



Metal Additive Manufacturing Solutions & Services

wipro 3D

About Wipro Group



WORLD'S MOST ETHICAL
COMPANY – 4th YEAR IN A ROW



\$ 8.76 BILLION
CONSOLIDATED REVENUES
(FY 2015-16)



1,74,000 +
WORKFORCE



1180 ACTIVE CLIENTS IN
175+ CITIES, 56 COUNTRIES
6 CONTINENTS



USD 21Bn \$
MARKET CAPITALIZATION



IT PRODUCTS &
SERVICES

Wipro Technologies

- IT
- BPO
- R&D Services
- Consulting Services



INFRASTRUCTURE ENGINEERING

Wipro Infrastructure Engineering

- Hydraulic Cylinders
- Truck Hydraulic Solutions
- Aerospace And Defense
- Industrial Hydraulics
- Wipro Water



ADDITIVE
MANUFACTURING

WIPRO3D

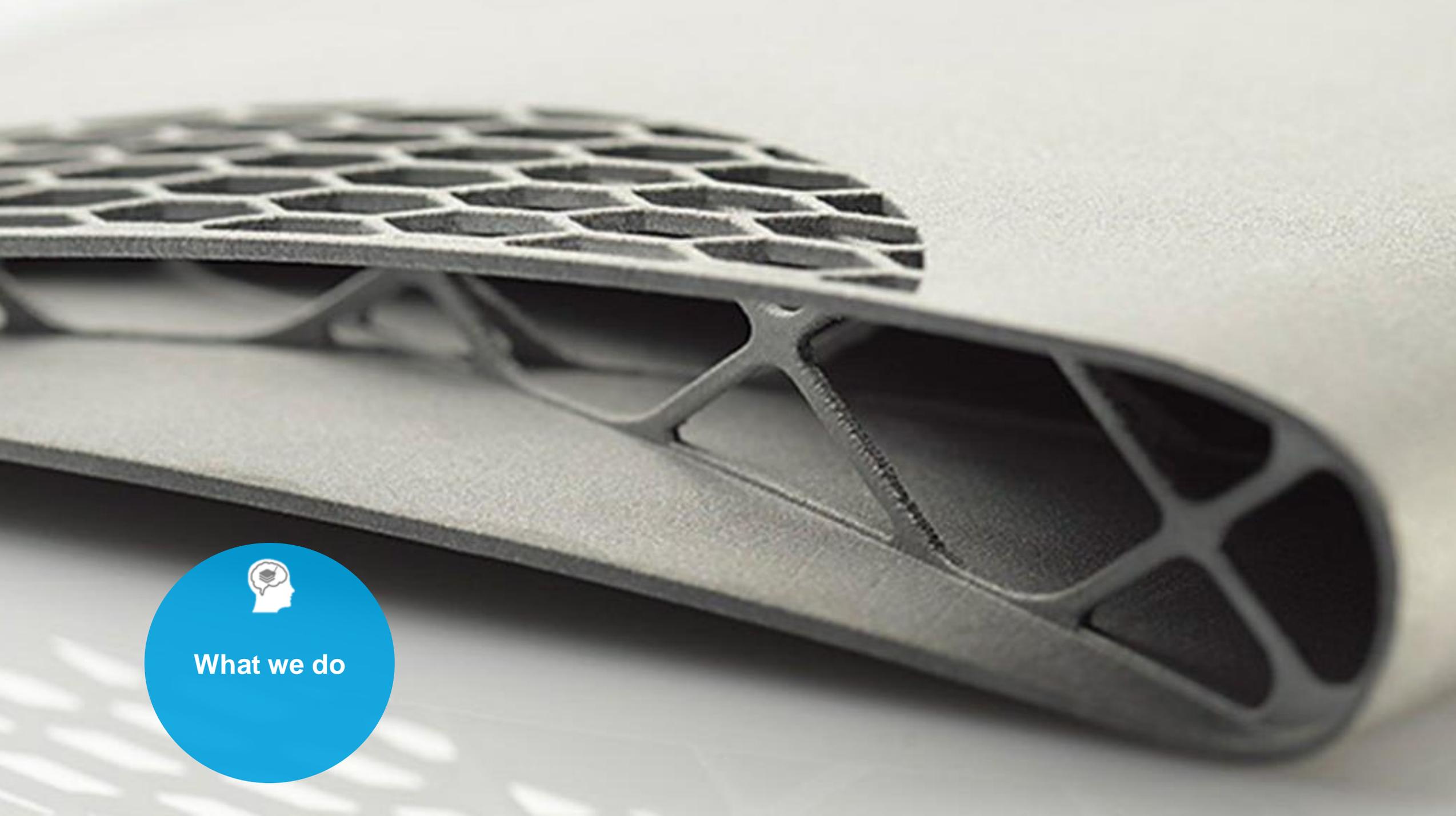
- Metal Additive Manufacturing
Solutions & Services



CONSUMER CARE &
LIGHTING

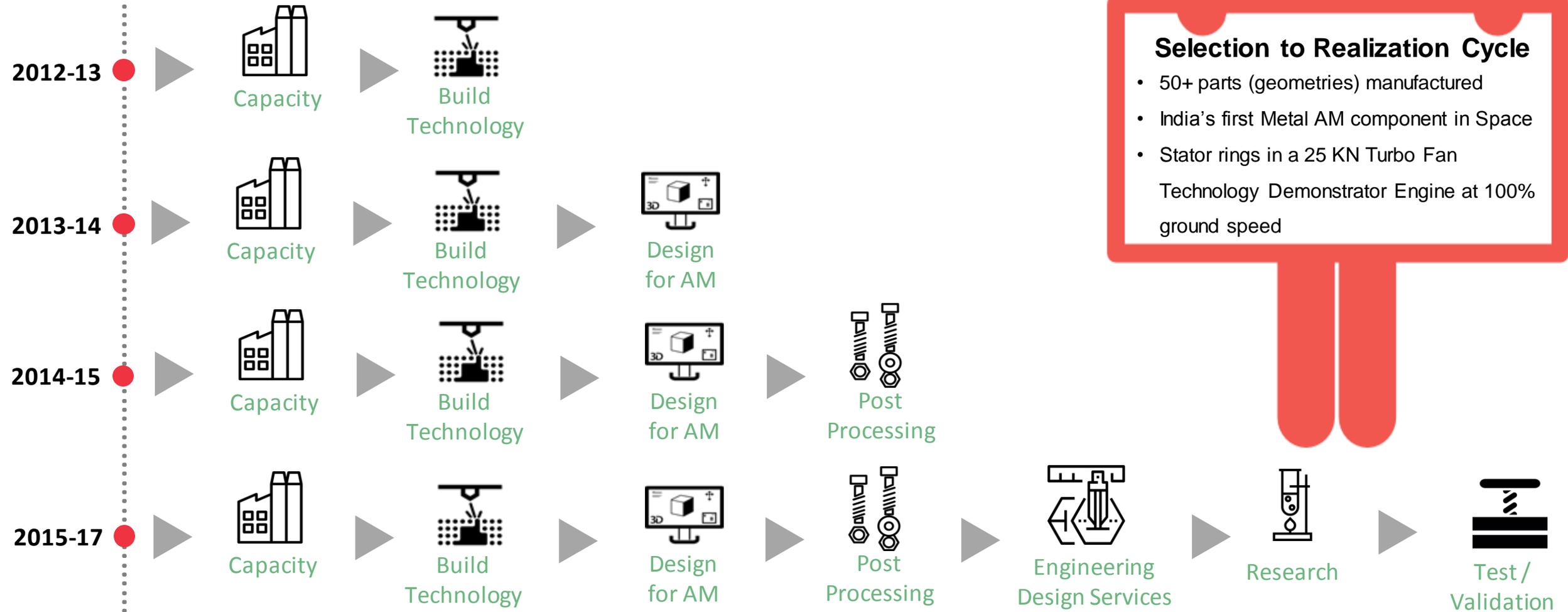
Wipro Consumer Care & Lighting

- Personal Care
- Baby Care
- Wellness Products
- Lighting Furniture And Switches



What we do

Our AM Competencies

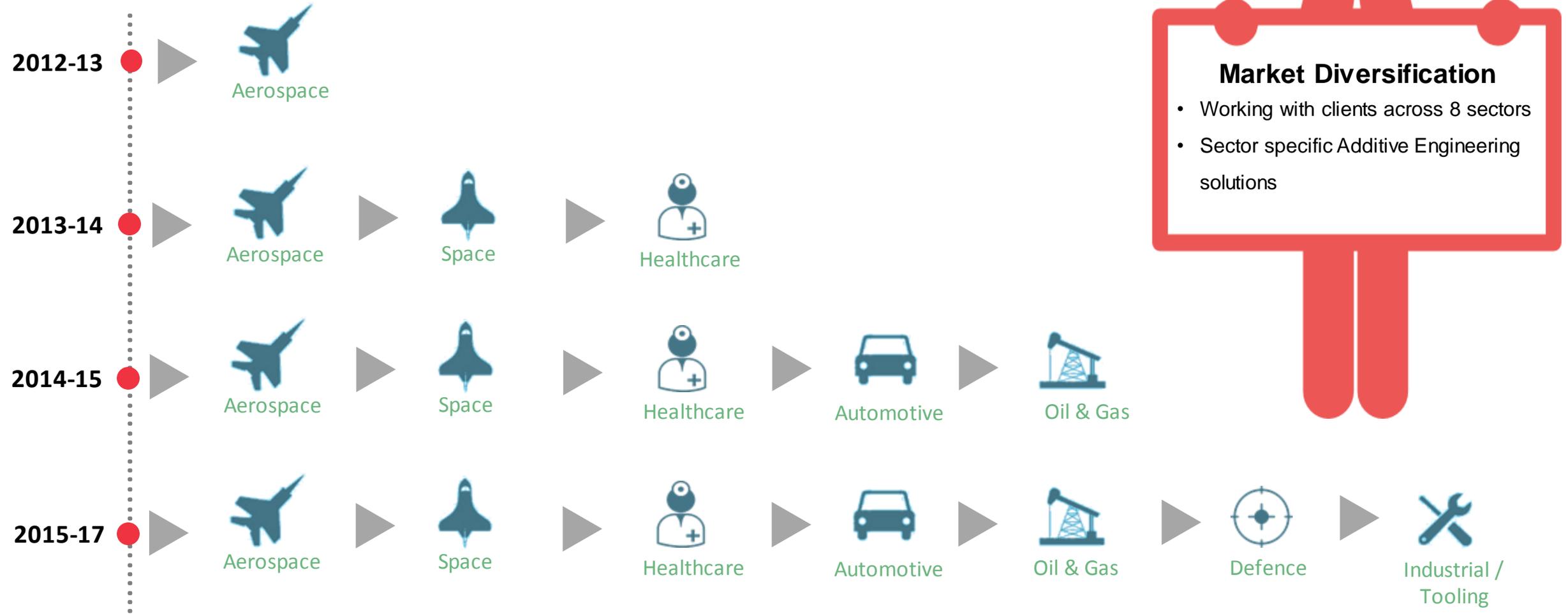


Selection to Realization Cycle

- 50+ parts (geometries) manufactured
- India's first Metal AM component in Space
- Stator rings in a 25 KN Turbo Fan Technology Demonstrator Engine at 100% ground speed



Our AM Journey



Market Diversification

- Working with clients across 8 sectors
- Sector specific Additive Engineering solutions

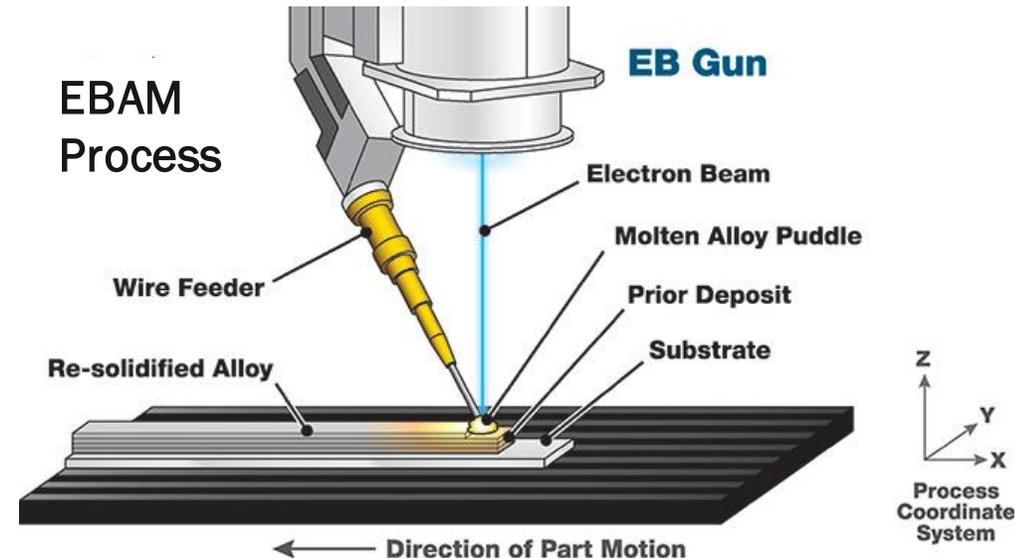
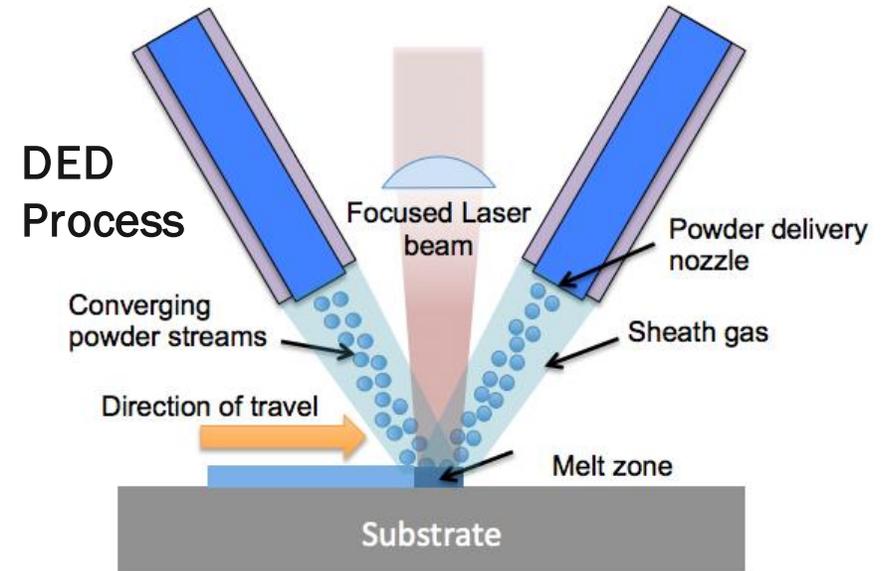
Multiple AM Technologies

	SLM	EBM	LENS	EBAM	HYBRID
Feed Delivery	Powder bed	Powder bed	Nozzle Injected (Powder)	Nozzle Injected (Wire)	Nozzle Injected (Powder)
Optics	Laser 200 – 1000 W	Electron Beam	Laser 200 – 1200 W	Electron Beam Upto 42 kW	Upto 2.5 kW
Resolution	50-80 Micron	140 Micron	25 Micron	25 Micron	25 – 140 Micron
Prevalent Build Envelope	400 x 400 x 400 mm	350 x 380 mm	1500 x 900 x 900 mm	1778 x 1194 x 1600 mm	660 dia x 1500 mm
	Current	Planned			

Directed Energy Deposition (DED) & Electron Beam AM (EBAM)

	DED	EBAM
Feed Delivery	Nozzle Injected (Powder)	Nozzle Injected (Wire)
Optics	Laser 200 – 1200 W	Electron Beam Upto 42 kW
Resolution	250 Micron	25 Micron
Prevalent Build Envelope	1500 x 900 x 900 mm	1778 x 1194 x 1600 mm
Build Speed	0.14 - 0.63 g/s	0.14 - 0.63 g/s

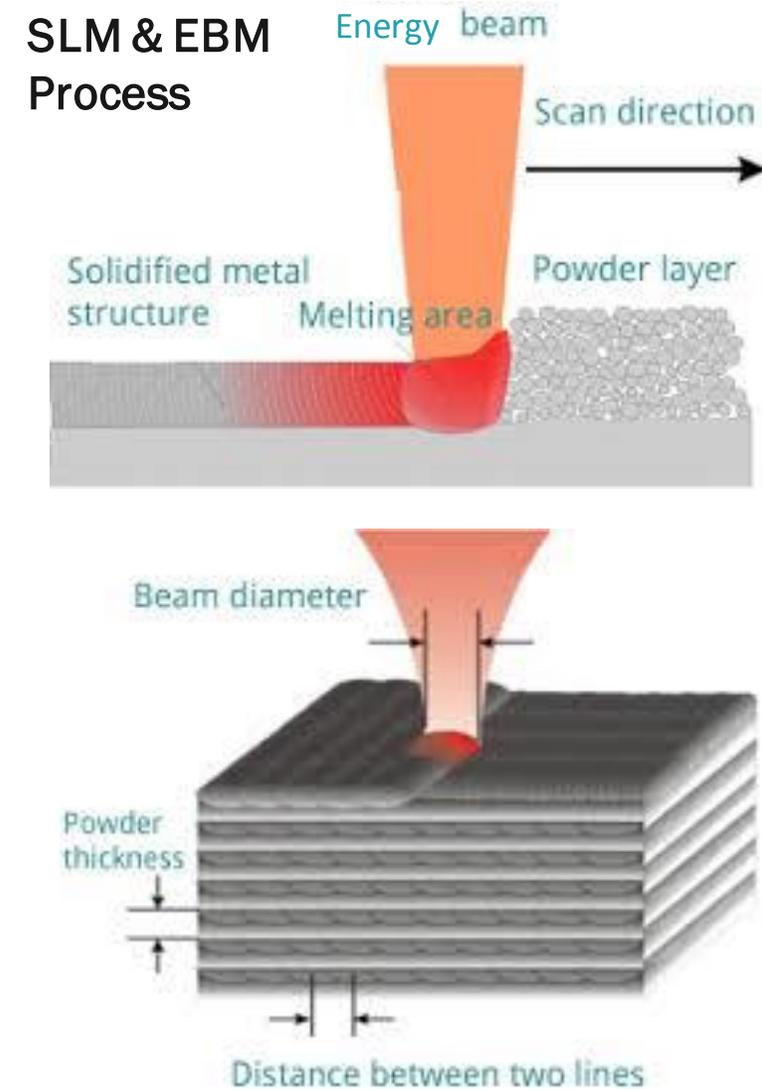
Planned



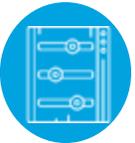
Selective Laser Melting (SLM) & Electron Beam Melting (EBM)

	SLM	EBM
Feed Delivery	Powder bed	Powder bed
Optics	Laser 200 – 1200 W	Electron Beam
Resolution	80 Micron	140 Micron
Prevalent Build Envelope	400 x 400 x 400 mm	350 x 380 mm
Build Speed	0.03 - 0.06 g/s	0.81 - 2.51 g/s
	Current	Planned

Note: SLM is a proven technology for series production.



Typical Additive Value Delivery

-  Improve Functional Performance
-  Achieve Monolith Design
Avoid Metal Joining Techniques
-  Cost Effective Iterations
-  Obsolete/Legacy Parts
Out Of Production
-  Better Mechanical Properties
-  Material Workability Issues
-  Flexible Production
-  Maintenance, Repair,
Overhaul
-  Achieve Superior Topology
& Complex Geometry
-  Supply Chain Issues
-  Faster Design Iterations
-  Customization
-  Weight Reduction Imperatives
-  Optimized Post Processing
-  Tool-less Production
(Quick Batch Production)
-  Response Time &
Design To Realize Time

AM Metals Offering

Standard Alloys

Titanium Alloys
(Ti6Al4V, Ti6Al4V ELI, CP Ti)

Nickel Alloys
(IN718, IN625, Hastelloy X)

Aluminium Alloy
(AlSi10Mg)

Stainless Steels
(17-4 PH, 15-5 PH, 316L, Corax)

Cobalt Chrome Alloys
(MP1 and SP2)

Maraging Steel

Non-Standard Alloys Can be Developed

WIPRO3D has the ability to develop custom AM process for non standard alloys as per business case

AM Infrastructure

AM Technology

- EOS M280, M290 (250 x 250 x 300 mm)
- EOS M400 (400 x 400 x 400 mm)
- Automatic powder handling module
- Under evaluation: Direct Energy Deposition, Electron Beam Melting

Post Processing

- Custom Inert Gas furnace
- Vertical Machining Centre
- Turning Centre
- Surface Grinding & Treatment
- Special processes capability

Test/Validation & Research

- Particle size analyser
- Optical Microscope
- 7 Axis 3D Scanner
- ONH Analyser
- Part Density Measurement System
- Powder Flowability Measurement
- Powder Tap Density Measurement

Metal AM Solutions & Services

- 
AM Consulting
 - Additive Thinking Framework
 - Experience Tours
- 
Additive Design & Engineering
 - Additive Design
 - Simulation & Validation
- 
AM Services
 - Prototyping
 - Production
- 
R&D Services
 - Product Development
 - Parameter Optimization/ Customization
 - New Material Adoption for LPBF/SLM
- 
Turnkey Services
 - Design, Program Manage, Deploy and operate a Captive AM Center.

AM Competencies

- 
Engineering Design

Aerospace pedigree and understanding of domain.
- 
Additive Design

Build strategy and plan, design & topology optimization, custom parameters, simulation
- 
AM Build Technology

Existing SLM. EBM & DED upcoming
- 
Post Processing

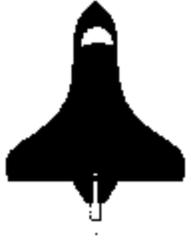
Micro machining, Abrasive Flow Machining deployed. HIP upcoming
- 
Research

Custom parameter development, new alloy adoption, post processing methods.
- 
Test, Validation, Certifications

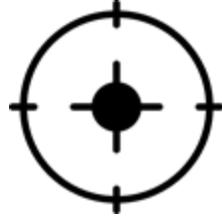
Part prove out, DOE, functional tests
- 
Quality

AS9100 Rev C, ISO 9001
WIPRO3DQMS

Domains



Space



Defence



Aerospace



Transportation



Nuclear



Healthcare



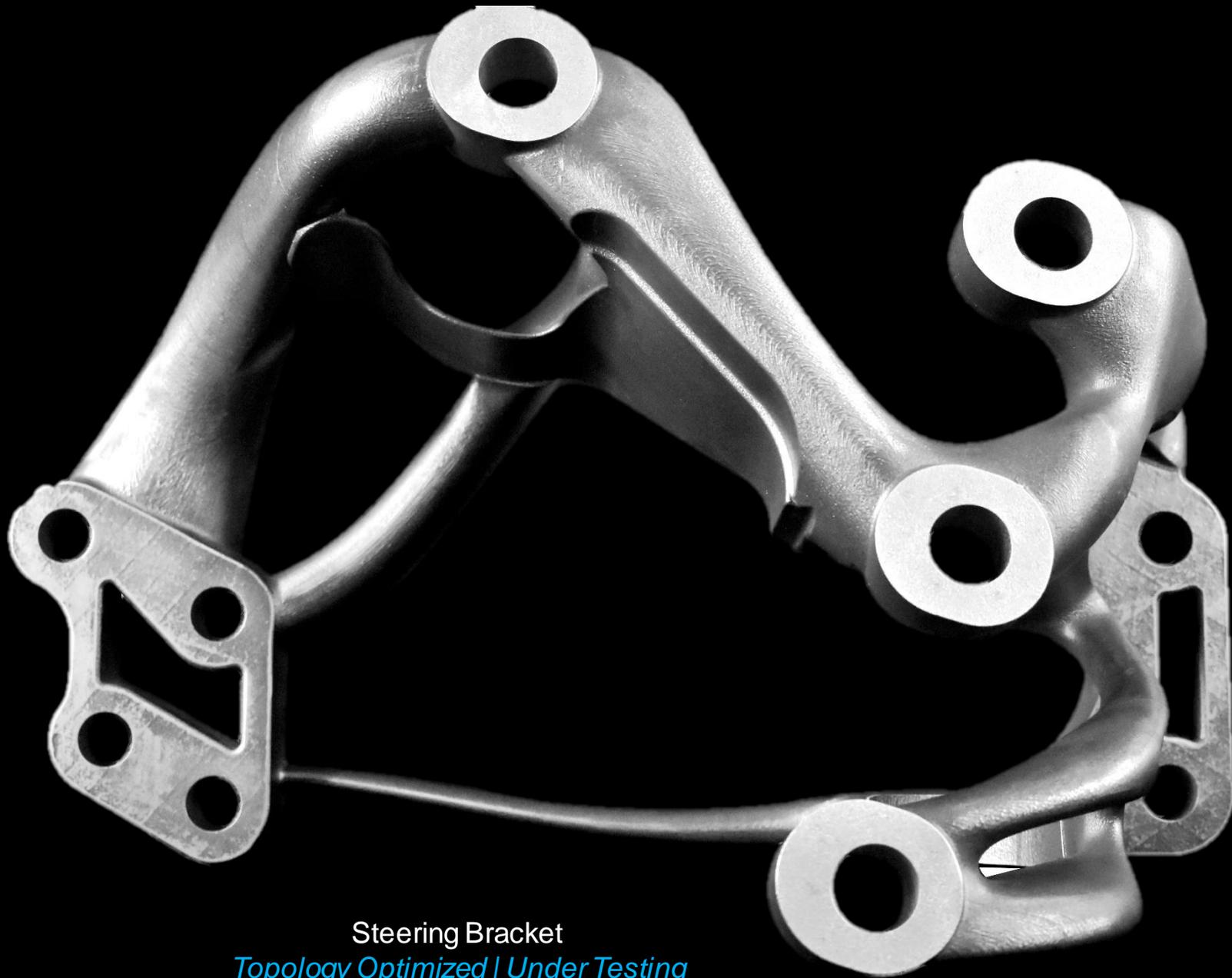
Industrial



Oil & Gas



X Band Feed Cluster 4x2
Under space flight qualification



Steering Bracket
Topology Optimized | Under Testing

Client Design

Additive Design

Client Design

Additive Design

North West
Feed Cluster 2x2

In Orbit

RF Leakage eliminated
12 parts redesigned into 1
AlSi10Mg

PTO Cover

73% weight reduction
Laminar Flow Achieved
AlSi10Mg

Rear Upright
Bracket

35% stiffness increase
53.5% weight reduction
Ti6Al4V

Altimeter

15% weight reduction
1.2 mm wall thickness
4 parts redesigned into 1
AlSi10Mg

Aero Bracket

53% weight reduction
78% deflection reduction
AlSi10Mg



Anti Icing Assembly
To be tested | Multiple Alloys



Anti Icing Assembly (Front View)
To be tested | Multiple Alloys



HP Compressor Stator Stage 4
Validated at 100% ground speed | Ti6Al4V



Launch Vehicle Gyro Housing
Under testing. | AlSi10Mg



UAV Flame Tube
Phase 1 testing cleared | IN 718



Component Gallery (Not exhaustive)



Propulsion Nozzle Disc
Undertesting | IN 718



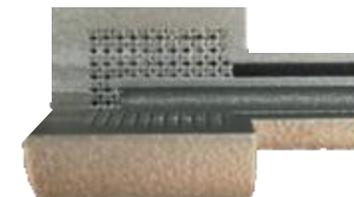
Sensor Housing
Validated | SS 316L



Ka Band OMT
85% signal efficiency | AISi10Mg



Impeller
Tech Demonstration | AISi10Mg



Cold Finger
Validated | AISi10Mg



Ka Band Single Body
Delivered | AISi10Mg



Exhaust Strut (Hollow)
Validated | IN 718



HiLov Manifold
Validated | AISi10Mg



Integrated Helix Antenna
Undertesting | AISi10Mg



Gas Turbine Nozzle Tip
Validated | HX



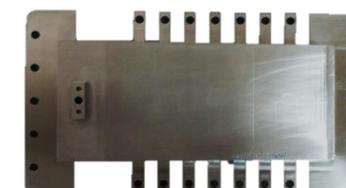
HP NGV
Undertesting | IN 718



LP NGV
Undertesting | IN 718



Starting Nozzle
To be tested | IN 718



Tx Antenna
Validated | SS 316 L





We welcome you to our AM Solutions Centre

Materials Characterization Lab



Materials Characterization Lab



Sample Preparation | Weighing Balance | Powder Flowability
Apparent Density Analyzer | Particle Size Analyzer

7 Axis CMM
& 3D Scanner

Additive Manufacturing



EOS M 280



EOS M 290
with Melt Pool Monitoring



EOS M 400

Post Processing



Stress Relieving Furnace



EDM Wire Cut



3+1 CNC

Wipro 3D relies on its partner ecosystem for specialized processes such as Sparking, Vacuum Heat Treatment, Laser Welding, Abrasive Flow Machining, Micro Machining and 5 axis/Vertical CNC Machining

Post Processing



**Shot / Bead Blasting
(Various Media)**



Tumbling

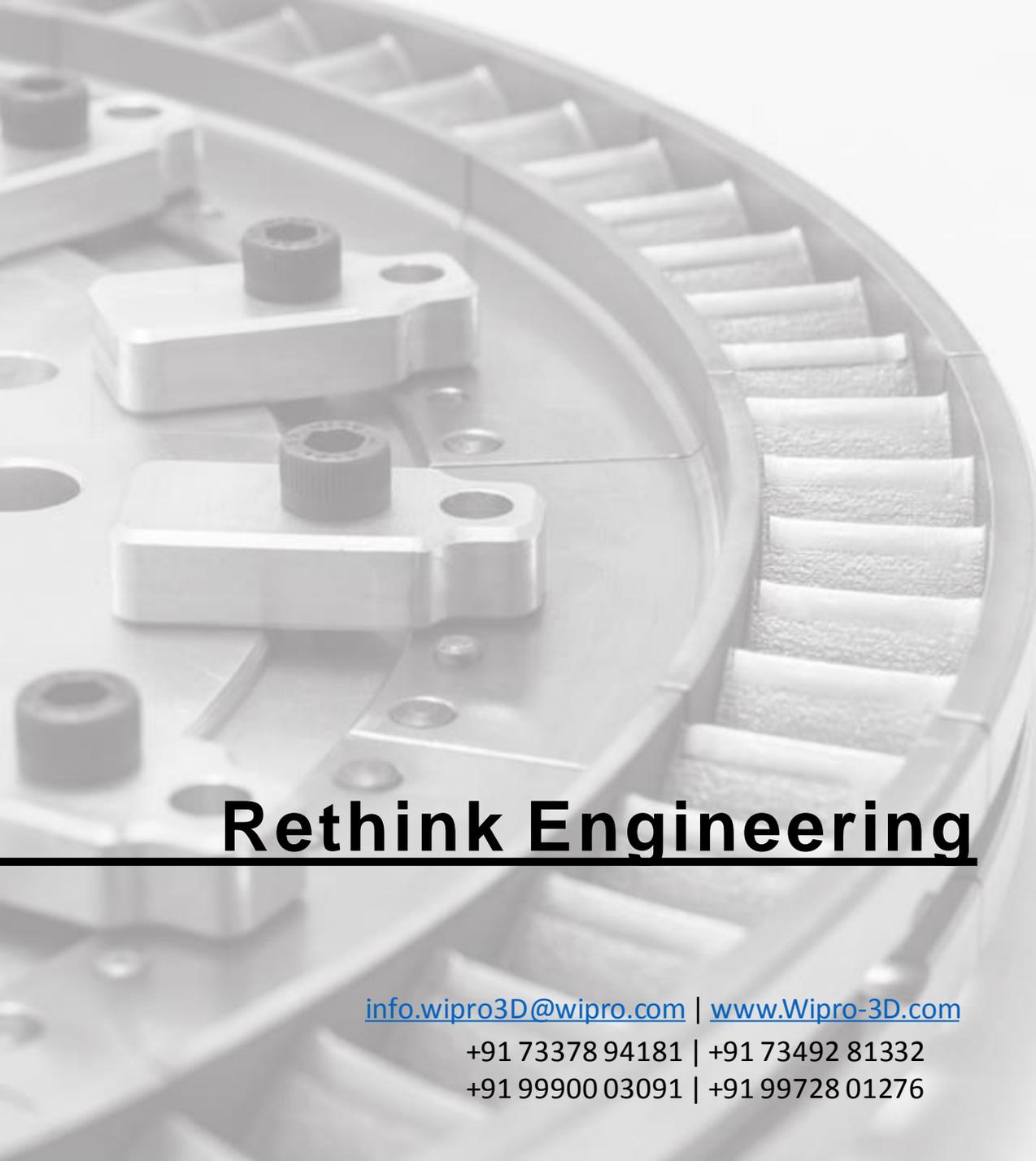


Robust Packaging

Wipro 3D relies on its partner ecosystem for specialized processes such as Sparking, Vacuum Heat Treatment, Laser Welding, Abrasive Flow Machining, Micro Machining and 5 axis/Vertical CNC Machining

Why Wipro 3D as your Strategic AM Partner

- Demonstrated experience in Metal AM for 4+ years
- Proven knowledge and understanding of Additive Design & Engineering
- Strong engineering design, simulation and domain led workforce
- AS 9100 D Certified
- R&D Capabilities
- Custom material adoption
- Developing additional AM applications in advanced materials
- In house metal AM set up all under one roof: Metal AM machines, post processing machines and materials characterization lab
- IP protection measures and culture
- In the process of implementing global footprint in metal AM
- Strong partner ecosystem including 3D Printer OEMs, AM providers, research organizations, software vendors



Rethink Engineering

info.wipro3D@wipro.com | www.Wipro-3D.com

+91 73378 94181 | +91 73492 81332

+91 99900 03091 | +91 99728 01276



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