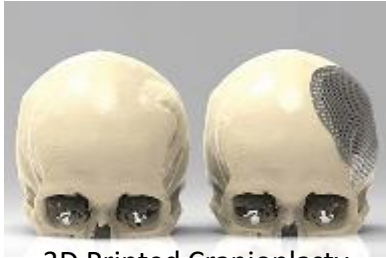
# How Additive Manufacturing can disrupt traditional supply chain ?

- AM revolutionize product design as it is possible to produce parts with much more complex geometry.
- AM shorten product time to market through rapid prototyping and testing.
- AM eliminate cost for tooling, jig and fixture, dies which result in flat part cost/quantity.
- Three factor above open door to **Mass Customization !**



# Industries that will benefit from AM Technology

## Medical



3D Printed Cranioplasty



Prosthetic Arm

## Aerospace



Turbine Blades



Composite Tooling

## Automotive



Engine Manifolds



Car Interior

## Building - Construction

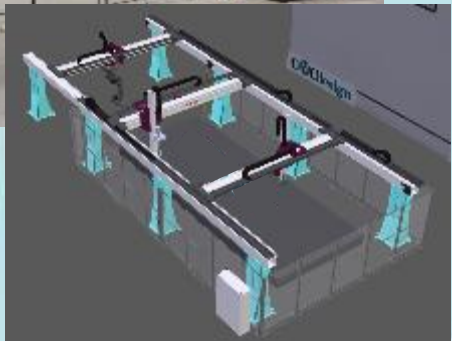


Pre-fab building



In-situ fabrication

# Additive Manufacturing Machines From Benchtop to Factory Floor



# Case Study: Concrete 3D Printing



CNC Design manufactures Concrete printers for Construction in Preform, Onsite and Architectural sectors.

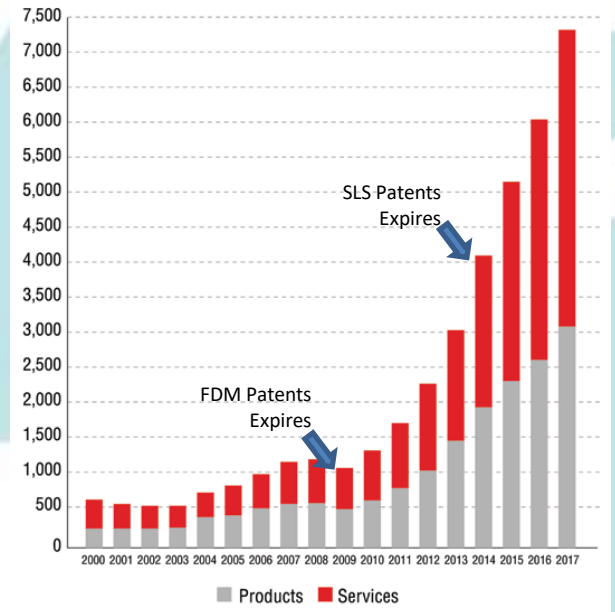
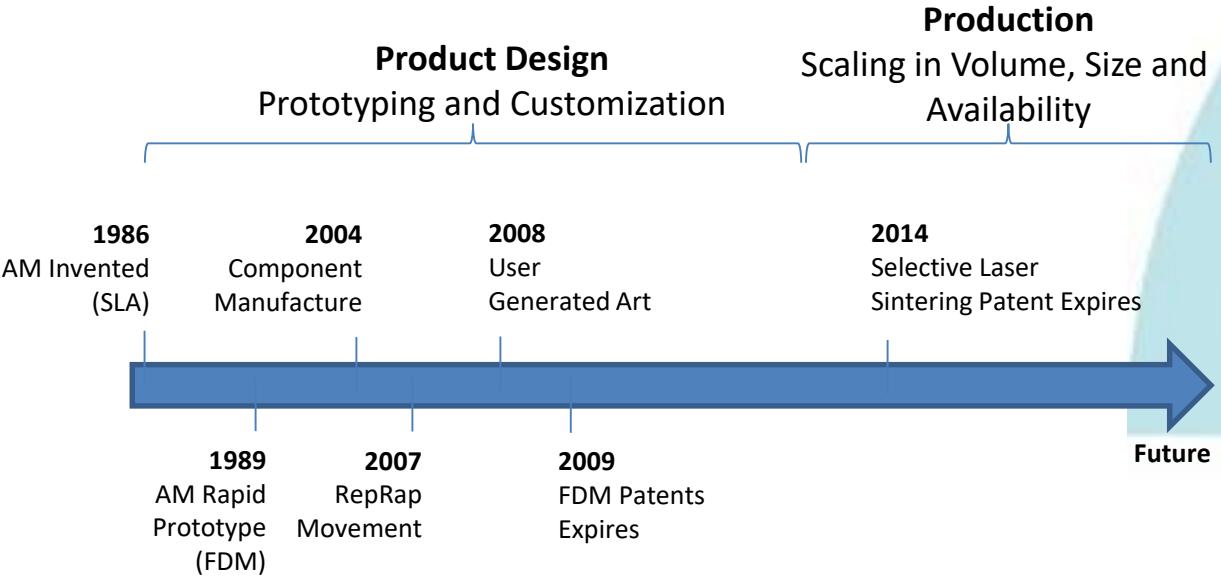
## VSF Configuration:

- One or Two beam
- 3 or 5 axis concrete printing and robot reinforcement placement.
- Maximum print rate 4000 Kg/Hr.
- Printing surface speed 6-40 m/min
- Printable Module size 9m x 5m x 3.2m



# Additive Manufacturing Evolution

## Why it takes so long to take off ?



Revenue for AM products and services worldwide. The market has grown by 5.5 times over the past eight years. (US\$ m)

Source: Wohlers Report 2018

- Main Applications 1986 - 2011:**
- Product Design
  - Product Part Production
  - Rapid Prototyping
  - Concept Modeling

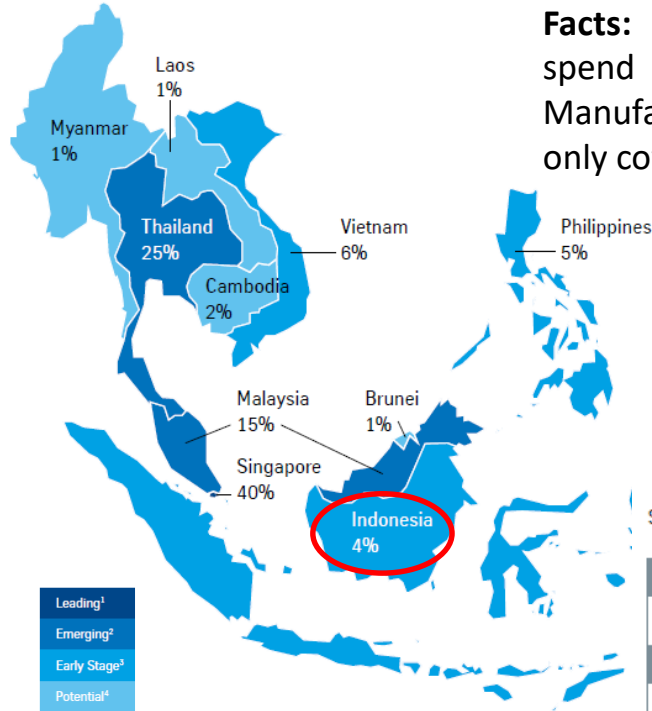
- Catalyst for Mass Production Adoption!:**
- GE plans to mass-produce 25,000 LEAP engine nozzles with AM – already have \$22B in commitments
  - Parts will drive production and operational cost savings
  - First test to see if AM can revolutionize production

- Main Applications 2014 - Future:**
- End Product Production
  - Mass Production
  - Democratized Consumer 3D Printing



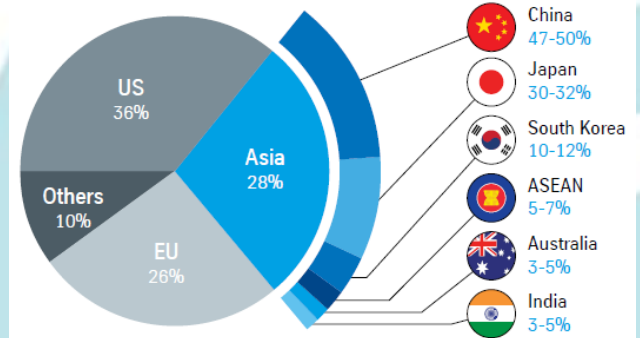
# Additive Manufacturing Market

## Where we are in new this game ?



**Facts:** In 2019 ASEAN countries spend \$3.8 billion for Additive Manufacturing Technology, which only cover 5-7% of total Asia market

Asia AM market size  
Billion USD, 2019



Source: IDC, thyssenkrupp analysis

- Leading<sup>1</sup>
- Emerging<sup>2</sup>
- Early Stage<sup>3</sup>
- Potential<sup>4</sup>

Singapore	Thailand	Malaysia	Vietnam	Philippines	Indonesia	Cambodia	Myanmar	Brunei	Laos
Manufacturing Value Add <sup>5</sup> 2017 (Billion USD)									
58.3	117.3	83.8	30.4	69.2	231.3	3.0	18.8	2.2	1.2
Industrial Printer Installed base <sup>6</sup>									
100-120	50-60	30-40	10-15	10-15	10-15	<5	<5	<5	<5
AM Penetration <sup>7</sup>									
Medium	Low-Medium		Low						

Source: IDC, thyssenkrupp analysis



## **PT CNC Disain Nusantara**

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A close-up photograph of a CNC lathe machine in operation, showing a metal workpiece being turned and a cutting tool. The image is partially obscured by a dark teal overlay on the left side.

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