Metal Additive Manufacturing Solutions & Services

wipro 3D

WIPRO
A diversified global conglomerate

Who we Are

About Wipro Group

WORLD'S MOST ETHICAL COMPANY – 10h YEAR IN A ROW

$ 9 + BILLION CONSOLIDATED REVENUES (FY 2019-20)

1,90,000 + WORKFORCE

1180 ACTIVE CLIENTS Presence IN 63 COUNTIRES

USD 21Bn $ MAKET 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
- Industrial Automation

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

Joint Ventures

Wipro Kawasaki Precision Machinery

Hydraulic Pumps and Swing Motors for Excavators

Wipro-GE Healthcare

Healthcare Equipment and Solutions

Wipro Infrastructure Engineering: Global Reach

Workforce : 2300 +
Facilities : 16
Legacy : 40 + years in mfg

USA

Chambersburg
Rochester
Everett.

BRAZIL

Piracicaba
Plant area: 9,000 sq.m.

EUROPE

Pernio – Finland | *Plant area: 16,000 sq.m.*
Bispgarden – Sweden | *Plant area: 3,500 sq.m.*
Ostersund – Sweden | *Plant area: 8,000 sq.m.*
Rm Valcea – Romania | *Plant area: 12,000 sq.m.*
Skelleftea – Sweden | *Tech and Protoshop*
Israel : Aerostructure

INDIA

Bengaluru | *Plant area: 15,800 sq.m.* | *Tech and Protoshop*
Chennai | *Plant area: 10,500 sq.m.*
Hindupur (plant 1) | *Plant area: 9,675 sq.m.*
Hindupur (plant 2) | *Plant area: 19,000 sq.m.*

Aerospace & Defence

Aerospace play

Engineering

- Design
- Stress analysis
- Certification
- Manufacturing

Avionics

- Cabin Systems & IFEC
- Navigation
- Communication
- Cockpit Electronics

PLM

- Product Data Management
- Knowledge Based Engineering (KBE)
- Manufacturing Solutions

Consulting

- Sourcing, Market Strategies
- Benchmarking
- ECM, ILM

Testing

- Qualification and pre-compliance testing covering DO160F and various MIL standards

Aerospace & defense – Our credentials

Manufacturing Credentials

Current Products and Programs

- B787 – PDOS Cylinders and Pistons
- A330 – Nose Landing Gear Retraction & Locking Actuator
- A340 – Nose Landing Gear Retraction & Locking Actuator
- A380 – Nose Landing Gear Retraction Actuator
- A320 Neo – Power Door Opening System (PDOS) Cylinder & Piston

Product Portfolio

- Actuators & Parts
- Manifold / Valve Blocks
- Hydraulic components
- Other precision components

Manufacturing Facilities

- USA, Everett, 28,000 ft²
- Israel, Kiryat Bialik, 125,000 ft2
- India, Bengaluru

IT Services Credentials

Engineering & Manufacturing

- Certification Manufacturing
- Connected Cabin
- Avionics
- PLM integration
- Pre-compliance testing covering DO160F & other standards

Supply chain & IT transformation

- Work Transfer Management
- MRO
- Cyber Security Services
- SAP S4 HANA
- ServiceNow
- Workday & SFDC
- Office 365 capabilities
- SIAM
- Cloud offerings

AIRBUS · CESA · BAE SYSTEMS · THALES · RECARO · ROLLS ROYCE · SAAB · Honeywell · ZODIAC AEROSPACE · AIRBUS MILITARY · BOEING · QATAR · ANA

We are investing to be partners of the future

Investment Areas

Advanced Analytics

- Predictive asset maintenance
- Anomalous event analytics
- Flight schedule optimizer
- Warranty analytics
- Fraud analytics
- Social media analytics

Robotic Process Automation

- Upto 70% productivity benefits
- Process excellence & automation implementation
- Focus on
  - Order entry and validation
  - Inventory reporting, compliance reporting

Additive Manufacturing

- AM Material Research
- Engineering Design
- Additive Engineering & Topology Optimization
- Complex Machining and Assemblies
- AM Sample & Serial Production with Post Processing
- R&D
- Managed AM Services

Blockchain

- Airworthiness certificate
- Provenance tracking to combat conflict minerals
- Smart Diagnostics and machine maintenance

AR/VR

- MRO solution through AR & VR
- Both mobile and wearable AR & VR solutions
- Enhanced field service efficiency

Creating experience-led, high velocity business models that operate on a global scale

Transforming IT and business processes through intelligent automation

Accelerating Wipro's transformation to a digital culture by training 17,500 of our engineers in digital technologies

Expanding local capabilities across multiple geographies globally through acquisition and new delivery centers

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Additive Manufacturing Solutions

Our Aerospace AM Customers

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AIRBUS

Honeywell | Aerospace

MOOG

BOEING

UTC Aerospace Systems

RECARO Aircraft Seating

ZODIAC AEROSPACE

Saab Grintek

Sentient Blue

HAL

ADA

DEFENCE R&D ORGANISATION MINISTRY OF DEFENCE

MAINTENANCE COMMAND INDIAN AIR FORCE

ISRO

Our AM Competencies

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2012-13
- Capacity
- Build Technology

2013-14
- Capacity
- Build Technology
- Design for AM

2014-15
- Capacity
- Build Technology
- Design for AM
- Post Processing

2015-21
- Capacity
- Build Technology
- Design for AM
- Post Processing
- Engineering Design Services
- Research
- Test / Validation

Our AM Journey

2012-13

Aerospace

2013-14

Aerospace

Space

Healthcare

2014-15

Aerospace

Space

Healthcare

Automotive

Oil & Gas

2015-17

Aerospace

Space

Healthcare

Automotive

Oil & Gas

Defence

Industrial / Tooling

Five Strategic Priorities for a resilient AM business

01 Accelerate AM Adoption

Focus & scale

- Prioritized sectors & markets
- Consulting and competency building programs

02 Strengthen Clients and Partnerships

- Strategic clients with mature AM use cases
- Large AM production business
- Strategic partnerships for AM machines, software and post processing

03 Lead with Business Solutions

- Beyond manufacturing services
- Leveraging industry, technology and consulting expertise
- Captive AM centres
- Managed AM services
- Customer specific AM and PP processes

04 Deliver Right-Fit Products

- Quality and Manufacturing systems
- Process Certifications
- Standards compliance
- Additive Engineering Framework

05 Quality First

- A holistic quality and manufacturing standard developed for LPBF
- Encompassing materials, models, machines, processes, input and output

Our AM Offerings

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Series Production

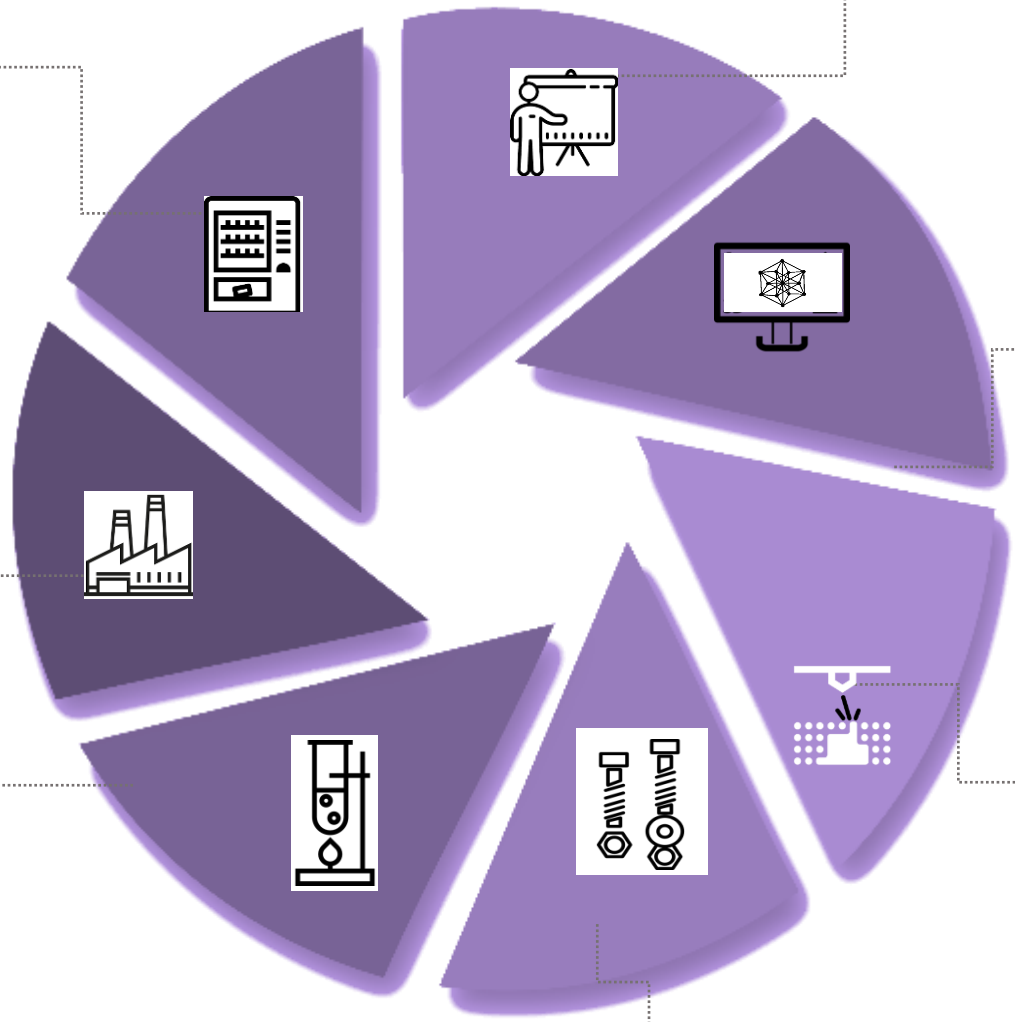
Capability to deliver repeatable, predicable, scalable quality for production volume end use parts)

Turnkey Services

Design, installation and commission of Captive AM centers with operational support delivered through a BOOT model

Material Development

Custom parameter development, custom metal powder development, adapting new alloys to AM



Complex Hybrid Assemblies

Contract manufacturing and assembly services with machining, welding supported by skill toolmakers and 6-Sigma quality processes

Additive Consulting & Competency Building

Wipro 3D's AddWize™ is a structured and systematic approach to adopt, apply and accelerate Additive Technology implementation.

Additive Engineering

Build strategy and planning, design optimization, build orientation, parameter optimization, post processing complexity, volume considerations, functional performance and opportunity for value creation.

Additive Manufacturing Services

In-house / access to multiple build technologies:
- Process package development and proveout
- Contract manufacturing

Our Capabilities

Capacity
Adequate manufacturing capacity and access to idle capability in the ecosystem to assure customers of timely delivery of required volumes / parts.

Engineering Design
Deep understanding of the industry, components, design capability and component awareness.

Test and Validation Certifications
Part Prove outs, design of experiments working with prestigious academia, and work with clients to run performance tests.

Additive Engineering
Build strategy and planning, design optimization, build orientation, parameter optimization, post processing complexity, volume considerations, functional performance and opportunity for value creation.

Research
Custom parameter development, custom metal powder development, adapting new alloys to AM, post processing.

Application Engineering
In-house / access to multiple build technologies: metal sintering, electron beam melting, with multiple build volumes, speeds and applications.

Post Processing
In house and augmented capabilities for various post processing techniques including HIPing, micro machining, abrasive flow machining etc.

Our Additive Manufacturing Solutions Centre

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CAPACITY

- 12,000 sft to be later scaled to 20-40,000 square feet state of the art facility in Bangalore

POST PROCESSING

- Inert Gas & Vacuum furnace
- Machining Centres
- Shot peening (various media)
- EDM Wire Cut
- Surface Grinder
- Specialized Machining processes
- Tumbling Equipment

BUILD TECHNOLOGY

- EOS M290, M280
  Build size: 250 x 250 x 300 (mm)
- EOS M400
  Build size: 400 x 400 x 400 (mm)
- Automatic powder handling module
- Developing custom Electron Beam metal powder bed fusion machine

RESEARCH

TEST / VALIDATION

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

Ecosystem of Partners for Specialized Machining, Testing, Validation and other services Includes existing and planned equipment.

Materials

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PRODUCT CLASS	PRODUCT NAME	PRODUCT CLASS	PRODUCT NAME
MARAGING STEEL	Maraging Steel MS1	COBALT CHROME	EOS Cobalt Chrome MP1 EOS Cobalt Chrome SP2
STAINLESS STEEL	SS 17-4 PH SS 15-5 PH SS 316L EOS SS CX (Corax)	TITANIUM	Titanium Ti6Al4V Titanium Ti6Al4V ELI Titanium TiCP grade 2
NICKEL ALLOY	Nickel Alloy IN 718 Nickel Alloy IN 625 Nickel Alloy HX	ALUMINIUM	Aluminium AlSi10Mg
CUSTOM	A286 HR Steel, Super Duplex SS, CM 247 LC under development		Can be made available based on technical and commercial due diligence.

Software

Design

- SOLIDWORKS
- CATIA
- Altair Inspire

Simulation

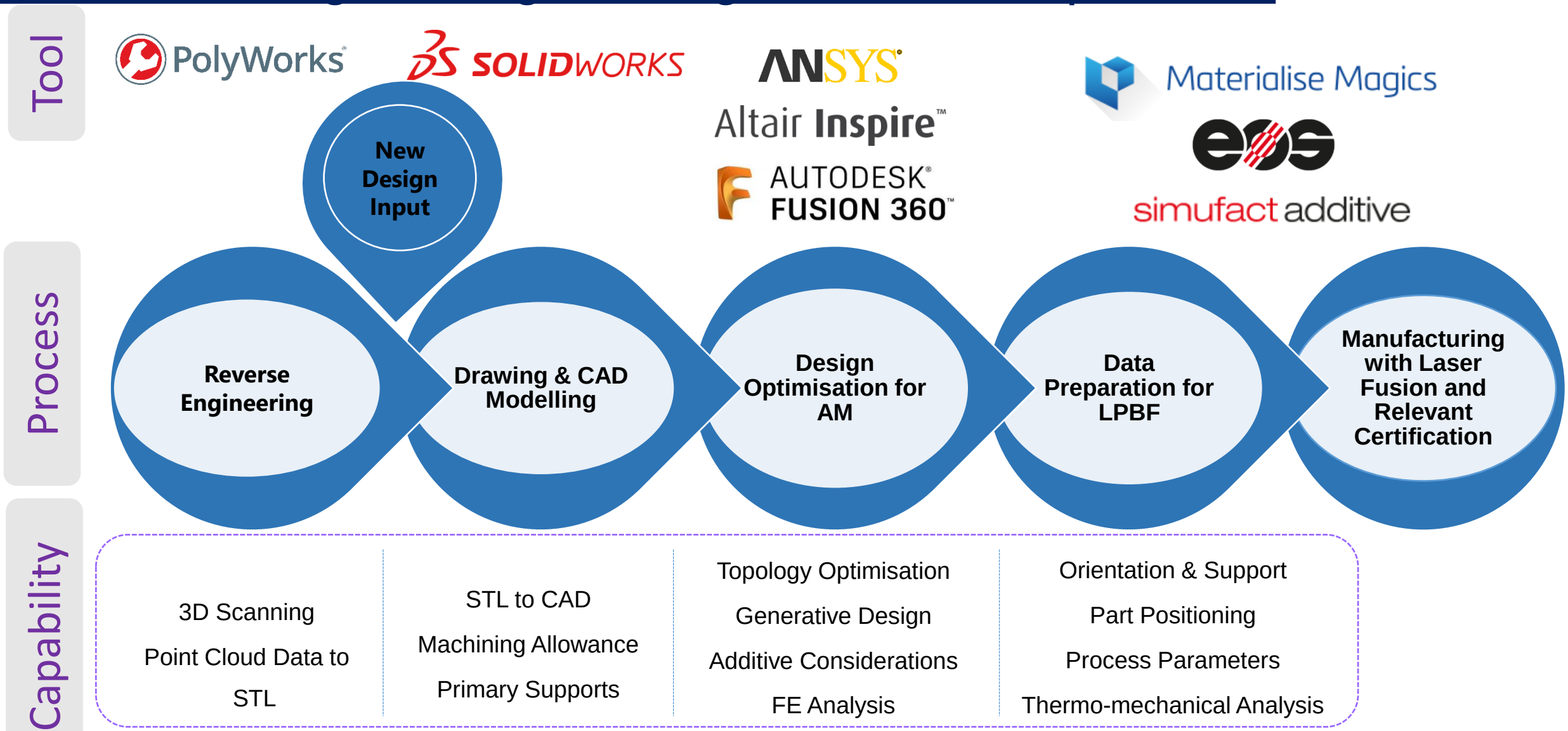
- ANSYS CFD
- ANSYS Mechanical

AM & QC

- DNA am
- Simufact
- Magics by Materialise
- EOS EOSTATE

Additive Engineering

Additive Engineering – Design Process Capabilities



Case in Point: Inner Ring for Turbine Nozzle

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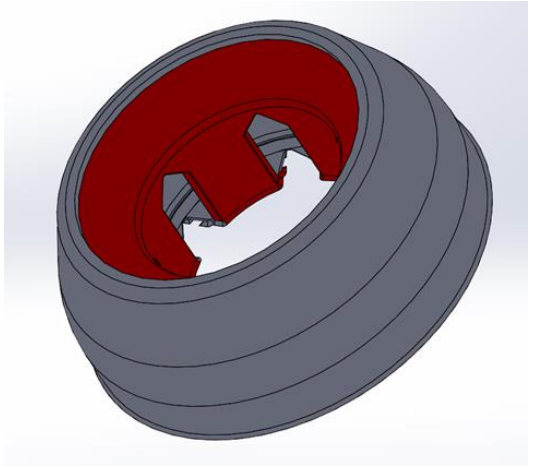
CAD Data developed using Point Cloud Data & 2D Drawing

Point Data Created Using Onsite 3D Laser Scanner

PolyWorks

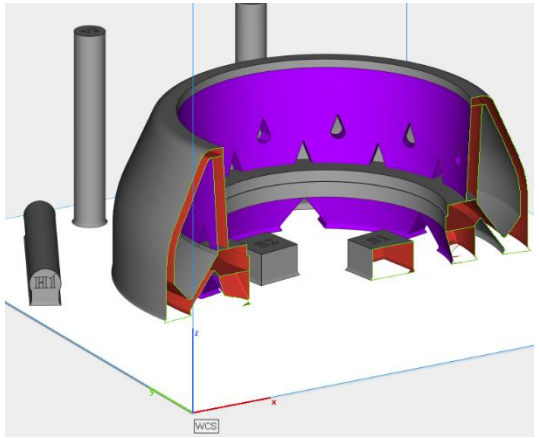


CAD Modelling for Printing and Machining

Solid Support Structures for Heat Dissipation

Vane Profile Machining Allowance

SOLIDWORKS



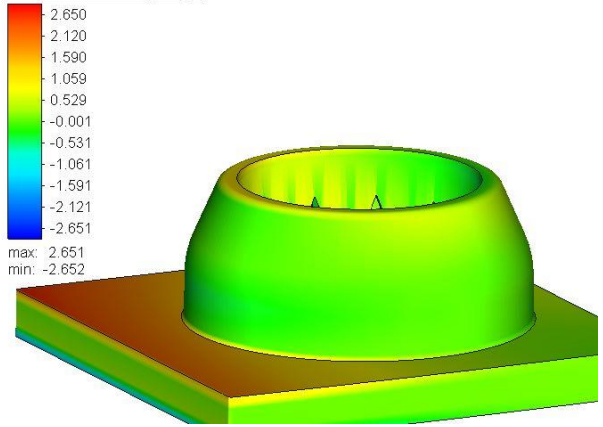
Additive Design Considerations

Build Strategy for Qualification

Manual Support Removal

Solid Supports for Heat Dissipation

Materialise Magics



Thermo-mechanical Build Simulation

Residual Stress

Deformation

Peak Temperature

eos

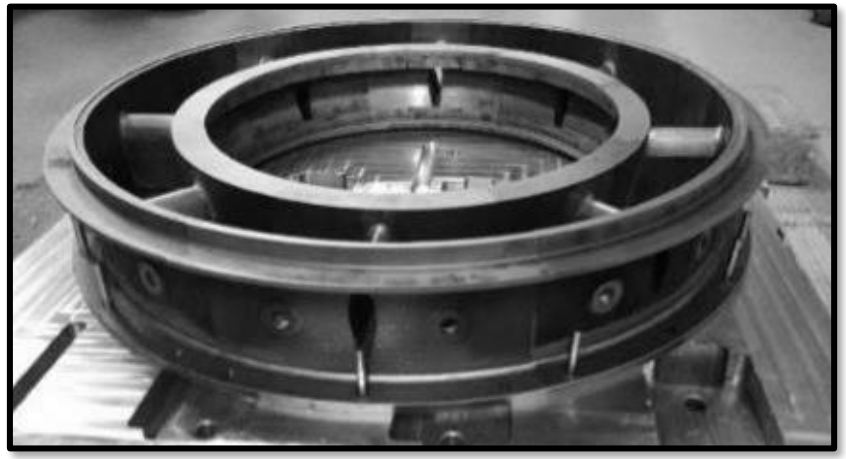
simufact additive

Application Engineering

Case in Point - Aerospace

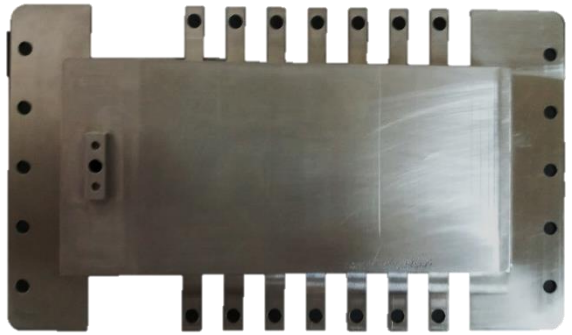
High Pressure Compressor Stator
300 mm Dia
Ti6Al4V
25 KN – 32 KN Thrust Jet Engine
Validated at 100% ground speed

Flame Tube
280 x 162 mm
IN718
UAV Engine (2000K op temp)
Passed system level combustion testing



Nozzle Guide Vane
450 mm Dia
IN718
25 KN – 32 KN Thrust Jet Engine
Validated at 100% ground speed

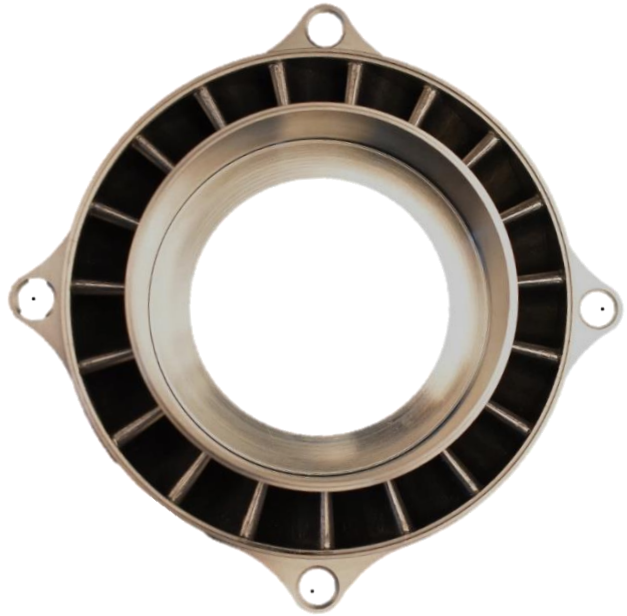
Case in Point - Defence



Rx Antenna
172 x 85 x 37 mm
SS316L
Missile Communication
Validated

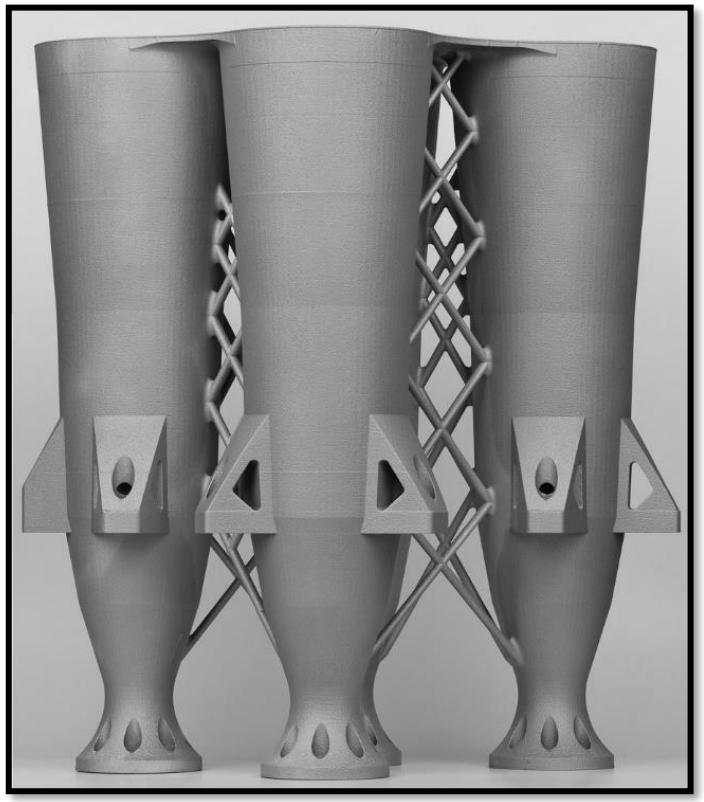
Starting Nozzle
172 x 85 x 37 mm
IN718
UAV Engine
Validated

Anti Icing Assembly
1 m dia
IN718 & Ti6Al4V
Aircraft Thermal Management
Under Testing



Nozzle Disc
120 x 32 mm
IN718
Missile Propulsion
Passed endurance testing, flight trials upcoming

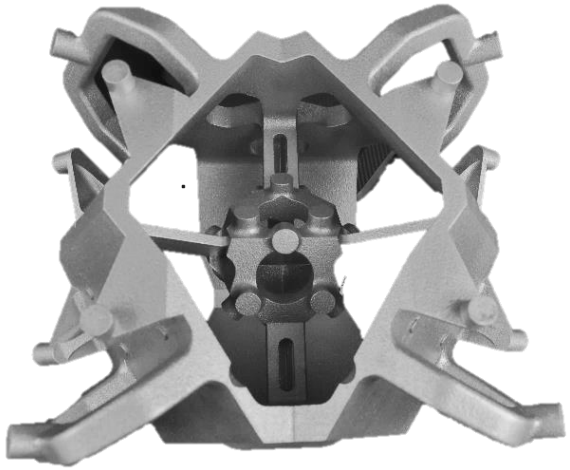
Case in Point - Space



NW Feed Cluster 2x2
250 x 250 x 320 mm
AlSi10Mg
Satellite Communication
In Orbit

Pre Burner Impeller
170 x 87 mm
AlSi10Mg
Cryo Fuel System
Validated

Injector
142 x 50 mm
Ti6Al4V
Rocket Propulsion
Validated



MINS Cluster
178 x 168 x 193 mm
AlSi10Mg
Rocket Guidance & Positioning System
Under Testing

Case in Point - Aerospace

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PART	MATERIAL	AM COMPETENCIES DEMONSTRATED		VALUE DELIVERED		
INNER RING	A286 HR STEEL	DESIGN FOR AM	BUILD TECHNOLOGY	HOMOGENEOUS STRUCTURE	WEIGHT REDUCTION	BETTER FUNCTIONAL PERFORMANCE

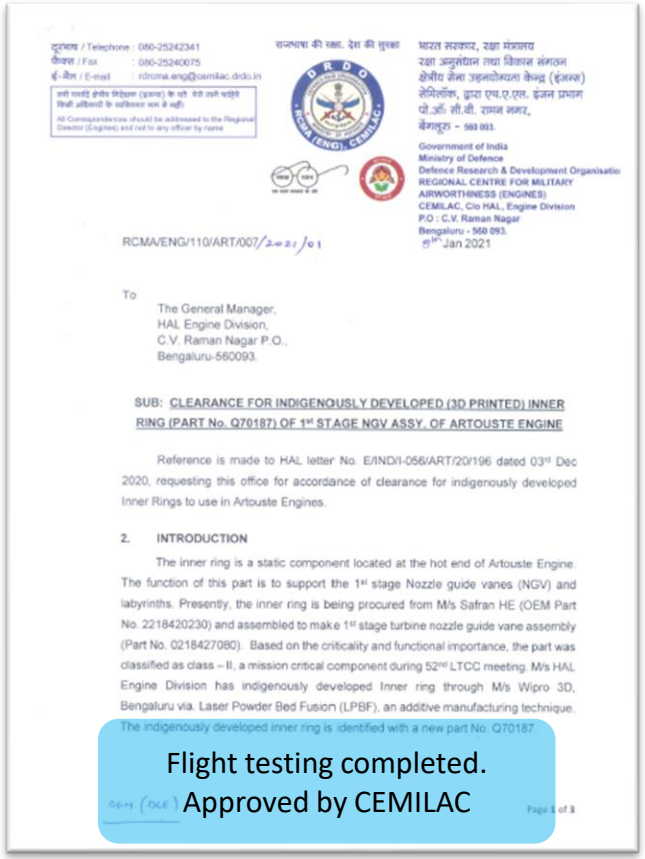
- A landmark project in application engineering with metal AM

- Scope:
  - Material development and adoption to LPBF
  - RM characterization and validation
  - AM process development
  - Material testing,
  - Machining trials and prove out,
  - Inspection (radiography, CMM, and CT scan) executed over 2.5 years

Proven Out

Application: Helicopter engine

Features : 2.2 mm wall thickness



RCMA/ENG/110/ART/007/2021/01

To

The General Manager,
HAL Engine Division,
C.V. Raman Nagar P.O.,
Bengaluru-560093.

SUB: CLEARANCE FOR INDIGENOUSLY DEVELOPED (3D PRINTED) INNER RING (PART No. Q70187) OF 1st STAGE NGV ASSY. OF ARTOUSTE ENGINE

Reference is made to HAL letter No. E/IND/I-056/ART/20/196 dated 03rd Dec 2020, requesting this office for accordance of clearance for indigenously developed Inner Rings to use in Artouste Engines.

2. INTRODUCTION

The inner ring is a static component located at the hot end of Artouste Engine. The function of this part is to support the 1st stage Nozzle guide vanes (NGV) and labyrinths. Presently, the inner ring is being procured from M/s Safran HE (OEM Part No. 2218420230) and assembled to make 1st stage turbine nozzle guide vane assembly (Part No. 0218427080). Based on the criticality and functional importance, the part was classified as class – II, a mission critical component during 52nd LTCC meeting. M/s HAL Engine Division has indigenously developed Inner ring through M/s Wipro 3D, Bengaluru via. Laser Powder Bed Fusion (LPBF), an additive manufacturing technique. The indigenously developed inner ring is identified with a new part No. Q70187.

Flight testing completed.
Approved by CEMILAC

Case in Point - Defence

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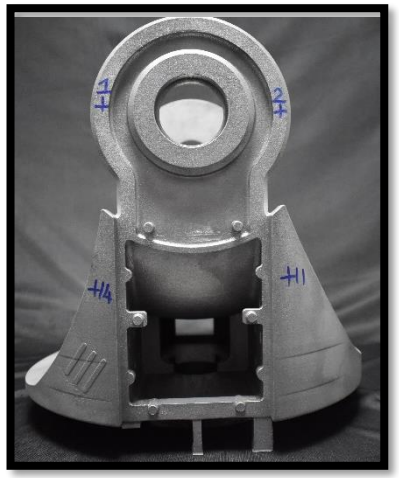
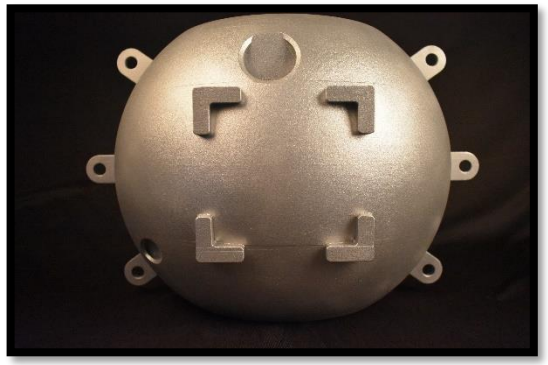
PART	MATERIAL	AM COMPETENCIES DEMONSTRATED		VALUE DELIVERED		
GIMBAL MOUNTED CAMERA HOUSINGS	AlSi10Mg	DESIGN FOR AM	BUILD TECHNOLOGY	HOMOGENEOUS STRUCTURE	WEIGHT REDUCTION	BETTER FUNCTIONAL PERFORMANCE





Application: Electro Optical Surveillance system for Helicopter

Features : 2 mm wall thickness
PO to part : 30 days

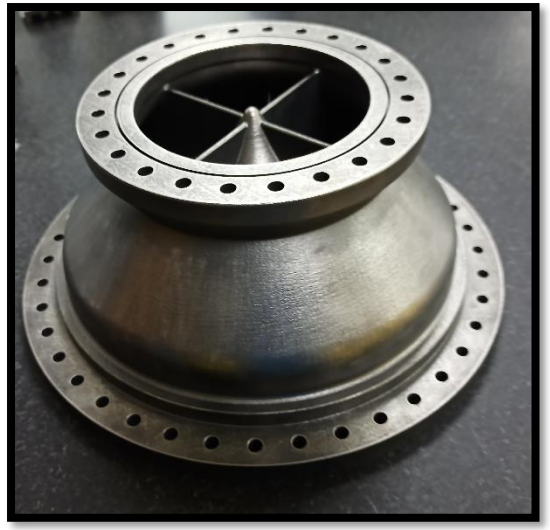
Flight testing completed. Approved by CEMILAC

Proven Out

- One of the tallest part printed in M400 the size is about Ø 370 X 356 mm and continuous 12 days build

Case in Point - Space

PART	MATERIAL	AM COMPETENCIES DEMONSTRATED		VALUE DELIVERED		
LOX & LH 2 Exhaust Casings	IN718	DESIGN FOR AM	BUILD TECHNOLOGY	HOMOGENEOUS STRUCTURE	WEIGHT REDUCTION	BETTER FUNCTIONAL PERFORMANCE



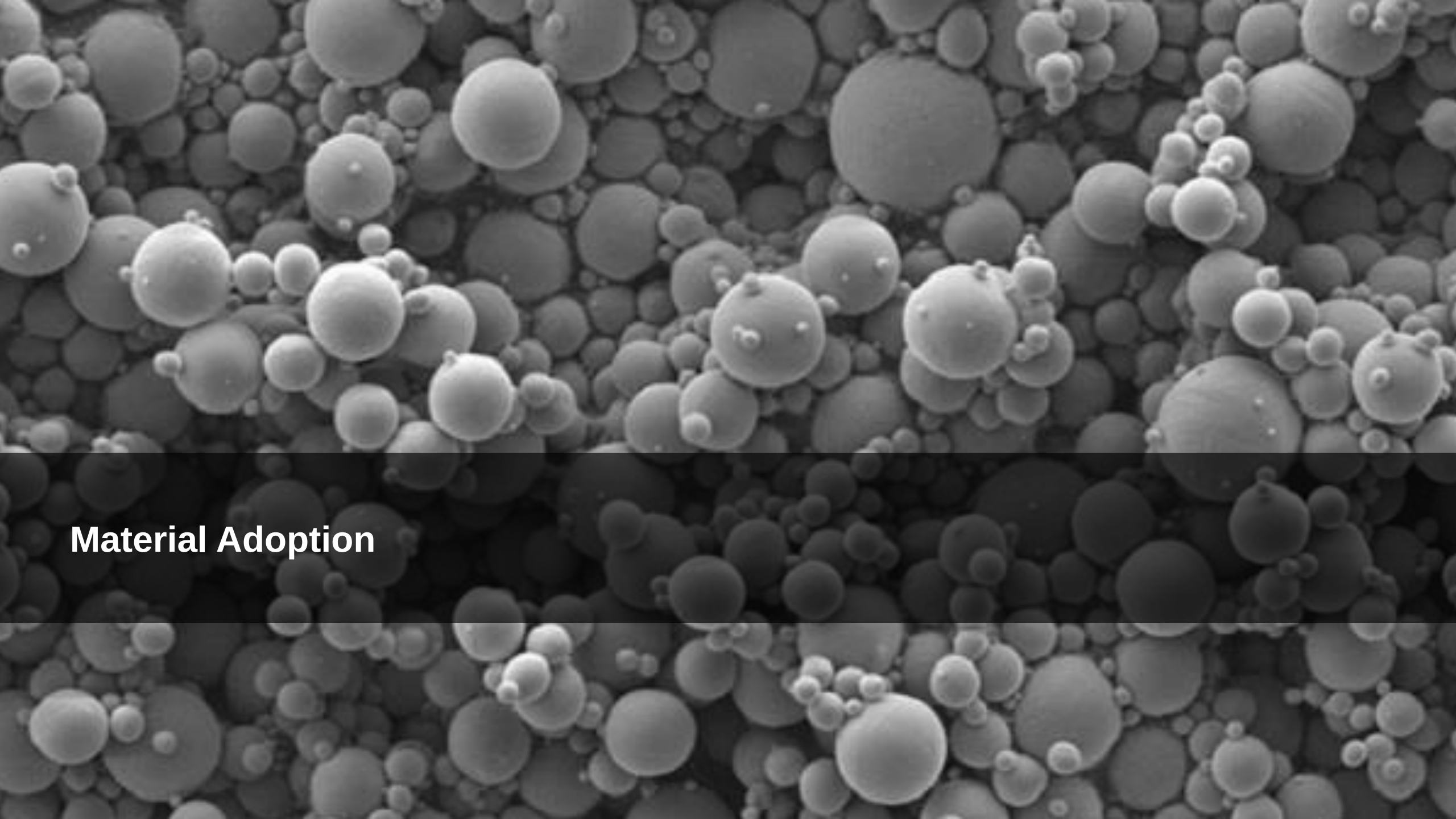
Application: Rocket Combustion

Features : 2 mm Blade thickness

Build hours : 140 per part

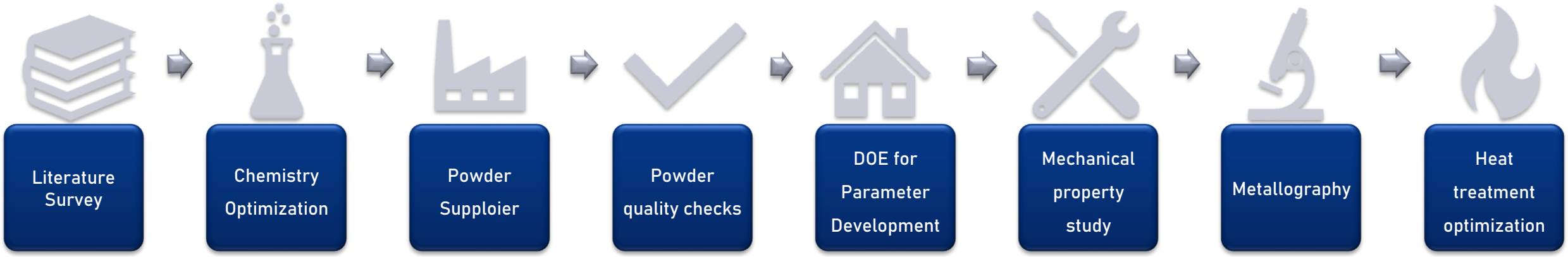
Qualification tests cleared:
Pressure test at 650 Kelvin for 10 min with 6.5 Bar simulating hot engine test condition

Proven out



Material Adoption

Material Adoption & Development Framework



- Understanding of Metallurgy of material
- Role of each alloying element in the material
- Chemistry alterations to make it feasible for AM
- Effect of chemistry alterations on final properties

- Vacuum/gas automized powder manufacturing : supplier
- Particle Size Distribution
- Flowability
- Apparent density
- Tap density
- ONH
- Powder morphology

- Systematic DOE approach used for parameter development
- Base line parameter / go to parameters chosen after benchmarking with similar materials
- Further development based on the results obtained

- Metallography – as built without etch defects, after etch melt pool formation observation
- Part Density
- Mechanical properties- tensile, stress rupture, fatigue.
- Heat treatment cycle optimization
- After HT metallography for phases, grain size

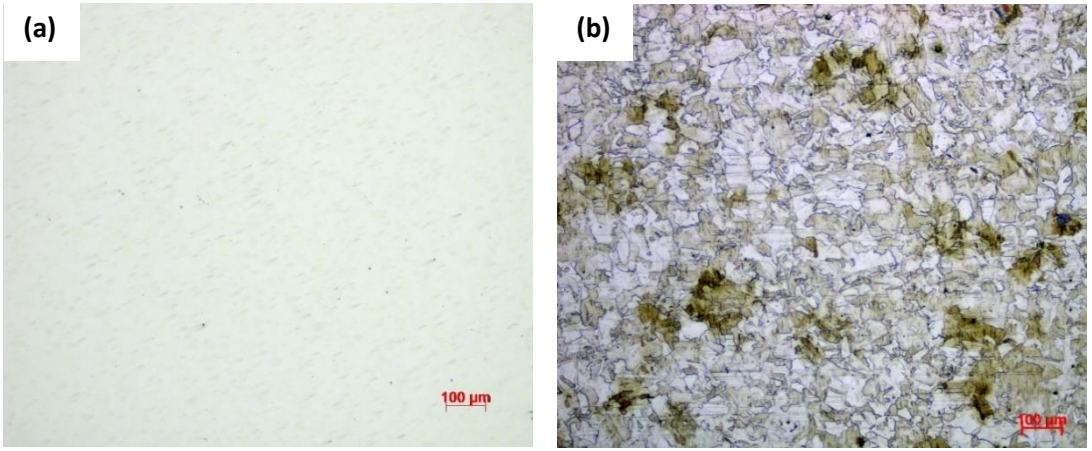
A286 Steel (Heat Resistant Steel)

- The A286 alloy is an Iron-Nickel based austenitic superalloy, that is useful for applications requiring high strength and corrosion resistance.
- This “Heat Resistant Superalloy” is designed to maintain its good strength and oxidation resistance at temperatures up to 700°C.
- Applications: Aircraft and industrial gas turbines, Jet engines, Turbine wheels and blades, frames, casings, offshore oil and gas industry

Chemistry (wt.%)	
C	max 0.08
Mn	max 0.35
Si	max 0.3
Cr	13.5-16
Ni	24-27
Mo	1-1.5
Ti	1.9-2.35
B	0.003-0.01
V	0.1-0.5
Co	max 1
Fe	Balance

Mechanical Properties	
Property	LPBF
Tensile	
Tensile Strength (MPa)	800 -1050
Yield Strength (MPa)	600 -900
Elongation (%)	3-12
Elevated tensile (650°C)	
Tensile Strength (MPa)	500-600
Yield Strength (MPa)	450-550
Elongation (%)	1-5
Hardness (HBW)	333 ± 10
Density (g/cm^3)	7.8

Microstructure



(a) Without etch micrograph_no porosities; (b) Microstructure of A286 after etch showing equiaxed structure(100X)

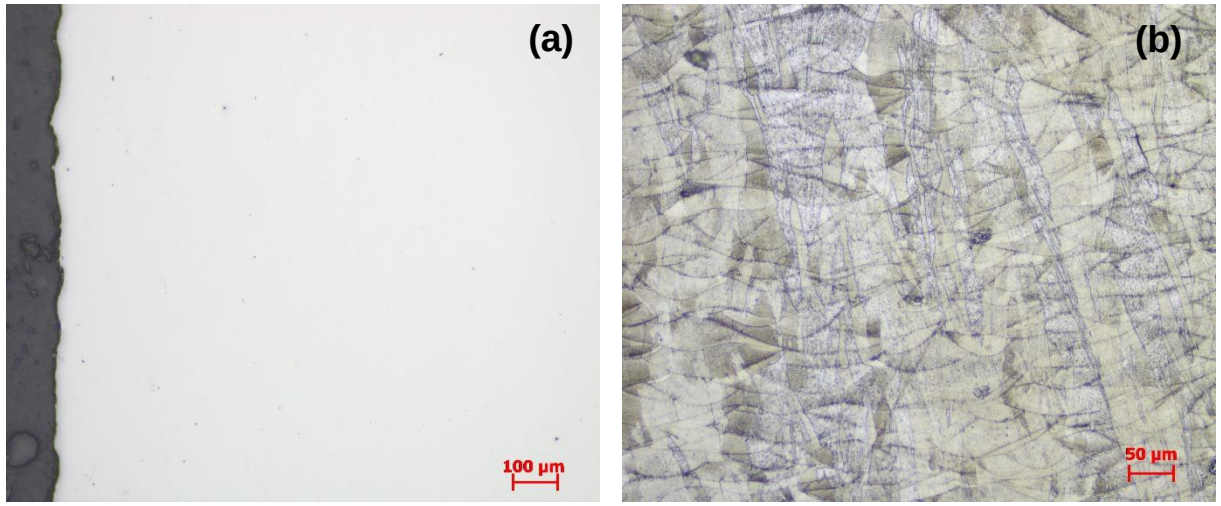
CM247LC (under development)

- CM 247 LC is a nickel base superalloy with low carbon content. It is a modified superalloy with a chemical composition of Mar-M247. With a potential for operation at high temperatures (≈1100 °C) due to the high γ' volume fraction.
- Applications: combustion chamber out to the exhaust nozzle, turbine blades and vane segments.

Chemistry (weight %)																		
Element	Al	C	Cr	Co	Cu	Fe	Hf	Mn	Mo	Nb	Ni	P	Rh	S	Si	Ta	W	Zr
Min.	5.4	0.05	8.0	9.00	-	-	1.2	-	0.4	-	Balance	-	-	-	-	3.1	9.3	0.004
Max.	5.7	0.1	8.5	9.50	0.10	0.25	1.6	0.20	0.6	0.10		0.015	0.1	0.005	0.15	3.3	9.7	0.02

Mechanical Properties		
Property	LPBF	LPBF + HIP
Tensile		
Tensile Strength (MPa)	1130 ± 15	1300 ± 50
Yield Strength (MPa)	930 ± 15	790 ± 20
Elongation (%)	8 ± 3	15 ± 5
Elevated tensile (760°C)		
Tensile Strength (MPa)	1230 ± 30	-
Yield Strength (MPa)	830 ± 30	-
Elongation (%)	12 ± 4	-

Microstructure



(a) Without etch microstructure showing NSD;

(b) Microstructure of CM247 after etch showing columnar in Z direction as built condition (100X)

Systems & Certification

Quality Certifications

TÜV NORD

CERTIFICATE

Management system as per
ISO 9001 : 2015

In accordance with TÜV INDIA procedures, it is hereby certified that

WIPRO ENTERPRISES (P) LTD.
9B-10A, Phase - I, Peenya Industrial Area,
Bangalore - 560 058, Karnataka,
India

applies a management system in line with the above standard for the following scope

Manufacture of Components and Assemblies using Additive Manufacturing Technology for Aerospace and Industrial Applications

Certificate Registration No. QM 08 01878 — Valid until 20.03.2023
Audit Report No. Q 10132/2020 — Initial Certification 2017

Certification Body at TÜV INDIA PVT. LTD. — Issue 21.03.2020 — Place : Mumbai

This certification was conducted in accordance with the TÜV INDIA auditing and certification procedures & shall be valid subject to regular Surveillance Audits.

TUV India Pvt. Ltd., 801, Raheja Plaza – 1, L.B.S. Marg, Ghatkopar (W), Mumbai - 400 086, India cert.helpdesk@tuvindia.co.in

AS 9100 D Certified

Lloyd's Register

Working together for a safer world

Additive Manufacturing Facility Qualification

In accordance with the requirements of the LR-TWI 'Guidance notes for Additive Manufacturing certification' (April 2020)

This is to certify that:

Wipro 3D,
A Division of Wipro Enterprises Pvt Ltd.
Peenya Industrial Area, Bangalore 560058, India

has been assessed against the requirements for additive manufacturing facilities and conforms to the requirements for the equipment and processes described below:
Design data development & control
Reception, storage & handling of feedstock
Additive manufacturing process & build control

incorporating the equipment below:
EOS Models AM280, AM290, AM400 (Powder Bed Fusion)

utilising the following feedstocks:
Titanium Alloys, Aluminium Alloys, Cobalt Chrome Alloys, Nickel Alloys, Stainless Steels

when performing Additive Consulting, Design, Production and Research & Development services

"This Qualification relates only to the facility stated above; it is not valid for equipment, feedstock materials or operators which have been varied from those included within the qualification scope (see Facility Audit Reports PRJ1100224939 and PRJ1100287350 for full details). Approval is subject to the continued maintenance of the quality system in accordance with the requirements of the Guidance Notes referred to above and associated inspection procedures.

Lloyd's Register shall be notified of any modification or changes to the equipment in order to obtain a valid qualification. Furthermore, any materials or components produced at this facility shall be subject to the appropriate certification activities."

Certificate No: PRJ1100224939
Original Approval: 05 November 2019
Current Certificate: 15 December 2020
Certificate Expiry: 04 November 2022

David Hardacre on behalf of Lloyd's Register Asia
a member of the Lloyd's Register group

Lloyd's Register Group Limited, its affiliates and subsidiaries and their respective officers, employees or agents are, individually and collectively, referred to in this clause as the 'Lloyd's Register'. Lloyd's Register assumes no responsibility and shall not be liable to any person for any loss, damage or expense caused by reliance on the information or advice in this document or howsoever provided, unless that person has signed a contract with the relevant Lloyd's Register entity for the provision of this information or advice and in that case any responsibility or liability is exclusively on the terms and conditions set out in that contract.

Lloyd's Register Asia
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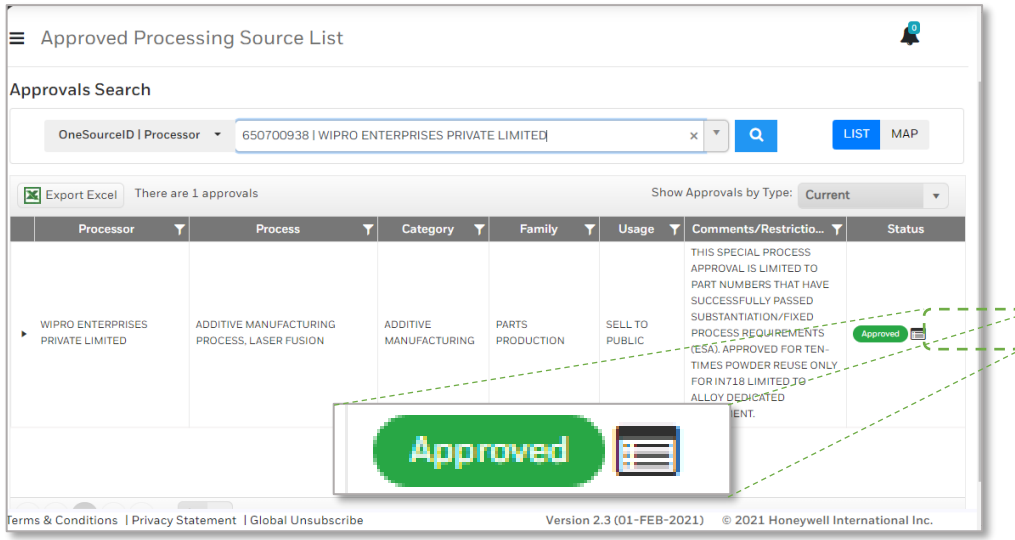
Lloyd's Register Certified



AM Certified by an American Aerospace Engine Manufacturer

ISO 27000

Expected Sept 2021

AM Enterprise Backbone

wipro 3D

DNA am

Build File Management

Chemical Analysis

Batch Splitting & Blending

Inventory Management

Inclusions Reporting

Quality Control

Visible Powder Traceability

Tooling & Equipment Management

Powder Status & Locations

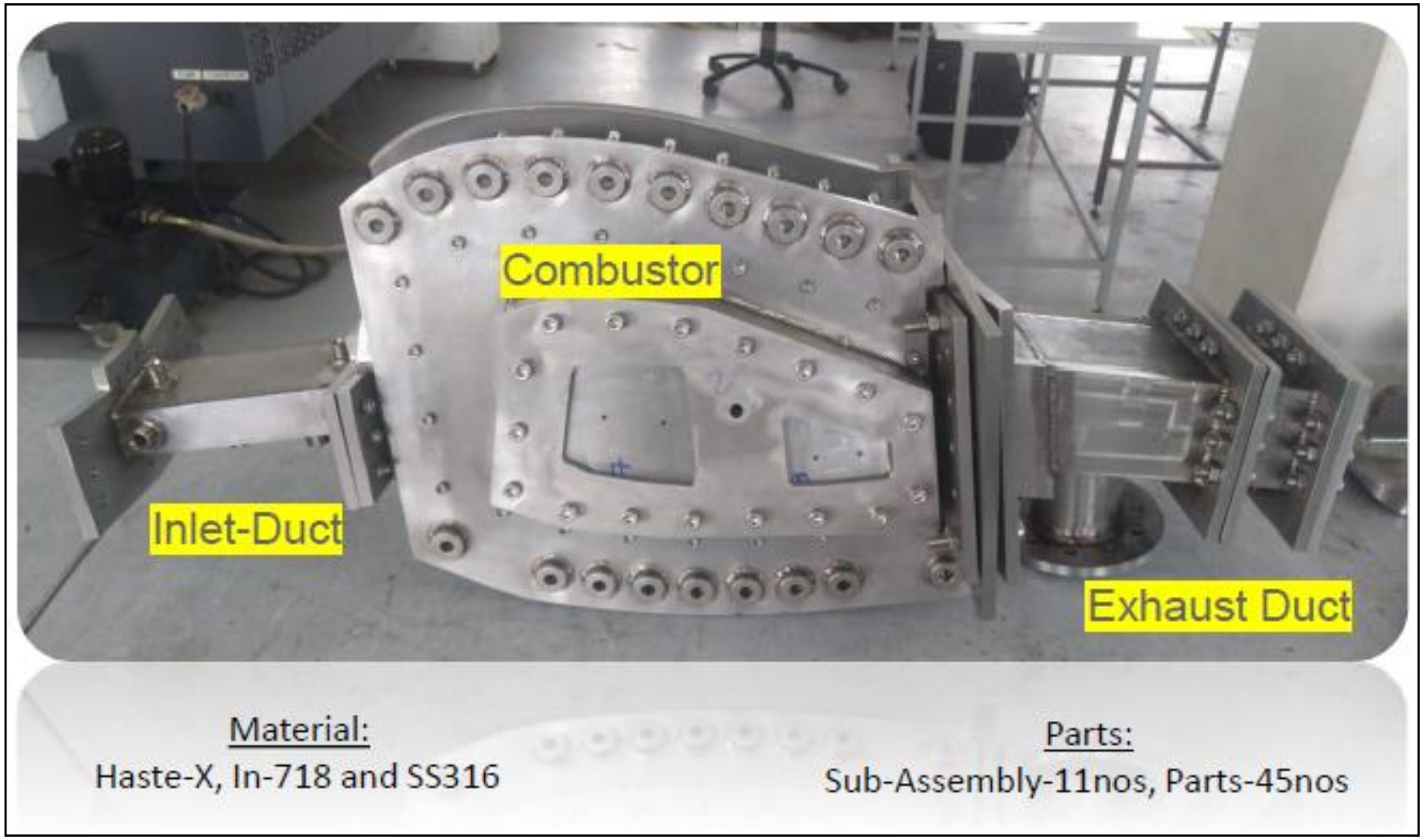
Visual Stock Location Management

Powder Tolerance

Chemical Trial

More than LPBF

Hybrid Assemblies



Suggested Next Steps

- GKN is looking to adopt Metal Additive Manufacturing to gain a business benefit for castings supply chain.
- Wipro3D suggests to begin with a Pilot as follows:
    1. Wipro3D will conduct an online meeting for GKN, sharing the Additive Thinking Framework, and examples of ‘right-fit’ parts for AM and ‘not-fit’ parts for AM.
    2. Based on this meeting, GKN can select a group of parts for Wipro3D evaluation, and share the 3D models and 2D drawings.
    3. It is suggested to select a diverse of parts based on material, functionality, cost, quantity and current pain-point.
    4. Wipro3D will react to the shortlisted parts with a justification for AM, where applicable, and with a recommendation to continue as-is, where AM would not be feasible.
    5. Based on GKN approval, Wipro3D will share a quote for the selected parts.
    6. Wipro3D will not charge for the pilot steps 1-4 listed above.
    7. Basis successful use of the selected AM parts, Wipro3D will assist GKN to create a roadmap for transitioning casting parts to AM.

    Note: Ideally, Wipro3D conducts AM pilots in person. However, given the current pandemic and travel restrictions, we can meet online.

Why Wipro 3D as your Strategic AM Partner

- Demonstrated experience in Metal AM for 5+ years
- Proven knowledge and understanding of Additive Design & Engineering
- Strong engineering design, simulation and domain led workforce
- AS 9100 D Certified and Lloyd's Register 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
- Ability to scale in multiple geos, both domestic and international
- 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

Thank you

Contact

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