3D PRINTING INSIGHT

JULY 2024

THE INSIGHT INTO

3D PRINTING & ADDITIVE MANUFACTURING TECHNOLOGY

www.amsi.org.in
ww.iw3dp.com

AMSI
ADDITIVE MANUFACTURING SOCIETY OF INDIA

3D PRINTING INSIGHT

PRESIDENT'S REPORT

We are excited to present the July 2024 issue of the '3D Printing Insight', a joint effort by the Additive Manufacturing Society of India (AMSI) and the Indian Women in 3D Printing organization (IW3DP). AMSI proudly unveils its new logo and outlines five key objectives for the next five years:

- **MADE IN INDIA – MADE FOR THE WORLD:** Foster the development of industry-grade additive manufacturing machines, materials, and software in India for global markets.
- **Enhance 3D Printing Applications:** Work towards expanding the applications of 3D printing across various sectors in India.
- **Skilling and Upskilling:** Offer industry-driven skill enhancement courses in 3D printing, additive manufacturing, Industry 4.0, and digital twin platforms.
- Mentoring and Incubation: Provide guidance and support for startups and incubators in the additive manufacturing domain.
- Global Networking: Facilitate connections with global additive manufacturing industries, organizations, and academic institutions through technology showcases and conferences.

Furthermore, We're pleased to announce the 13th International Conference & Exhibition on 3D Printing and Additive Manufacturing (AM 2024) on October 24-25, 2024, in Bangalore. This event will foster collaboration, networking, and knowledge exchange on the latest global advancements in 3D printing. Join us at AM-2024!

We thank our corporate and academic members for their unwavering support in fostering a thriving 3D printing technology ecosystem in India with AMSI. We look forward to seeing you at the AM-2024 conference and exhibition on October 24-25, 2024, at The Lalit Ashok, Bengaluru.

Sincerely,
Dr. L. Jyothish Kumar
President, AMSI

3D PRINTING INSIGHT

CHAIRWOMAN'S REPORT

Dear Members and patrons of Indian Women in 3D Printing,

June has been an exciting month for the Indian Women in 3D Printing Society (IW3DP). We are thrilled to welcome **Dr. Shiny Velayudhan, Scientist** to our Advisory Board. Her expertise will undoubtedly enhance our mission and initiatives.

This month, as part of our **UpSkill 3D Initiative**, we successfully hosted a Basic 3D Printing Training for the students of NIE Mysore in association with EOS, AMSI and Additive Learning. This initiative aims to bridge the gap between the skills acquired and the skills required in the industry.

Additionally, IW3DP has collaborated with the Vellore Institute of Technology on a research proposal on Additive Manufacturing funded by the British Council . This partnership marks a significant step towards advancing our **research capabilities and broadening our impact.**

In March 2024, I had the privilege of attending the first **National Additive Manufacturing Symposium (NAMS-2024)** in Delhi. Organized by the Ministry of Electronics and Information Technology (MeitY) in collaboration with the Government of Telangana and industry partners, this conference aimed to position India as a global hub for additive manufacturing. The symposium provided a platform for discussing advancements, challenges, and opportunities in the field, highlighting India's growing role in the global additive manufacturing landscape.

Sincerely,
Dr. Kavya Shree K
Founder Chairwoman

ORGANIZATION UPDATES FOR THE MONTH, JUNE

INDIAN WOMEN IN 3D PRINTING

UPSKILL 3D - IW3DP SKILL DEVELOPMENT INITIATIVE

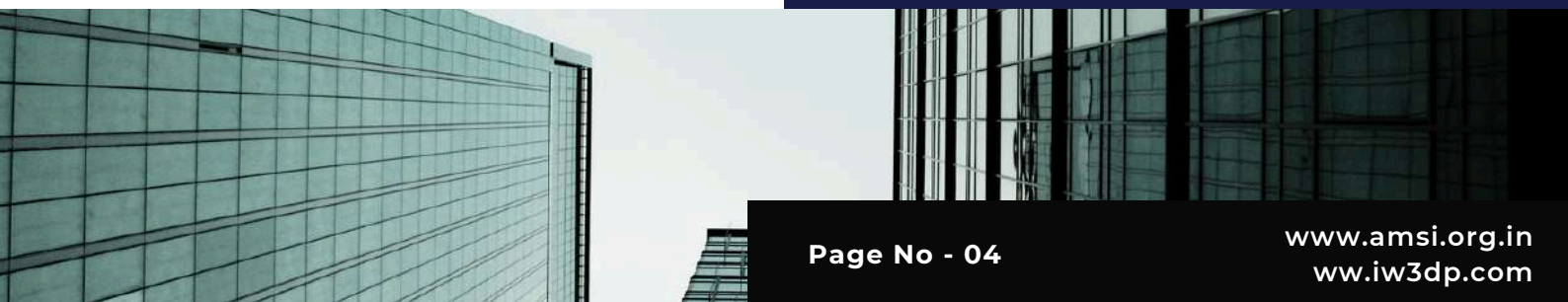
'Bridging the Gap between Skill Acquired vs Skill Required'

IW3DP in association with EOS, AMSI & Additive 3D hosts **Basic 3D Printing Training** for **National Institute of Engineering, Mysore** students at Additive Manufacturing Lab at Cambridge Institute of Technology, Bangalore.
A total of 35 students and two Faculty underwent the training.

IW3DP ADVISORY BOARD UPDATE

IW3DP welcomes **Dr. Shiny Velayudhan,** Scientist E, Sree Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum. An Institution of National Importance, Department of Science and Technology, Govt. of India to the IW3DP - Advisory Board.

IW3DP Collaborates with Vellore Institute of Technology for a Collaborative Research Project Proposal in Additive Manufacturing as part of "Going Global Partnerships, Industry Academia Collaborative Grant 2024-25", British Council, UK



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ADDITIVE MANUFACTURING SOCIETY OF INDIA

ORGANIZATION UPDATES FOR THE MONTH, JUNE

ADDITIVE MANUFACTURING SOCIETY OF INDIA

AMSI was delighted to join the National Conference on Additive Manufacturing at the SCOPE Convention Centre in New Delhi on June 28th. The event united industry leaders, innovators, and policymakers to delve into pioneering advancements and future trends in additive manufacturing and 3D printing. Dr. L. Jyothish Kumar, President of AMSI, participated in a panel discussion titled "Enhancing India's AM Ecosystem Share in Global and Domestic Markets."

We are delighted to introduce Dr. V. Anilkumar from the Vikram Sarabhai Space Centre, ISRO, as the Session Chairman for AM 2024. Dr. Anilkumar will lead discussions on Metal 3D Printing Applications for Space during the conference.

Leverage the Full Potential of a Heat Exchanger with Additive Manufacturing

Challenge:-

- Increase the performance of a heat exchanger while reducing weight.

Solution :-

- Additivemanufacturing with EOS M 290 and EOS Aluminium AlSi10Mg.

Results:-

- 3 times higher performance of heat rejection.
- 1/3 of the pressure drop.
- 22 % less weight.
- Flexible design allows optimum form factor - 55 mm smaller.
- Integrated functions reduce part countand costs for assembly

The Next Generation in Heat Exchange Technology withIndustrial 3DPrinting

Conflux Technology has patented a highly efficient, compact heat exchanger design that derives its performance from a geometry that can only be made using additive manufacturing (AM). High sur-
face area density, combined with optimized fluid pathways and 3D surface features, results in a high thermal exchange, low-weight, low pressure-drop heat exchanger. The performance advantages were achieved within a rapid development timeline which was underpinned by Computational Fluid Dynamics modelingand design for AM exper- tise. With no tooling implications to consider, multiple variants can be manufactured simultaneously.

Source: EOS

Challenge :-

Heat transfer is a ubiquitous challenge that is at the heart of the First Law of Thermodynamics. A heat exchanger, simply speaking, is a device that effectively transfers heat between two (or more) fluids, typically a liquid-liquid, liquid-gas, gas-gas or multiple fluids. You can find them in products like air condi- tioners and car engines. One practi- cal benefit of such devices is energy recovery. There are numerous others, it is a complex technology with broad applications. Heat exchanger designs and manufacturing methods have evolved with the prevailing technologies available and, conse- quently, have been limitedby those technologies.

Short Profile

Conflux Technology is an additive manufacturing applications company focused on providing engineered solutions to thermal and fluid challenges.
In summer 2017, AM Ventures entered the stage and invested in Conflux to further accele- rate the transformation and
to support this fantastic team and products.

www.confluxtechnology.com

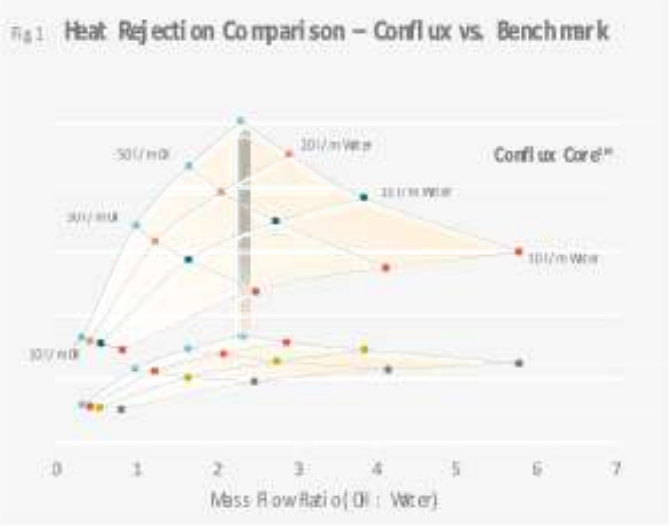
Conflux's Founder and CEO, Michael Fuller, spent more than a decadeas an engineer in the automotive racing industry.Here, heat exchangers have to perform in harsh environments. Therefore, smaller and more efficient compo- nents are sought but substractive manufacturig methods have reached their limits.MichaelFuller saw the rapid and transfomative benefits of 3D printing and ultimately identified additive manufacturing as an enabling technology for the next generation of heat exchangers.
Highly complex geometries with hitherto unachievable surface area densities resulting in a compelling thermal exchange performance could be achieved. And this, pack- aged in efficient volumes. Such components could have a dramatic effect on futuredevelopments, such as lighter racing cars and aircrafts. These fundamental opportunities are extended when functions are in- tegrated and multi-variant simultaneous production is realized. Michael Fuller was set to take this idea from concept, to design, to prototype, to product using industrial 3D printing.

Solution :-

Conflux Technology analyzed the industrial additive manufacturing landscape and, after a technical due diligence process, concluded that EOS is the only partner that has the technical and commercial capabil- ities to fulfill Conflux'sambitions. The ConfluxCoreTM design was patented after a rapid proof-of- concept development program.Within just 6 months, 6 prototypes were built and a final product could be developed. During the development program, several tools were utilized: Computational Fluid Dynamics (CFD) complemented the heat exchanger design iterations with flow visualization and, after correlation, performance predictions.
Non-linear thermo-mechanical Finite Element Modeling (FEA) was used to analyze the resultant displacements and stresses to ensure structural integrity was maintained. EOS equipment possesses a suite of specific AM software tools for data preparation, process optimization and quality assurance. These were all used during the development of the Conflux CoreTM heat exchanger which now has applications acrossmultiple industries such as Aerospace, Automotive, Oil u Gas, Chemical Processing and Micro-Processor Cooling.

Results :-

The Conflux CoreTM heat exchang- er was compared to a Formula 1 benchmark. Young Calibrations, a UKAS-certified laboratory in the UK, provides accredited calibration services and thermal fluid and com- ponent testing services, and tested Conflux's product. The results (see fig.1) underline the radical improvement Conflux has achieved with their 3D printed heat exchanger. AM al- lowed Conflux to design internal ge- ometries that radically increasedthe surface area in a given volume.
This tripled the thermal heat rejection. And at the same time, the pressure drop is reduced by two thirds. Addi- tionally, AM enabled a compact and new design of the heat exchanger, reducing its lengthby 55 mm compared to a F1 benchmark. This ultimately also eliminates 22 % of weight.



The design flexibility AM offers allows for optimum placement inside a vehicle and also enables the merging of components, reducing the overall number of parts. Integra- tion of sub components into a single part removes assembly time and reduces failure points from joints and seams.

Redesigning the Hydraulic Manifold Block for Additive Manufacturing with DfAM and Topology Optimization

Additive manufacturing (AM) is a viable alternative to traditional methodslike machining and casting, to manufacture components for hydraulic applications, such as hydraulic manifold blocks, end fittings, and other accessories. Additive Manufacturing allows a much higher levelof design freedom,part integration, and weight Reduction possibilities via Topology Optimization and improved media flow pathswith varied geometry internal channels for optimum flow - while maintaining structural integrity.

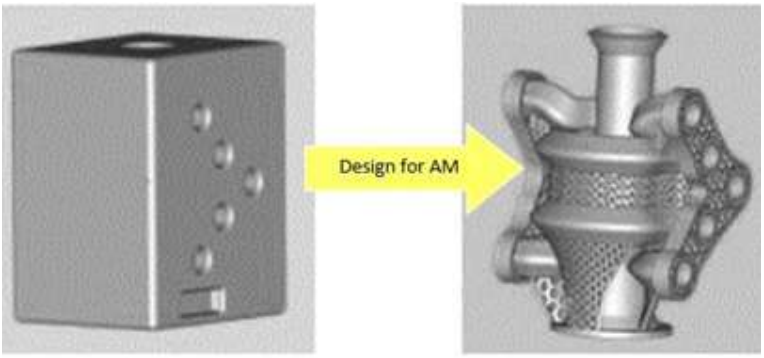
Challenge :-

Traditional methods of manufacturing hydraulic manifold blocks using milling and drilling operations to create the internal fluid channels, involve high machining costs and long lead times. These fluid channels are in straightor angular lines.

- Abrupt angled junctions in flow paths can cause flow stagnation with dead legs and increase in hold up volume resultingin loss of flow efficiency.
- The pressure drops due to sharp edges generating stress.
- Dirt reservoirs are formed at areas with no fluid flow causingdamage and possiblyfailure to the whole system

Solution :-

The flow geometries in the manifold blocks for AM have been redesigned to incorporate the optimum flow paths. The overall structure is modified as well such that the manifold blocks designed employing DfAM techniques are considerably lighter (see image below).
The image displays the redesigned hydraulic manifold block using Topology Optimization, along with the weight reduction in comparison to the traditional design of the same part.



Results :-

The redesigned manifoldblock was additively manufactured with reduced build time, less material consumption, reduced support removal and post- processing. The manifold block itself deliveredincreased efficiency and without any leakage in operation.

Time Frame - The complete redesign to realize the lifecycle of the manifold block was reduced to 8 hours from 30 hours for manufacturing it using conventional methods.

Improved Performance - Structural integrity was maintained.

Weight Reduction - Reduction of component weight by 75% (from 3.61 kg to 0.54 kg).

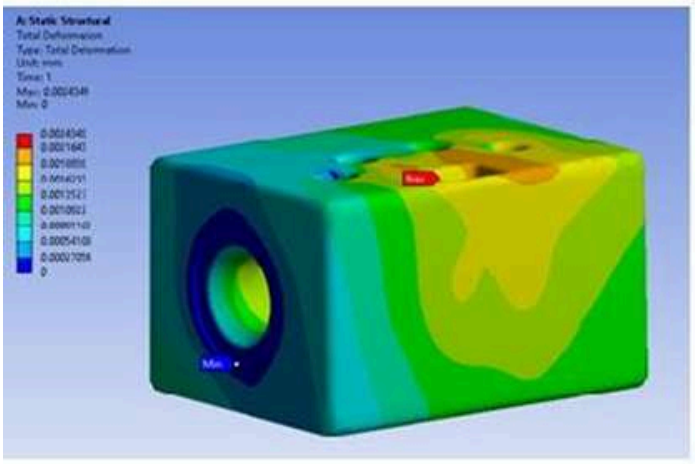
I**mproved flow efficiency -**
The horizontal holes are no longer needed, the fluid can now flow around sharp turns and is not disturbed by corners and edges.

Additive Engineering & Design

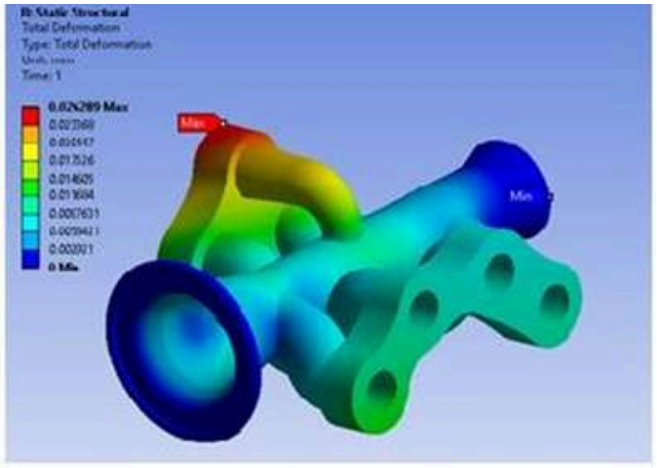
The redesigned manifold block was manufactured in Maraging Steel. It met the operational requirements with a reduced part weight and with enhanced performance by reducing the pressure drop. This was achieved without affecting all the inner channels.

Existing CAD data	Optimized CAD data
Part mass: 3.61 Kg	Part mass: 0.54 kg
Part volume :3,01,000 cm^3	Part volume:45,000 cm^3
Equivalent stress: 124 MPa	Equivalent stress: 360 MPa
Total displacement: 0.0024 mm	Total displacement :0.026 mm

Comparison of Hydraulic Manifold



Traditional design



AM design

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W3DP Indian Women in 3D Printing

TRUMPF

Smart Factory:Digital maintenance of TRUMPF laser in the global Mercedes-Benz production network

In the age of Smart Factory Mercedes-Benz relies on cloud-based monitoring of all TRUMPF lasers in smart factories in its global production network // Significant improvement in system resilience and reduction in the risk of unplanned downtime of machines ("condition monitoring") // Digital predictive servicing by connecting TRUMPF laser via MO360, the Mercedes-Benz digital ecosystem // Dynamic maintenance models: Optimization of service costs and needs-based on-site service assignments.

Ditzingen/Stuttgart, 10 June 2024 – Mercedes-Benz and high-tech company TRUMPF honed their decades-long relationship to make complex systems in production more resilient and efficient. In the age of smart factories, both companies are focusing on predictive digital maintenance in real-time laser maintenance. The corresponding pilot project at the Sindelfingen site served as a blueprint for all Mercedes-Benz plants worldwide. The innovative process significantly reduces the risk of unplanned downtime of machines, which enormously increases the resilience of complex vehicle production processes.

Predictive digital maintenance thanks to standardized data infrastructure :-

Until now, lasers have been serviced at fixed time intervals directly in their respective locations. Master data maintenance, documentation, and data exchange were carried out manually. With the help of the Manufacturing Service Bus (MSB) and additional elements of the Global MO360 data infrastructure, around half of the approximately 400 TRUMPF lasers and associated laser optics used worldwide at Mercedes-Benz are now connected in one cloud.

“The future of automotive production is about forward-looking, digital processes, dynamic maintenance, and maximum failure avoidance. Together with our partner TRUMPF, we are driving forward continuous process optimization with innovative condition monitoring even in system maintenance", said Jörg Burzer, Member of the Board of Management of Mercedes-Benz Group AG. Production, Quality & Supply Chain Management.

Condition Monitoring: Monitoring of production systemsin real time

In the digital service condition monitoring developed by TRUMPF, the status of the lasers are now continuously monitored and analyzed cloud-based in real time. In so-called condition monitoring, TRUMPF service experts use algorithms to monitor the networked laser centrally from a single point while the machine is in progress. Abnormilities are detected immediately and reported directly to the corresponding maintenance department, accompanied by recommended actions. Mercedes-Benz is therefore able to recognize additional maintenance requirements before a laser fails.The risk of a failureis so predictable and can be prevented by maintenance measures initiated on time. This avoids unplanned downtimes in production and significantly reduces breakdowns. Over 80% of all service cases can be predicted and proactively planned.

In addition, the results of these analyses help Mercedes-Benz to operate the laser better and therefore assist in the continuous optimization of its high-tech vehicle production.

“Digital networking is the key to greater efficiency in production. With smart factory solutions, we are strengthening the competitiveness of our customers. Through condition monitoring and data analyses, we support our partner Mercedes-Benz in its state-of-the-art production and increase the availability of our laser and machines”, said Hagen Zimer, CEO Laser Technology and Member of the Board of Management of TRUMPF

Mercedes-Benz guarantees data protection

Thanks to a globally uniform IT architecture and standardization of the components in all assembly and vehicle plants worldwide, the highly complex production facilities are validated. Production-relevant data is not passed on to third parties. Only the laser status data is sent to the TRUMPF cloud for analysis, whereby the data stream sare protected by cloud assessments and audits.

Digital photographs in print-ready resolution are available to illustrate this press release. They may only be used for editorial purposes. Use is free of charge when credit is given as “Photo: TRUMPF”. Graphic editing – except for cropping out the main motif – is prohibited. Additional photos can be accessed at the TRUMPF Media Pool.

Partnership between TRUMPF and Mercedes

Hagen Zimer, CEO of TRUMPFLaser Technology, and Jörg Burzer, Member of the Board of Management of Mercedes-Benz AG, in the S-Classproduction facility in Sindelfingen. (Image source: Mercedes-Benz AG).

About TRUMPF

TRUMPF is a high-tech companyoffering manufacturing solutions in the fieldsof machine tools and laser technology. The Company drives digital connectivity in the manufacturing through consulting, platform products and software

TRUMPF is one of the technology and market leader in highly versatile machine tools for sheet metal processing and in the field of industrial lasers. In 2022/23, the company employedsome 18,400 people and generated sales of about 5.4 billion euros. With over 80 companies, the TRUMPF Group is represented in nearly every European country as well as in North America, South America and Asia. The company has production facilities in Germany, France,the United Kingdom,Italy, Austria, Switzerland, Poland, the Czech Republic, the United States, Mexico and China.

Find out more about TRUMPF at **www.trumpf.com**

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Additive Solutions
ADDITIVE INDUSTRIES PVT LTD

SECTORS & INDUSTRIES WE SERVE

Aerospace Defense Engineering Education Medical Automobile

COLLABORATIONS

INDO-MIM TRUMPF HRMAC TECHNOLOGIES

Image Courtesy by TRUMPF

VALUABLE CUSTOMERS LIST

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ADDITIVE INDUSTRIES PVT LTD

- Additive Manufacturing
- NDT Solutions
- Metal Powder Supply
- Mechanical Testing
- 3D Scanning & Design

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+91 90 3636 9696

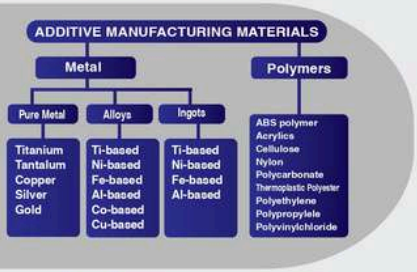
Why Choose ADDITIVE INDUSTRIES ?

We provide wide range of Metal powder, High end pre-processing software, Prototyping and Post Processing services along with testing of the end product.

- Our metal powders undergo rigorous quality control measures to ensure it meets or exceeds industry standards.
- Our team of experts is ready to assist you with technical guidance and support, ensuring your success in every project.
- We can tailor the particle size, alloy composition, and packaging to meet your specific needs.
- We maintain a robust supply chain to ensure prompt delivery and minimize downtime.

Additive manufacturing (AM) is a process of joining materials to make objects from 3D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies.

ADDITIVE MANUFACTURING



OUR SERVICE PROCEDURE

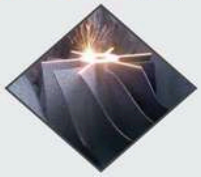
DESIGN → 3D PRINTING → POST PROCESSING → TESTING

DESIGN

We use 3D CAD (3-dimensional computer-aided design), a technology to create functional, virtual prototypes of 3-dimensional objects.

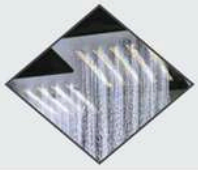
3D PRINTING

Metal Printing



FDM

Binder Jetting



Composite & Ceramic

POST PROCESSING

- Powder Removal
- Support Removal
- Heat Treatment
- Machining
- Surface Treatment

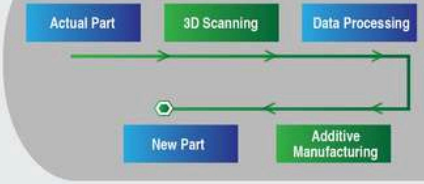
NON DESTRUCTIVE TESTING

- CT-Scanning
- Fluorescent Penetration Inspection
- Die-Penetration
- Ultrasonic Testing (UT)
- Radiographic Testing (RT)
- Magnetic Particle Testing (MT)
- Liquid Penetrant Testing (LT)

DESTRUCTIVE TESTING

- Tensile Test
- Creep Test
- Fatigue Test
- Rupture Test
- Corrosion Test

REVERSE ENGINEERING



ADVANTAGES OF OUR MANUFACTURING

- Cost Effectiveness
- Supply Chain Consolidation
- Mass Customization
- Design Freedom
- Accelerated Production
- Material Waste & Energy Management

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W3DP Indian Women in 3D Printing

Intech additive solutions

Intech additive solutions

Intech Additive: Transform your Manufacturing with Metal 3D Printing expertise.

Explore our Integrated Hardware & Software solutions for Streamlined Additive Manufacturing.

Hardware Solutions: iFusion Series

Precision Printing, Limitless Possibilities: Experience high-performance Metal 3D Printing with Intech Additive's iFusion Series.

iFusion325
Reliable Metal Innovator
Build Volume: 325mm x 325mm x 420mm
Laser Power: 500W/1000W
Laser Configuration: Single/Twin

iFusion150
Smart Metal Prototyper
Build Volume: Dia. 150mm x Ht. 180mm
Laser Power: 500W/1000W
Laser Configuration: Single

iFusion450
Metal Component Replicator
Build Volume: 450mm x 450mm x 450mm
Laser Power: 500W/1000W
Laser Configuration: Single/Twin/Quad

Materials:

Steel Alloys	Nickel Alloys	Aluminium Alloys	Titanium Alloys	Cobalt Crome
17-4PH	IN718	AlSi10Mg	Ti6Al4V	CoCr28Mo6
SS316L	IN625			
18Ni300				

Experience Intech Additive: Additive Manufacturing Redefined

- Veteran with 10+ years of Experience
- Complete Ecosystem with OEM Expertise
- Best-in-class design Software & Hardware for AM capabilities
- Fueling Innovation with Strategic Investments in R&D
- Seamless IoT & Software Integration
- Innovation driven Sustainable solutions
- Customer-centric Value-based Approach
- Unlocking Metal AM Efficiency Automation & HMI Expertise

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NITTE Meenakshi Institute of Technology

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INDIAN WOMEN IN 3D PRINTING

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RV College of Engineering

National Institute of Engineering, Mysore

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BMS College of Engineering

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