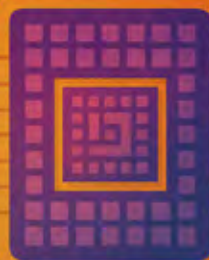


# Celebrating 10 Years of Additive Manufacturing Innovation



10 Years

WITH

**NAMIC**

NATIONAL ADDITIVE MANUFACTURING  
INNOVATION CLUSTER





# CERTIFYING

## the Future of Manufacturing in Maritime and Offshore

ABS provides certification and leading guidance for additive manufacturing (AM) in the maritime and offshore industries. Our services verify that 3D-printed components and processes meet rigorous ABS standards, covering design, materials, production, inspection and testing. By certifying AM facilities and parts, ABS helps industry leaders advance safety, achieve compliance and adopt innovative manufacturing methods with confidence.

Learn more by visiting [www.eagle.org](http://www.eagle.org)  
or contact our team at [additivemanufacturing@eagle.org](mailto:additivemanufacturing@eagle.org).

# Contents

04 Our Leaders'  
Voices

19 NAMIC Editorial  
Feature

49 Our AM Stewards  
Enterprise Feature

102 Acknowledgements

# 01

## Our Leaders' Voices

### Message from Prof Tan Chorh Chuan Chairman, A\*STAR

It is a great pleasure to contribute this foreword to mark the 10th anniversary of NAMIC. This milestone is a meaningful opportunity to reflect on NAMIC's journey and its impact in advancing Singapore's position as a hub for additive manufacturing excellence.

Over the past decade, NAMIC has been instrumental in shaping the growth of additive manufacturing in Singapore. By fostering collaborations across research institutes, start-ups, industry and government, NAMIC has helped translate innovative ideas into impactful applications. These

contributions have strengthened Singapore's supply chain resilience, advanced sustainable production, and delivered solutions in healthcare, aerospace and transport.

One notable example of strengthening supply was demonstrated during the COVID-19 pandemic. NAMIC led a task force that brought together government agencies, the National University of Singapore and industry partners to rapidly co-develop cost-effective 3D-printed nasal swabs, which were in short supply globally. This initiative created a reliable local supply at a critical time.

It highlights how science and collaboration can make a decisive impact in times of crisis, while also laying strong foundations for the future.

As we look beyond this first decade, we must encourage bold ideas and even higher levels of ambition, invest in new capabilities, and sustain the collaborative spirit that has defined NAMIC's journey. These will be essential for Singapore to remain at the forefront of additive manufacturing and continue making meaningful contributions both locally and globally.

On this 10th anniversary, I extend my warmest congratulations to NAMIC. I am confident that this publication will not only celebrate your many important achievements over the past decade but also inspire even greater innovation and impact in the years to come.



## Message from Mr Beh Kian Teik CEO, A\*STAR

It is my privilege to join in celebrating the 10th anniversary of the National Additive Manufacturing Innovation Cluster (NAMIC). As a national platform hosted by A\*STAR, NAMIC has accelerated the adoption of additive manufacturing (AM) technologies over the past decade. It has grown into a trusted bridge between science and industry, supporting enterprises with access to cutting-edge capabilities, nurturing new ventures, and driving the translation of research into impact. Its achievements reflect the strong alignment between A\*STAR's mission and Singapore's ambition to be a leader in innovation-driven growth.

At the heart of NAMIC's progress are its dedicated team and the network of eight hubs within Singapore's Institutes of Higher Learning who

continuously push boundaries. Their collective efforts demonstrate the spirit of innovation and resilience that defines Singapore's research and enterprise ecosystem.

**By harnessing science and technology, we can unlock new opportunities for growth, strengthen key industries, and create good jobs for the future.**

Emerging fields such as robotics, AI, and quantum are strategic pillars of our competitiveness, and their convergence with AM will help shape the next decade of industrial transformation. The merger of AI and AM is already evident in initiatives such as NAMIC's partnership with Mencast, a homegrown propeller designer and manufacturer in the maritime sector. By harnessing AI-driven design and AM, Mencast accelerated thousands of design iterations in days, delivered more efficient propellers in half the usual time, and reduced reliance on conventional supply chains. This achievement demonstrates how frontier technologies not only strengthen Singapore's industrial resilience but also open new opportunities for sustainable growth in traditional sectors.

Success stories like this reaffirm my conviction that NAMIC has played and will continue to play an important role in advancing our mission of translating science into impact. This anniversary is both a celebration of past achievements and a reminder of the possibilities ahead. Looking forward, I am confident that NAMIC will further strengthen Singapore's position as a global hub for innovation in AM, and that its next decade will bring even greater progress, sustainability, and shared success.



## Message from the Dr Lim Jui CEO, SG Innovate

NAMIC was conceived in late 2013. At that time, there had been a grant call issued by the NRF for a new concept to commercialise academic research called the "Innovation Clusters." Applicants were given a high degree of latitude in proposing what these might look like and how they might work. Within the context of a competitive grant call, institutions typically apply for these grants for themselves. Nobody applied for a grant with the express purpose of giving it to someone else, much less to an academic rival. Except NAMIC.

I was at NTU at that time, and I wanted something different, something that would draw on the relative strengths of our academic institutions to the benefit of all, and most importantly, to the benefit of Singapore. So, together with my colleague David Yeow, we came up with the idea of an innovation cluster that involved NTU, NUS and SUTD. The programme office would be administered under NTUitive, the technology transfer company of NTU, but funding would go to all three institutions in nearly equal proportions. NUS and SUTD didn't see it coming, but we expected only support from them. Why wouldn't they? It was "free money" – NTU writes the proposal, they get the money. The only question was whether

NTU itself was prepared to "share."

As expected, NUS and SUTD were only too happy to participate in the proposal. In the context of the times, this was a most unusual and compelling proposal, and we easily secured the award. And so it came to pass: let there be NAMIC!

After the euphoria of securing the grant subsided, we had to deal with the very real challenge of running it. Again, fortune favoured us. I met Chaw Sing at the buffet line of a conference. Chaw Sing was then the CTO of one of HP's operating units in Singapore. We hit it off, and before I knew it, I surprised myself by offering him the job of becoming the inaugural Executive Director of Singapore's first national platform in additive manufacturing. To my greater surprise, he actually accepted.

Under Chaw Sing's leadership, and supported by an incredible team, NAMIC went from strength to strength to become what it is today: an internationally respected partner in the advancement not just of additive manufacturing as a technology, but also of industry more generally, providing companies with an additional technology lever with which to make better products, more customised products, on demand, and with a significantly more sustainable supply chain. NAMIC's work has spawned start-ups, strengthened SMEs, and attracted foreign companies and

conferences to our shores, to great economic effect. While we started with three universities in 2013, today the cluster includes A\*STAR and our polytechnics, and corporate partners that number in the hundreds. NAMIC has also served as a talent force generator, with many of its former staff having moved on to important positions in the Singapore additive manufacturing ecosystem.

On this 10th anniversary of NAMIC, I want to thank and congratulate the NAMIC team for your resilience, hard work and many successes. I may be biased because of my founding role, but I feel confident that my sentiments are shared by most when I say that you have done all of us proud. Keep up the good work. Give Singapore that edge in competitiveness and resilience. Majulah NAMIC, Majulah Singapura!



**Majulah NAMIC, Majulah Singapura!**

## Message from Ms Cindy Koh Executive Vice President, EDB

They say a decade is ten years well spent if you've been doing it right. This year, we celebrate ten years of NAMIC doing it right in growing Singapore into a globally recognised additive manufacturing (AM) hub.

Launched in 2015 as a joint initiative by EDB, EnterpriseSG, NRF and NTUitive, and hosted within A\*STAR since 2022, NAMIC's initial role was to bridge the gap between cutting-edge AM research and industry needs to ensure the competitiveness of Singapore's key manufacturing industries. Today, that role has evolved significantly to include orchestrating Joint Industry Programmes (JIPs) for sectoral impact through a consortium model, supporting start-ups and SMEs through funding, mentoring and facilitating international market access, standards development in partnership with ASTM/ISO, and skillset accreditation through our

National AM Jobs-Skills Accreditation Framework (NAAF).

In a long chapter of achievements, there are three which, to me, exemplify NAMIC's impact. The first is the development of Singapore's own Wire Arc and Laser-Aided Directed Energy Deposition (DED) systems, which are being used by companies for critical large-format applications in the maritime, oil & gas and defence industries. The second was during COVID, when NAMIC worked closely with our hospitals, universities, regulatory bodies and local companies to develop a Singapore-designed 3D-printed nasopharyngeal swab for test kits. The short product development cycle enabled by AM meant that Singapore was able to rapidly double our testing capacity in less than two months, and this significantly bolstered our pandemic response efforts at a national level. Finally, the launch of the Digital Design Innovation Centre (DDIC) represents a significant milestone in industrialising AM in Singapore. The DDIC will support companies in part digitisation and design for additive manufacturing, and its partnership with local service bureaus will help overcome cost and knowledge barriers in AM adoption.

Notwithstanding these successes, in a world of constant technological change, shifting global order, and evolving customer expectations, NAMIC's efforts to enable and scale AM for a sustainable manufacturing sector in Singapore is an ongoing effort and will become even more important in such a dynamic future. I extend my heartiest congratulations to NAMIC on a decade of partnership and progress, and we look forward to the next decade of working with NAMIC to shape a more sustainable and resilient manufacturing future for Singapore.



## Message from Dr Ho Chaw Sing CEO of NAMIC, A\*STAR

Since our inception in 2015, NAMIC has progressed from an open university innovation cluster into an open technology accelerator platform catalysing the industrialisation and adoption of additive manufacturing in Singapore. This progress reflects Singapore's foresight and commitment to fostering transformative innovation, as well as rapid technological progress over the last decade. We have witnessed additive manufacturing shift from rapid prototyping and bespoke production to becoming a strategic enabler of "glocalisation" and innovation, reducing reliance on complex supply chains, and enabling more agile, resilient, and sustainable models in on-demand manufacturing.

NAMIC has been privileged to play a pivotal role in developing and growing Singapore's additive manufacturing ecosystem, driving adoption across sectors and catalysing private-public collaboration between industry, researchers, and public agencies. As I reflect on our journey, I am immensely grateful to all our partners, spanning diverse sectors in healthcare, aerospace, maritime, industrial, construction, semiconductors and more. Meaningful outcomes—such as the first deployed class-certified 3D-printed ship propellers on a vessel, 3D printing for drug compounding to enhance patient outcomes, and on-site 3D concrete printing for a private property development advancing sustainable urban solutions—would not have been possible without the strong collaborative effort from our many stakeholders across the ecosystem. Together, we have nurtured and scaled numerous applications and use cases that demonstrate the power of this technology in redefining manufacturing possibilities, while laying the groundwork for broader industrial transformation and innovation.

As we look to the future, NAMIC remains committed to deepening this impact by fostering meaningful partnerships and collaborations, building on key sectors that will lead to outsized economic and social impact.

**We remain steadfast in our mission to strengthen our industry and talent pool, as enterprises increasingly embrace additive manufacturing as a core pillar of business transformation for competitiveness.**

On this special occasion, I extend my heartfelt congratulations to the extended cluster team—past and present—our partners, and stakeholders who have been part of this remarkable journey with us. May the next chapter be one of even greater collaboration, innovation, and shared success!



Message from  
**Mr Cheong Chee Hoo**  
 Chief Executive Officer,  
 DSO National Laboratories



A heartfelt congratulations to NAMIC for an outstanding and influential decade as a national platform that has effectively driven AM innovation and adoption!

In the rapidly evolving field of additive manufacturing (AM), a decade is equivalent to a lifetime. When NAMIC commenced its operations a decade ago, AM adoption was in its infancy in Singapore. Ten years later, AM has become commonplace in the local industry, with NAMIC playing a pivotal role in accelerating its adoption. NAMIC has established a conducive test bed for product innovation and fostered application-centric research through partnerships between researchers and end-users, contributing to AM's widespread adoption.

Looking ahead to the next decade and beyond, digital technologies such as Artificial Intelligence (AI) will be integrated

with AM to drive the next wave of innovation. AI is already unlocking new, innovative designs that can be produced using AM. NAMIC acknowledges the potential of such technologies and has initiated efforts to integrate them with AM capabilities. These efforts include encouraging global digital technology start-ups to establish a presence in Singapore and conducting summits and industry engagement sessions to enhance the technical proficiency of our local workforce.

NAMIC has been instrumental in driving AM innovation and adoption, and I am confident that it will continue to play a key role in transforming Singapore into an AM hub that generates impactful outcomes.

of companies adopt 3D printing technologies. We have built a vibrant ecosystem that bridges research, industry, and global partners, placing Singapore firmly on the world's advanced manufacturing map.

NTUitive is proud to have been part of NAMIC's evolutionary journey to become a world-recognised leader in the additive manufacturing industry. NAMIC, through its thought leadership, has helped our researchers and spin-offs from Nanyang Technological University advance their innovations, connect with industry partners, and develop industry solutions that meet global challenges. NAMIC's extensive global network will continue to play

an integral part in bridging academic research with global markets.

3D printing is no longer confined to prototyping—it is redefining how mission-critical components will be made, where they are produced, and how quickly they reach the market. Through bold public-private partnerships, visionary R&D, and talent development, NAMIC will continue to drive Singapore's ascent up the manufacturing value chain—ensuring the nation remains a critical, future-ready node in global supply networks, and a birthplace for the world's most advanced products.

In just 10 years, NAMIC has grown from a bold vision into a national catalyst for additive manufacturing innovation—supporting over 170 industry projects, raising more than S\$40 million in public-private funding, and helping hundreds

Message from  
**Ms Ng Chai Pheng**  
 Director, Manufacturing,  
 Trade & Connectivity  
 National Research Foundation



Congratulations to the NAMIC team on reaching this significant 10-year milestone. This is an occasion not only to celebrate achievements, but, more importantly, to recognise the people who made them possible.

NAMIC's journey over the past decade has been driven by a dedicated team committed to advancing additive manufacturing in Singapore. The progress made—both in capability development and ecosystem building—is the result of their hard work and perseverance. The team—both present and past—has contributed with purpose to every initiative and milestone, shaping the journey through their dedication and impact.

Over the years, NAMIC has played an important role in shaping Singapore's additive manufacturing landscape. From fostering innovation to enabling adoption across sectors, NAMIC has maintained a forward-looking approach aligned with the nation's broader economic and strategic priorities.

As NAMIC looks ahead, the team is well positioned to respond with agility and purpose—advancing in step with developments in additive manufacturing and related technologies, while continuously refining its approaches to collaboration.

Wishing the NAMIC team continued success in the years to come.

Message from  
**Prof Reginald Tan**  
 ED (SERC), A\*STAR



Singapore's unique Research, Innovation and Enterprise ecosystem combines global talent, excellent test-bedding infrastructure and deep public-private partnerships. This creates a vibrant and dynamic environment which enables novel technology solutions to progress from concept to pilot and deployment at speed and at scale. NAMIC perfectly embodies this catalysing role by building capabilities in Singapore to support enterprises—especially start-ups and SMEs—along their journey of design, testing and adoption of additive manufacturing solutions for the growth and transformation of their businesses.

Message from  
**Ms Sidney Yee**  
 Venture Partner, iGlobe



A decade ago, the National Additive Manufacturing Innovation Cluster (NAMIC) embarked on a visionary journey to build a robust ecosystem for additive manufacturing (AM) in Singapore. Establishing an innovation cluster

is no small feat, requiring the development of infrastructure that empowers industries to achieve greater sustainability and efficiency. NAMIC's far-sighted leadership, backed by Singapore's bold commitment to innovation, laid the foundation for a transformative AM ecosystem that has flourished over the past ten years.

In an era defined by the rise of artificial intelligence and digitalisation, NAMIC has been instrumental in fostering AM infrastructure and value chain capabilities that are critical to scaling economic impact. Industries such as semiconductors, aerospace, and maritime have reaped the benefits of this vibrant ecosystem, positioning

Singapore as a global hub for innovation. Through a dynamic public-private partnership, NAMIC has orchestrated collaboration that drives progress, enabling champions of these industries to invest in a sustainable and efficient future.

As we celebrate NAMIC's 10-year anniversary, we congratulate all stakeholders for their unwavering dedication to this shared vision. Singapore's thriving AM ecosystem stands as a testament to what can be achieved when innovation, collaboration, and foresight converge. Here's to a decade of impact and to shaping an even brighter future for additive manufacturing in Singapore and beyond.

global supply chain disruptions. Over the past decade, NAMIC's work has been instrumental in building a robust, end-to-end Additive Manufacturing ecosystem in Singapore. By bringing together research institutes, industry players, and public sector partners, NAMIC has enabled the acceleration and translation of cutting-edge research and technologies into practical, market-ready solutions for commercialisation. This has significantly lowered barriers for enterprises to adopt new technologies—reducing both risk and cost—while fostering an environment conducive to technology test-bedding, co-innovation, and scaling.

Enterprise Singapore is pleased to partner with NAMIC to

support Singapore enterprises in building Additive Manufacturing capabilities for product and process innovation, thereby strengthening the resilience of Singapore's manufacturing sector. By leveraging Additive Manufacturing, enterprises can overcome the limitations of traditional manufacturing and offer complex, high-performance solutions. This allows them to develop differentiated products and processes that meet the demands of an increasingly complex marketplace and seize new growth opportunities. We look forward to continuous collaboration with NAMIC to further develop a stronger and more diverse pipeline of enterprises with unique capabilities across the value chain.

Message from  
**Mr Soh Leng Wan**  
 Assistant Managing Director,  
 Manufacturing,  
 Enterprise Singapore



Thank you NAMIC for the decade of efforts in working with Enterprise Singapore to support Singapore enterprises to build Additive Manufacturing capabilities.

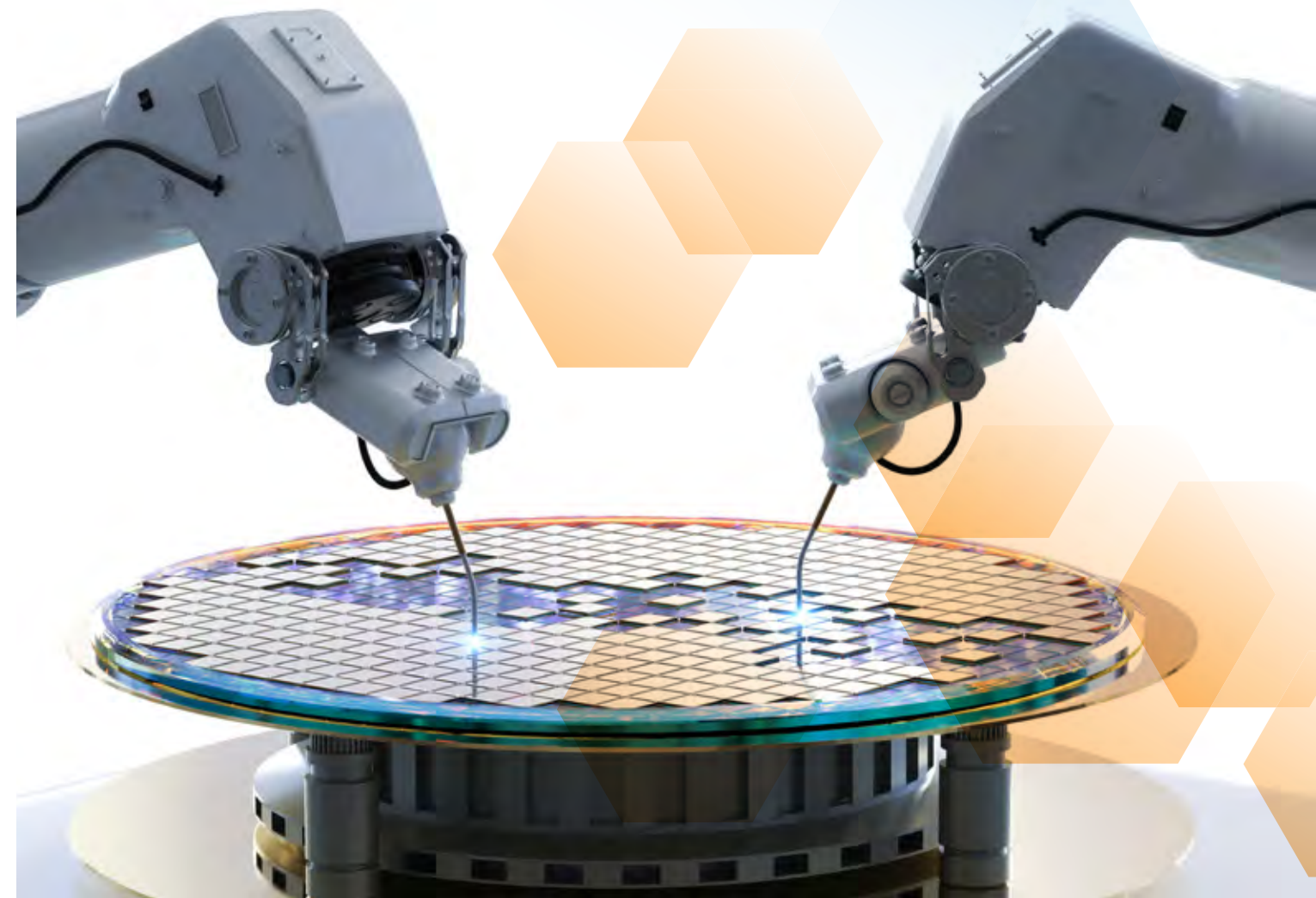
In an increasingly complex global environment, Additive Manufacturing offers opportunities for enterprises to innovate and respond swiftly to

Message from  
**Prof Yeo Yee Chia**  
 Deputy CE, I&E of A\*STAR



NAMIC has played a pivotal role in accelerating the adoption of additive manufacturing (AM) through partnerships, R&D investments, and industry test-bedding. NAMIC has built a very strong R&D base, accumulated highly valuable know-how, and translated research results into economic outcomes.

In the next decade, NAMIC and the AM R&D ecosystem here will seize bigger and more exciting opportunities ahead, innovate at an unprecedented pace, and create impact by capturing significant economic value for Singapore!



Message from  
**Mr Fong Saik Hay**  
Director, FSH Assoc



Congratulations to NAMIC on its 10th Anniversary! Having had the privilege of being involved over the last few years in the Project Evaluation Panel, I have observed NAMIC grow significantly beyond its primary function of promoting

the innovative use of additive manufacturing. It has evolved into what I would describe as a nexus of innovation, underpinned by additive enabling technology. This is because it serves as a confluence of AM practitioners from all Institutes of Higher Learning (IHLs), researchers of diverse disciplines, innovators, and industries. NAMIC is impacting every physical space and has built a healthy funding model that allows freedom of ideas alongside the rigour of R&D work.

I appreciate the collective professional judgement applied to project proposals, assessing whether they are technically feasible, innovative, and commercially viable. As a result, this approach has evolved the

human capital of the entire ecosystem, allowing ideas and concepts to be catalysed and supported. This culture will have a lasting impact.

Looking forward, with the express generation of ideas and possibilities brought about by AI, NAMIC will play a crucial role where possibilities need physical materials to be rapidly embodied and validated, facilitating a "fail fast, fail early" approach. The cadence of rapid idea generation must be matched by rapid embodiment for greater return on investment (ROI) in our Research and Development (R&D).

Congratulations again to the NAMIC Team and the exemplary leadership of Chaw Sing!

national accelerator to foster a collaborative, innovative additive manufacturing (AM) ecosystem in Singapore, and to develop an interconnected network of research performers and industry players to actively develop and translate new AM technologies for industry adoption.

Under the leadership of CEO Dr Ho Chaw Sing and his team, NAMIC established three additive manufacturing industry capability development hubs in partnership with the 3D Printing Centres at NTU, NUS, and SUTD. NAMIC also partners with Singapore EDB, Enterprise Singapore, and the Singapore Manufacturing Federation to focus on sectors where Singapore has competitive advantages, such as aerospace, marine and offshore, precision engineering, MedTech, clean tech, electronics, and building construction.

Today, NAMIC is the key enabler of Singapore's Manufacturing and Economic Vision 2030 and drives the adoption of hybrid additive manufacturing technology integrated with digital workflow and automation to support product innovation, high-mix low-volume manufacturing, reduced material waste, and supply chain simplification.

As the Co-Chairman of the NAMIC project evaluation panel, I have the opportunity to learn about many of the projects that are being initiated now but will realise their full impact only in the near future. I am therefore confident that the NAMIC of 2035 will continue to amaze experts with its innovative ideas, new inventions in AM, and the ingenuity of our researchers and business managers alike. All the best to NAMIC for another ten years.

Message from  
**Mr Joachim Ihrcke**  
Senior Advisor, Leistrizt SEA



Congratulations to NAMIC for its achievements over the last 10 years. Looking forward to a continuation of this stellar performance for another decade.

To truly appreciate NAMIC's progress over the last decade, one has to look back to the beginning. NAMIC was established as a

# WE ARE SINGAPORE'S LEADING PROVIDER OF 3D PRINTING SOLUTIONS.

## ABOUT US

**20 +**  
YEARS OF AM KNOWLEDGE &  
TECHNICAL EXPERTISE

**200 +**  
INSTALLED AM BASES

**150 +**  
CLIENTS INCLUDING LOCAL SMES  
& INTERNATIONAL MNCS

**500 +**  
COMPLETED AM PROJECTS

**2012**  
ESTABLISHED YEAR

## WHAT WE DO

**OUR PRODUCT RANGE**  
INDUSTRIAL POLYMER 3D PRINTERS  
INDUSTRIAL CERAMIC 3D PRINTERS  
ADVANCED 3D SOFTWARES  
DRY ELECTROPOLISHING SYSTEM

**OUR FULL SUITE SERVICES**  
POLYMER 3D PRINTING  
CERAMIC 3D PRINTING  
PROJECT CONSULTATION  
METAL SURFACE FINISHING

🔍 CREATZ3D SINGAPORE



scan QR code to  
visit our website

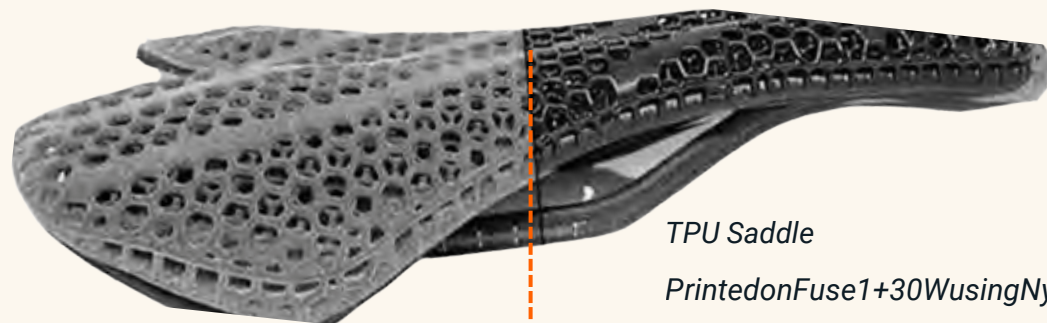
Redefining Innovation with  
Additive Manufacturing.

Drop us an email at [info@creatz3d.com](mailto:info@creatz3d.com)  
or connect with us at (65)66318555.

**CREATZ3D**

# Scalable Production with 3D Printed End-Use Parts

From high-performance materials to vapor smoothing,  
we power your end-use applications



TPU Saddle

Printed on Fuse 1+30W using Nylon 12

Post-Processed with PostPro

## Why Formlabs for End-Use Part Production?

- Industrial-Grade 45+ Materials
- Blazing Print Speeds
- Reliable Quality, 99.9% repeatability
- Start jobs remotely, with Automation



## Why Enhance Your Parts with PostPro

- Watertight sealing
- Injection-molded surface quality
- 2-hour automated cycles
- Perfect for customer-ready finishes



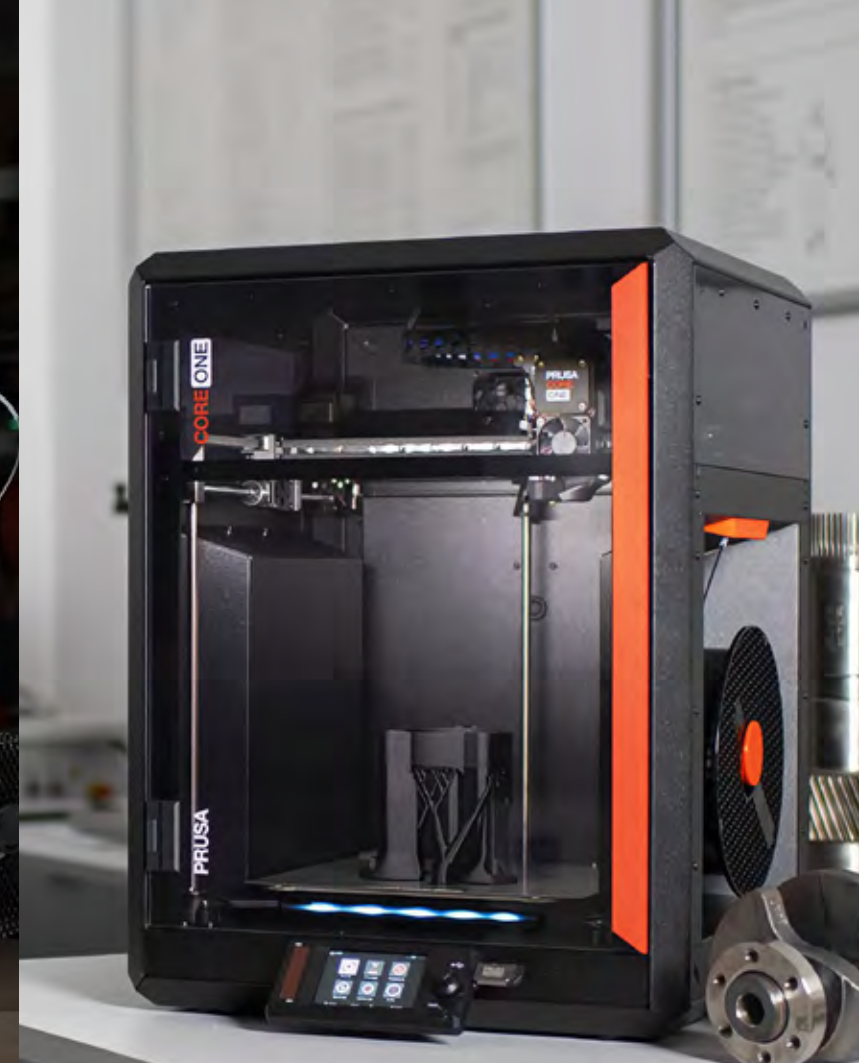
**Ready to Scale Your  
Manufacturing  
Workflow?**

+65 6743 2325

sales@eye2eye.com

www.eye2eye.com.sg

Book Free  
Consultation



**PRUSA  
RESEARCH**  
by JOSEF PRUSA



- ISO 9001:2015 (QMS)
- ISO 14001:2015 (EMS)
- ISO 45001:2018 (OH&S)
- Red Dot 2025 Award-Winning 3D Printers

- Sole authorized distributor
- Recommended repair center
- Full warranty & parts inventory
- Live in-person demo

**Transform Your Manufacturing with Prusa. Contact REIFY 3D Today**

[www.reify3d.com](http://www.reify3d.com) [info@reify3d.com](mailto:info@reify3d.com) +65 9682 7677



# INNOVATIVE 3D PRINTING

TOGETHER, WE ACHIEVE ENERGY'S POTENTIAL



## FDM TECHNOLOGY

High quality printing by Markforged Printers  
with proprietary plastic & metal filaments

## TAILORED SOLUTIONS

Customised designs by dedicated Technical  
Team for your unique needs

contact us  
[www.omsos.com](http://www.omsos.com)



AM Journeys – A decade of Innovation,  
Technological Advancement and  
Entrepreneurship

# 02

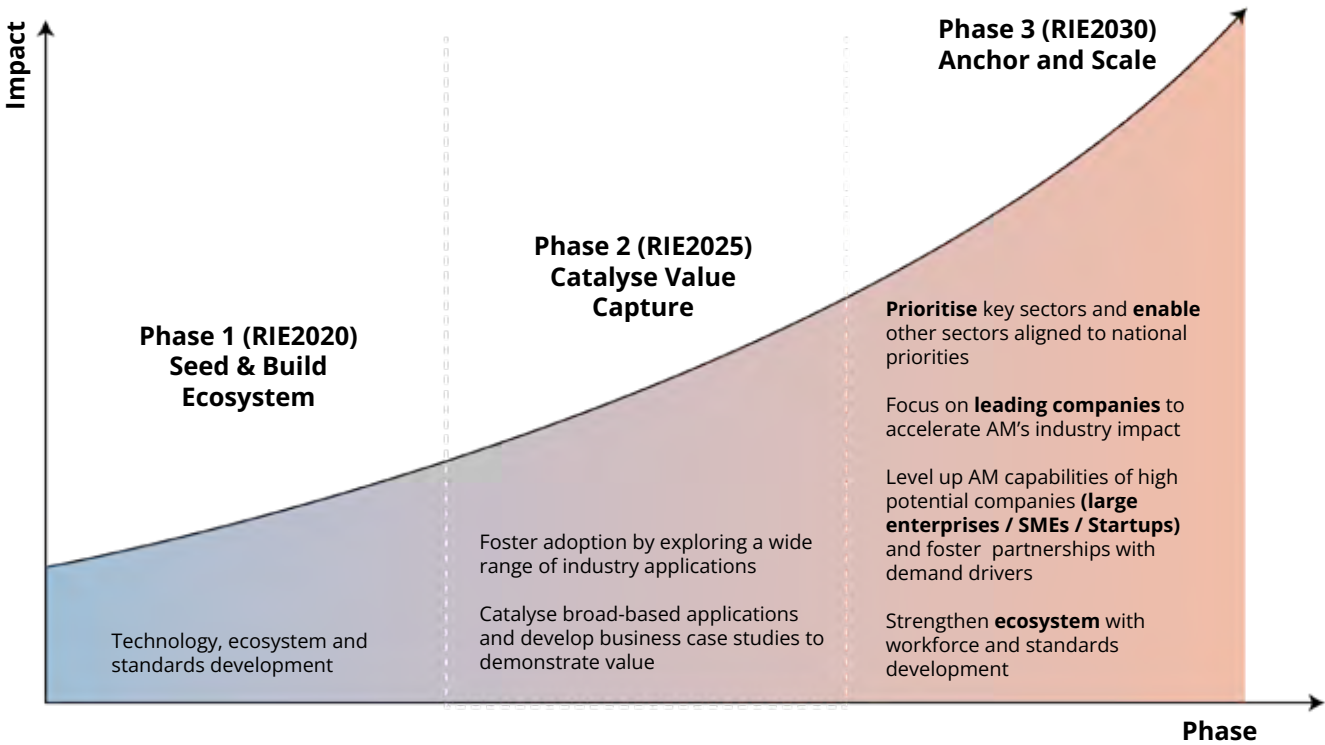
## NAMIC EDITORIAL FEATURE



National Additive Manufacturing Innovation Cluster (NAMIC) is Singapore's national platform for **accelerating the adoption of additive manufacturing (AM) technologies**. It connects research excellence with industry needs, turning advanced manufacturing innovations into real-world solutions that drive economic growth and competitiveness.

**Established in October 2015**, NAMIC played an important role in removing barriers for AM industry adoption, fostering strategic collaboration, and driving technological innovation across sectors. Led by its Cluster Lead Party (CLP) first hosted at NTUitive, the Innovation and Enterprise arm of Nanyang Technological University (NTU), NAMIC managed funding, coordinated translation activities, and worked closely with agencies such as the Singapore Economic Development Board (EDB) and Enterprise Singapore to strengthen global outreach and partnerships. In April 2022, NAMIC moved under the A\*STAR leadership to enhance strategic co-ordination and consolidate national-level efforts in additive manufacturing (AM). The

cluster first began with three founding specialised R&D translation hubs at National University of Singapore (NUS), Nanyang Technological University (NTU) and Singapore University of Technology and Design (SUTD), focusing on technology development, intellectual property generation, licensing, spin-off creation, and industry adoption. Under the leadership of Dr Ho Chaw Sing, appointed as Managing Director, NAMIC has since grown to eight hubs in 2022, incorporating Singapore Institute of Technology (SIT), three polytechnics (Temasek, Nanyang, and Singapore Polytechnic), and the SIMTech Additive Innovation Centre (AIC), further strengthening Singapore's position as a global leader in AM excellence.



# NAMIC's Decade of Transformation from RIE2020 to RIE2030

Guided by the national Research, Innovation, and Enterprise (RIE) plans, NAMIC has navigated a phased approach, systematically building a world-class ecosystem.

## PHASE 1 (RIE2020): SEEDING AND BUILDING THE ECOSYSTEM

Under RIE2020, NAMIC's primary mission was to seed and build the foundational pillars of an AM ecosystem where none existed at scale. The focus was on establishing the essential infrastructure and capabilities needed for future growth.

This involved funding translational research to bridge the gap between public sector R&D and industry needs, attracting the business presence of global AM leaders to Singapore, and catalysing early technology demonstrators to showcase what was possible. This foundational work in technology, ecosystem building, and standards development was critical in paving the way for the industry applications that would follow.

## PHASE 2 (RIE2025): CATALYSING VALUE CAPTURE

With the foundational elements in place, the strategy pivoted under RIE2025. The focus shifted from building potential to proving value. The key objective of Phase 2 was to catalyse value capture by driving the adoption of AM across a broader range of industries.

This was an era of exploration and validation, where NAMIC orchestrated public-private partnerships to fund application development and build tangible business cases. By fostering adoption across diverse sectors and developing a robust value chain of local competencies, we demonstrated the real-world benefits of AM—from enhanced design freedom to more agile production. This phase was crucial for building industry confidence and showcasing a clear return on investment, moving

AM from a novel technology to a viable industrial solution.

## PHASE 3 (RIE2030): ANCHORING AND SCALING FOR NATIONAL IMPACT

As we enter the RIE2030 timeframe, NAMIC is making its most strategic leap yet. The mission has evolved from broad-based catalysis to a highly targeted approach designed to anchor and scale for maximum national impact. Having proven the value of AM, we are now concentrating our resources on sectors and companies where we can achieve needle-moving outcomes.

The Phase 3 strategy is defined by a clear set of priorities:

**Prioritise Key Sectors:** We will focus our efforts on industries critical to Singapore's economy and resilience.

**Focus on Leading Companies:** We will partner with industry leaders to accelerate AM's industrial impact, driving sector-level R&D and deploying innovative, sustainable manufacturing solutions.

**Level Up High-Potential Enterprises:** We will systematically nurture our local SMEs and start-ups, building the next generation of industry champions.

**Forge Global Partnerships:** We will strengthen our ecosystem and reinforce Singapore's position as a global trusted node for digital manufacturing and deep tech innovation.

This represents the maturation of our national strategy—a deliberate shift from proving the technology to deploying it for strategic advantage, ensuring that Singapore captures a definitive leadership role in the future of global manufacturing.

## A Thriving AM R&D Ecosystem @ Our Hubs

NAMIC's **eight specialised hubs** form the core of Singapore's AM R&D ecosystem, **each contributing unique expertise** and driving innovation across diverse sectors. These hubs are critical partners in shaping the AM landscape and generating economic outcomes with industry collaborators.



The NUS Centre for Additive Manufacturing (AM. NUS) has developed and applied 3D printing technologies to drive product innovation, particularly in biomedical and healthcare fields that improve patient outcomes and transform lives. It is Singapore's only multidisciplinary AM hub spanning four faculties — Medicine, Engineering & Design, Science and Dentistry — leveraging strong academic-healthcare integration to translate technology, spark industry solutions and launch spin-offs such as Craft Health and Kosmode Health.



The Singapore Centre for 3D Printing (SC3DP) at NTU spearheads advanced research in AM, positioning Singapore as a global leader in innovation. Its strategic focus spans design, process digitisation, materials development, AI-driven automation and sustainability. SC3DP's multidisciplinary approach supports diverse sectors — including aerospace, maritime, construction, healthcare, defence, energy and electronics — driving cross-industry transformation. By fostering strong academia — industry partnerships, SC3DP drives innovation, delivers high-impact solutions and nurtures future-ready talent.



Combining expertise in robotics, materials, processes, equipment and design, SUTD Digital Manufacturing and Design (DManD) Centre drives product innovation and rapid prototyping. Its proprietary Wire-Arc Additive Manufacturing system (WAAM) is already reshaping industry applications, highlighted by its collaboration with Mencast Marine to modernise ship propeller production for higher efficiency and sustainability.



NAMIC Hub@SIT drives AM by combining deep technical expertise with SIT's applied learning approach. Focusing on land transport, marine & offshore, and defence & space, the SIT hub leverages strengths in DfAM, advanced hybrid metal and high-performance polymer printing. This robust synergy, underpinned by strong industry partnerships, facilitates the development and deployment of tailored, real-world solutions. Beyond technological innovation, NAMIC Hub@SIT serves as a talent incubation centre and builds sustainable capabilities to propel Singapore's industrial transformation.



From concept to pilot production, the AIC at A\*STAR leverages whole-of-A\*STAR expertise, state-of-the-art facilities and applied workforce training to empower businesses to implement end-to-end AM solutions. Through strategic public-private partnerships and strong local and global collaborations, AIC drives co-creation, accelerates technology adoption and strengthens Singapore's position as a trusted hub for additive manufacturing innovation across key sectors including semiconductor, aerospace, space, maritime, energy and biomedical.



SP's Innovation Centre for Additive Manufacturing (ICAM) provides end-to-end AM solutions with commercial impact for the maritime, built environment and precision engineering sectors. Its in-house gas atomisation plant produces customised metal powders to support high-value innovations, including the Maritime & Port Authority's Joint Industry Programme, which has delivered a Class-approved ship component. ICAM also bridges the talent gap by developing a skilled AM workforce.



NYP's Additive Manufacturing Innovation Centre (AMIC) provides comprehensive services in product design, design for AM, AM process optimisation and applied R&D — delivering integrated turn-key solutions. Its state-of-the-art facilities encompass Polymer (EASA certified), Composite, Metal (EASA & ABS certified), Copper 3D printing and Electropolishing. AMIC also offers manpower training in Specialist Diploma, SkillsFuture and customised short courses in Additive Manufacturing.



TP's Digital Fabrication & Additive Manufacturing Centre (DFAMC) excels in applied research and engineering innovation. By advancing product design improvement and process optimisation, it has delivered breakthroughs ranging from 3D printed in-ear monitors that enhance both fit and audio quality to titanium corneal prostheses developed with SERI to treat severe corneal blindness, demonstrating additive manufacturing's transformative impact across diverse industries.



## Key Milestones and Collaborations

### 2015

**Oct '15** – Launch of NAMIC led by NTU through NTUitive, in partnership with NUS and SUTD



### 2016

**May '16** – NUS develops 3D-printed customised tablets that release drugs at different rates



**Aug '16** – Gilmour Space Technologies successfully launched a self-made rocket in Australia using 3D printed fuel, developed together with SUTD



### 2017

**Launch of quarterly NAMIC AM Summits**



**Mar '17** – US-based Emerson launches new AM centre in Singapore, second worldwide development hub with AM capabilities



**Jul '17** – NUS opens \$18m centre for 3D printing, AM.NUS, funded by NAMIC and EDB, to explore 3D printing in the biomedical and healthcare fields



**Nov '17** – MOU signing between SAF HQ MES and NAMIC to spearhead 3D printing for military applications



### 2018

**Apr '18** – NAMIC partnered with MPA in a PPP to launch JIP Phase 1, which delivered Singapore's first maritime AM market feasibility study for the maritime and energy sectors



**Oct '18** – NAMIC Joins ASTM International's Global Additive Manufacturing Center of Excellence as Strategic Partner



**Oct '18** – NAMIC's inaugural **Global AM Summit 2018** in conjunction with ITAP



### 2019

**NAMIC and SUTD started a journey with Mencast Marine to transform traditional propeller production with 3D printing**



**May '19** – NAMIC's inaugural Startup Innovation Forum (SIF) and Singapore AM Week



**Oct '19** – NAMIC launched the inaugural AM Business Network Directory



### 2020

**Aug '20 – COVID-19 Initiative – 3D Printed Nasopharyngeal Swabs** - NAMIC, in partnership with Structo, Eye-2-Eye, Forefront Medical, and NUS, with support from Temasek and EDB, led an initiative that progressed from design to clinical trials approval in three months. This resulted in the production of 3 million swabs using a monolithic design and SLA 3D printing. The design was licensed to companies in the US, India, and Indonesia



**Nov '20** – MPA-NAMIC-SSA JIP Phase 3 – 6 AM projects awarded



### 2021

**Jan '21** – Launch of NAMIC's AM Careers @SG e-jobs portal



**Jul '21 – AM facility at PSA Pasir Panjang Terminal for WAAM Twistlock Pin** following successful outcome from JIP between MPA, ESG, PSA, 3D Metalforge, NAMIC and SUTD



**Dec '21 – Development of a lighter and more robust knee brace, X-Brace for the elderly**, created through collaboration between a local engineering firm (Delsson), surgeons from Centre for Orthopaedics, and NTU 3D printing specialist, with support from NAMIC



### 2022

**Apr' 22 – NAMIC 2.0:** NAMIC came under A\*STAR's leadership to consolidate SG's national efforts in AM. Expansion to 8 Hubs including SIT, NYP A\*STAR, SP, TP



### 2023

**Feb'23** – NAMIC's inaugural Innovation & Enterprise Fellowship Programme (IFP) was established to equip technical professionals with hands-on experience in AM spanning technical, operational, and commercialisation aspects

**Feb '23 - Launch of Entegris' Singapore Digital Manufacturing Technology Centre (SDMTC)**



**Jul '23** – Creat3D's ceramic components in Aliena's innovative MUSIC plasma propulsion system for STRIDER mission



### 2024

**2024** – Using SUTD hybrid WAAM system, Mencast successfully printed Singapore's first 3D printed ship propeller and completed a sea trial



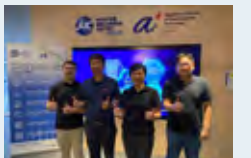
**Jun '24** - MPA-NAMIC launched JIP Phase 3 to accelerate AM marine parts adoption and build resilient supply chains through DfAM, digital inventory, and rapid qualification & certification



**Oct'24 – NAMIC setup Digital Design Innovation Centre (DDIC)** at Jurong Innovation District Park (JID), DDIC's role is to co-develop digital design inventories and support enterprises in AM adoption



**Nov '24** - Strategic collaboration with ELH Tech, Additive Innovation Centre (AIC) @ A\*STAR, hosted at the Singapore Institute of Manufacturing Technology (SIMTech) to accelerate the adoption of advanced metal and polymer AM technologies



### 2025

**Mar' 25** – Launch of Aerospace Standards SS708 at Inter Airport South East Asia 2025



**Aug '25** – NAMIC witnessed Singapore's 1st on-site 3D concrete printing for structural applications spearheaded by Woh Hup, with technical expertise from NUS



**Oct'25 – NAMIC celebrates 10th Anniversary!**



# Pillars of Public-Private Partnerships

NAMIC's strategic framework for advancing AM in Singapore is built upon a robust model of public-private partnerships, supported by four core pillars: **Talent Development, Start-up Development, Ecosystem Development and Industry Development.** These pillars are instrumental in accelerating the translation of AM technology from research institutions to commercial enterprises, fostering innovation and strengthening Singapore's position as a global AM hub.



## Nurturing Singapore's Deep-Tech Startup Ecosystem

Since its inception in 2015, NAMIC has been more than a technology enabler; it has been a catalyst for cultivating Singapore's deep-tech start-up landscape. Recognising that emerging technologies like AM thrive when paired with entrepreneurial drive, NAMIC has actively nurtured a pipeline of innovative ventures capable of tackling global manufacturing challenges.

Over the past decade, NAMIC has supported more than 130 start-ups spanning sectors from MedTech and space to sustainability and AI, connecting them to global value chains and multinational corporations. Flagship events such as the **Start-up Innovation Forum and the Global Additive Manufacturing Summit** have brought together innovators, venture capitalists and corporate partners to spark collaborations and accelerate go-to-market timelines.

As NAMIC looks ahead to the next decade, it will continue to play a pivotal role in building a thriving, sustainable deep-tech ecosystem, one where breakthrough ideas become impactful solutions for Singapore and the world.



>\$457M  
Investments for startups

> 255  
Startups Supported



## Ecosystem Development



NAMIC fosters a collaborative ecosystem that connects industry leaders, researchers and government agencies to accelerate the adoption of additive manufacturing technologies. Through strategic partnerships with esteemed local

## Industry Development

NAMIC acts as an interlocutor for AM between industry, government agencies and research performers to lower industry adoption barriers, foster collaboration and drive innovation in AM technologies through:

### 1. Application Development and Demand Generation

Catalysing AM adoption by evaluating market drivers, building and orchestrating the entire value chain and fostering the development of sector-specific applications.

### 2. Productisation Services to Transform Research into Products

Pulling through research outcomes into tangible technology solutions, ensuring that innovations are not only groundbreaking but also commercially viable for industry deployment.

### 3. Market Access Facilitation for AM Companies

Forging strategic and sustained public-private partnerships to bridge the gap between the public and private sectors, accelerate commercialisation and open new market opportunities for AM enterprises.

and global organisations, including ASTM International, we create pathways to emerging markets, innovative applications and advanced capabilities. Our flagship programmes, **the Global AM Summit and Start-up Innovation Forum**, serve as key convening points for thought leaders and innovators to exchange insights, showcase breakthroughs and forge partnerships that transcend borders and sectors. More than a series of initiatives, this ecosystem is a vibrant community where expertise converges, ideas are nurtured and transformative solutions take shape, driving progress, competitiveness and sustainable growth across industries.



> 440  
Projects Supported

>1600  
AM Experts Trained

> 190  
Companies adopted AM

## Digital Platforms and E-Portal



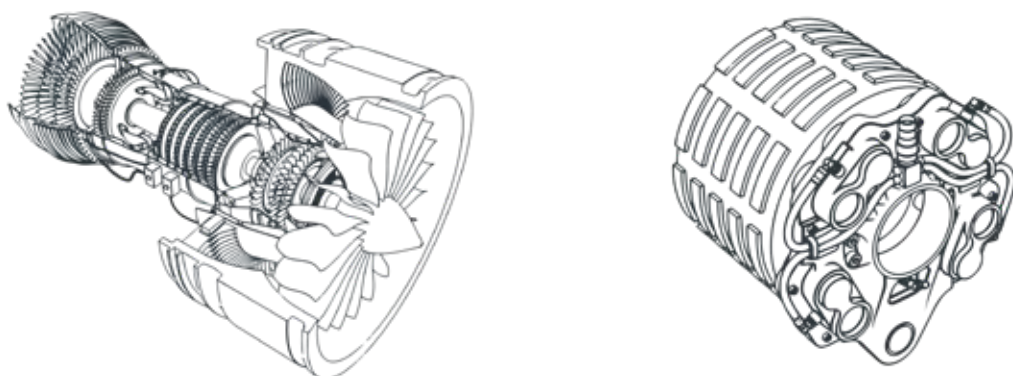
### Digital Design & Innovation Centre (DDIC)



Digital Design Innovation Centre (DDIC) is a NAMIC initiative launched in October 2024 with two key focus areas: converting physical spare parts into digital inventories, and creating AM part designs that meet performance and cost targets. The first focus **addresses common industry challenges** such as costly physical spares, long lead times, and unsupported legacy parts. A digital inventory converts physical items into secure, production-ready digital files for on-demand manufacturing near the point of use. This can reduce obsolescence exposure and strengthen supply-chain resilience.

The second focus **supports SMEs in moving toward higher-value applications through AM**. Although AM can enable novel, high-performance designs, the engineering knowledge required to realise these benefits is not yet widespread.

To deliver on these focus areas, DDIC provides engineering design and consulting services that may be partially funded through NAMIC Proof-of-Concept (POC) grants. Through DDIC, SMEs gain access to design and engineering expertise across AM processes. DDIC works with customers and service bureaus to ensure designs meet performance, cost, and manufacturability requirements, and draws on resources across NAMIC's hubs to assemble comprehensive capabilities aligned to each problem statement.



## A dedicated on-demand video and virtual events platform — NAMIC.TV and NAMIC YouTube channel

Launched in 2022, **NAMIC.TV** is our dedicated video and virtual event platform, bringing the global AM community closer to Singapore. It complements NAMIC's mission to accelerate AM adoption and strengthen the local innovation ecosystem by offering a dynamic space for thought leadership, knowledge sharing and industry engagement. Working alongside NAMIC's other media channels, including the NAMIC YouTube channel, NAMIC.TV quickly became the go-to destination for **virtual events, exclusive interviews and curated content from global AM pioneers**. Viewers can conveniently tune in live or revisit recordings of past webinars and flagship events.

### Hosting Flagship Events

- NAMIC's Global AM Summit
- NAMIC's Start-up Innovation Forum
- NAMIC-ITAP Pavilion series showcases
- NAMIC's Virtual Summit
- Singapore AM Week highlights



### Forums

on the latest trends in AM technologies

#### Talent and Career Development

In 2021, NAMIC organised a forum, AM Careers@SG: Info-Sharing Session, which introduced NAMIC's job portal ([jobs.namic.sg](https://jobs.namic.sg)) and addressed the talent shortage in 3D printing.

#### Outstanding Ladies in Singapore Additive Manufacturing Start-up Space



NAMIC.TV offers more than event streaming. It is a cornerstone of NAMIC’s digital resources, capturing the pulse of the industry through technology showcases and sustainability forums, and empowering our community to stay informed, inspired and connected.

Media Coverage

On significant industry news and partnerships

CNA news coverage on the MPA-NAMIC-SSA Joint Industry Programme, which allocated \$1.6 million for projects in digitalisation and 3D printing within the maritime industry. This highlights government support for innovation in the sector.



Exhibitions & Challenges

Promoting sustainability

2024: Scarce City exhibition, focused on the intricate relationships between technology, art and economic impacts from societies

2023: 1-KG Challenge exhibition, focused on sustainable design models



Outreach

Creating AM awareness and educating the community through seminars

- The Future of AM with SG Innovate
- Healthcare 3D Printing Forum with 3D Heals
- Expert Insights: Innovating for the Built Environment with Construction 3D Printing
- Expert Insights: Staying Ahead of the Curve with AM for the Transport Industry



Connecting AM enterprises through:  
AM Business Network Directory

Inaugurated in 2019, the AM Business Network Directory was **Asia Pacific’s first comprehensive resource dedicated to AM**. This initiative harnesses NAMIC’s events, partners and digital platforms to connect a global audience with trusted AM products and services. Its goal is to **boost partner visibility, strengthen their presence in the APAC ecosystem and raise their profile across the global value chain**. From the start, the directory has covered enterprises across the AM value chain including service bureaus, machine manufacturers, software providers, distributors, materials suppliers and certification bodies.

Its scope has since expanded to medical device makers, adopters, post-processing specialists and training and consultancy providers. To encourage collaboration, it now also profiles enterprises from across Asia Pacific, including China, Malaysia and Thailand. The online platform is known for its intuitive interface, mobile responsiveness and accessibility. With readership exceeding 10,000 and strong exposure through international tradeshows, e-newsletters and social media, it consistently ranks among the top ten most visited pages on NAMIC’s website, highlighting its role in driving traffic and referrals. Today, the directory anchors Singapore’s AM ecosystem by connecting start-ups, service bureaus, standards bodies and TIC service providers, while strengthening the region’s engineering centres.



>200  
Enterprises profiled

>10,000  
readership

# Talent Development

NAMIC recognises that a skilled workforce is foundational to the growth of the AM sector. Its initiatives in talent development aim to equip professionals with the necessary technical, operational and commercialisation expertise in AM. Hence, NAMIC has introduced targeted programmes and platforms to nurture talent, bridge skills gaps and connect professionals to opportunities.

## Innovation & Enterprise Fellowship Programme (IFP)

Launched in April 2023, the IFP is a flagship programme that trains technical professionals through comprehensive exposure to the full AM value chain, from technical proficiency and operational execution to commercialisation strategies. With its structured timeline and focus on hands-on experience, the IFP aims to cultivate a new generation of AM specialists.

## AM Careers@SG e-Jobs Portal

Launched in January 2021, this dedicated portal connects talent with opportunities in the AM sector. It serves as a key platform for facilitating industry employment, tracking metrics such as job creation, identifying in-demand skillsets and highlighting emerging job trends.

>1300  
AM jobs created



Developing talent is only the first step, and what truly matters is equipping professionals with the right skills. In AM, these skillsets are distinct, combining technical expertise, business insight and essential soft skills. The following highlights the core capabilities that define a future-ready AM workforce.



## Talent development through: AM Careers@SG e-Jobs portal

The AM Careers@SG e-Jobs portal is **Asia Pacific's first AM career platform, launched in January 2021**, created to connect, engage and nurture talent while addressing challenges in workforce development and skills training. The portal has already **enabled successful placements**, demonstrating its effectiveness. At its core, AM Careers@SG reflects the spirit of innovation embodied by professionals like Lim Wen Yong and Jethro Koh, whose career journeys in AM go beyond jobs to push the boundaries of design, materials and rapid prototyping. Their stories mirror the exciting opportunities this platform continues to unlock for the future of manufacturing.



### Lim Wen Yong's AM Journey in MedTech Innovation

For Lim Wen Yong, AM is more than a career. It is a **pursuit of innovation** and **a belief in the design freedom** the technology enables. With a diploma in biomedical engineering followed by a degree in mechanical engineering, his path into biomedical device design was a natural progression.

The AM Careers@SG e-Jobs portal under NAMIC became an important avenue for Wen Yong to discover opportunities in the field. Through it, he joined SLM Solutions Singapore, a global leader in metal AM, where he worked on **supportless 3D printing and optimised build strategies** for high-quality parts. The role sharpened his technical expertise and problem-solving skills.

Seeking a new challenge, Wen Yong ventured into the start-up space with Castomize, a MedTech company that also advertised its opening on the AM Careers@SG portal. As a Design Engineer, he now **develops 4D-printed orthopaedic hand casts**, refining prototypes through patient feedback to improve comfort and usability.



### Jethro Koh's AM Journey in Pushing Technological Boundaries

Jethro Koh's AM journey has been **challenging yet extremely rewarding**. His first encounter with AM came during a university internship at Singapore's leading service bureau, 3D Metalforge. Watching parts take shape layer by layer fascinated him and sparked a lasting curiosity about the technology's potential. He later **built on his AM experience through hands-on** work with stereolithography (SLA), fused deposition modelling (FDM) and powder bed fusion (PBF) printers at the university, where his CAD designs came to life and reinforced his passion for AM.

After graduation, Jethro began his career as a design engineer at SMS-SME, a Korea-based global enterprise in ship parts maintenance. While the role was not directly tied to AM, it strengthened his engineering and design skills, laying a strong foundation. **His passion for AM** eventually led him to the NAMIC e-Jobs portal, where he secured a role

with SLM Solutions as a service engineer. Rising to team lead, he **honed his technical expertise** while witnessing first-hand how AM addresses real-world challenges.

Eager to expand his horizons, Jethro recently joined the NAMIC IFP programme to **explore deep-tech areas** such as automation. His journey shows how early curiosity, supported by the right opportunities, can grow into a career dedicated to innovation within Singapore's AM ecosystem.



The **AM Careers@SG portal** has enabled Wen Yong and Jethro at key moments in their AM journeys, **connecting talent with industry needs** while **strengthening Singapore's AM ecosystem**. Ready to shape your **own future in AM**?

Scan the QR code now to begin your journey today.



## Scaling Talent, Shaping the AM Industry

The National Additive Manufacturing Innovation Cluster (NAMIC) is pleased to announce a milestone in its Innovation and Enterprise Fellowship Programme (IFP), with 10 fellows graduating and another 10 continuing their journey. The 12–15 month programme combines **advanced additive manufacturing (AM) training with industry exposure**, while also instilling entrepreneurial skills and an innovation-driven mindset to **nurture talents to shape the future of Singapore’s AM ecosystem**.

The achievements of the graduates and the ongoing progress of current fellows highlight the IFP’s role in building a strong pipeline of talent. By fostering collaboration between industry leaders and aspiring innovators, the programme continues to strengthen Singapore’s AM sector. NAMIC takes this opportunity to **congratulate the graduated fellows** on their achievements, **extend its best wishes to the current fellows** as they continue their journey, and **express heartfelt gratitude to our industry partners** for their steadfast support in advancing this national initiative.

### Perspective From Industry Partners:

“IFP has been an **effective programme** for companies to assess, groom and develop potential candidates for key roles within the company. Coupled with the **exposure to various AM-related courses and certifications** that the fellows embark on prior to the secondment, this makes the fellows relevant and capable right from the start of the secondment. Furthermore, the strong monetary support also provided a means for the programme to attract strong candidates who are genuinely interested in seeking an AM-related career. Lastly, it provided the company with a relatively risk-free way to evaluate the necessity of an in-house AM-specific role versus outsourcing such a role to an external agency. Overall, the IFP is a crucial component in **building a vibrant AM ecosystem** and we look forward to further collaboration with the IFP.”

— Dr Lim Seng Han, Co-founder and Chief Technology Officer, Craft Health



“AM is a technology well used in Pelagus 3D due to its ability to produce industrial parts quickly and in high quality. NAMIC’s programme in **match-making high-calibre candidates** through the IFP provides the **much-needed support for companies to adopt and exploit the solution**. Ezekiel, whom we have now onboarded full-time, was instrumental in enabling our in-house A.I. part assessment tool that helps to scope the opportunity space for AM in our customer’s spare parts portfolio. He now leads in implementing our platform solution with users and explores new capability tools for our business. As a beneficiary of the programme, I am very glad to have participated and thank NAMIC for **enabling AM businesses** through such a valuable initiative.”

— Mr Daniel Tan, Chief Technology Officer, Pelagus 3D



(Top Left – Right):  
Lucas Tay, Fermi Toh  
Zheng Jie, Jack Ng, Liu  
Xiao Rui, Shong Yee Kiat,  
Ramon Joshua, Zhuo Jia

(Middle Left - Right):  
Ezekiel Hoe Jia Hao,  
Nathanael Choo,  
Yong Ling Xin,  
Vasanthan Katherayson

(Bottom Left – Right):  
Jethro Koh, Effy Ong,  
Kyle Finnigan,  
Wong Wei Heng,  
Noor Muhammad Noor  
Khalid, Joshua Leong,  
Desmond Tan

Missing photos of  
Brabakaran and  
Lorraine Ong

### Hear from the IFP graduates:

#### Empowering Customisation with Additive Manufacturing

“The IFP has been an invaluable opportunity to explore and participate in Singapore’s AM ecosystem. I look forward to continuing to explore new ideas—made possible with AM—with the creative freedom and supportive collaboration in Singapore.”

— Kyle Finnigan

#### Bioprinting: The Future of Tissue Engineering

“The IFP has been a transformative journey, enabling me to bridge my background in biotechnology with the cutting-edge field of AM. I aim to support the commercialisation and success of bioprinting for tissue engineering, a critical development for the biomedical industry.”

— Liu Xiao Rui

#### Saving Lives with 3D-Printed Implants

“The IFP exposed me to various AM-related workshops, seminars and key industry players within both the global and national ecosystem. I believe that AM will shape the future of manufacturing in Singapore.”

— Vasanthan Katherayson

### Our industry partners:





### Commercialisation Through Standards Development

A central pillar of NAMIC's mission has been to enable Singaporean innovations to be commercialised and compete globally. One of the keys to achieving this is building on the Singapore brand of quality, trust and safety. NAMIC has spearheaded the development of local and international AM industry standards and laid foundations through the **AM Centre of Excellence partnership with ASTM since October 2018.**

Through the **four ASTM standards and five**

**Singapore Standards / Technical References** published to date, the needs of critical sectors and new AM processes have been addressed. One example is the Singapore Standard SS 708, which was launched in March 2025 to facilitate the manufacturing qualification of polymer filament-printed parts supplied to aerospace MRO companies. These efforts have been instrumental in strengthening Singapore's position and leadership as an innovation-driven, advanced manufacturing hub.



## ASTM ADDITIVE MANUFACTURING CENTER OF EXCELLENCE



ADDITIVE  
MANUFACTURING  
CENTER OF  
EXCELLENCE

### Your Partner in Additive Manufacturing Success

The ASTM Additive Manufacturing Center of Excellence (ASTM AM CoE) is a leading global initiative dedicated to advancing the field of additive manufacturing (AM). Established by ASTM International, ASTM AM CoE brings together industry leaders, researchers, and innovators to drive the development of comprehensive standards, foster innovation, and promote best practices in AM through training, certification and advisory services.

### CORE PILLARS



R&D



EDUCATION & TRAINING



STANDARDS & CERTIFICATION



CONSORTIUM



ADVISORY, MARKET INTELLIGENCE

### TRAINING

- Professional Certificate Courses
- Short Courses
- Role-based Courses
- E-Learning

### CERTIFICATION

- AM Quality Certification (AMQC)
- AM Facility Safety Certification (AMFSC)
- AM Manufacturing Operator Certification (AMOC)

### ADVISORY

- Market Intelligence
- Advisory Services
- Consulting Services

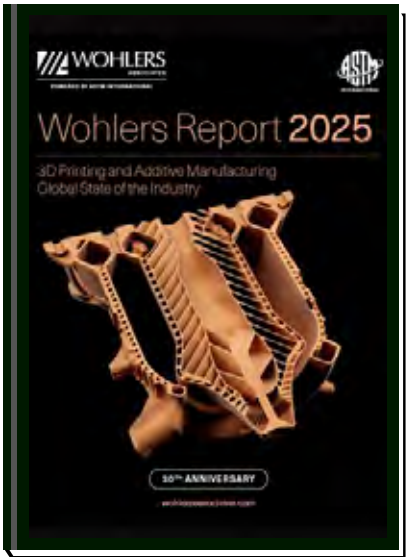
### WOHLERS REPORT 2025

#### Your Essential Resource for Additive Manufacturing Insights

The Wohlers Report is a globally recognized annual publication offering in-depth analysis of trends, developments, and forecasts in the AM industry. It serves as a trusted benchmark for policymakers, researchers, corporations, and governments navigating the evolving AM landscape.

#### Key Enhancement of the 2025 Edition

- ✓ **Tripled** the number of expert contributors (260+ from 40+ countries)
- ✓ Expanded segments: **Qualification, Certification, Robotics, Data Management, Cybersecurity, Space, Military, and AM Marketplaces**
- ✓ Added **Technology-specific** data, material trends, and software submarkets
- ✓ **Downloadable charts**, data packs, and modernized visualizations
- ✓ **Flexible licensing** (Individual, Enterprise, Academic)



\*Available in both digital & printed versions

## Products Distributors



## AM Equipment



## AM Material



## Regulatory/Standards/Testing, Inspection, and Certification



## Singapore's AM Ecosystem

## Design, Engineering, Manufacturing and R&amp;D Service Provider



## Software/Digital Platform



## AM Adopters



## Feature Story: Connecting Art and Science with AM

### Interactions Beyond Borders: A World First in Additive- Manufactured Art

The Future of Manufacturing with Additive Technology By Lakshmi Mohanbabu

The Moon Cubes are part of the larger Interactions Project, born from my vision of five designs that resonate across cultures, transcending the boundaries of discipline and geography. A universal language of connection, it has evolved into a framework uniting art, science and technology. Today, it is the **first artwork in the world—produced through additive manufacturing—to bridge the extremes of space and the deepest ocean.**

The journey to space began when two Interactions artefacts were selected for the Moon Gallery, the first extraterrestrial gallery destined for permanent placement on the lunar surface. The challenges were numerous: how could intricate designs be reduced to less than a centimetre and still retain their clarity, while also surviving launch, zero gravity and the searing heat and freezing cold environment of the Moon?



3D Printing Build Plate with Interactions Cubes: Each cube has a side length of 0.98 cm and is made from Inconel, a nickel-based superalloy.



This was where NAMIC's support became pivotal. I worked closely with scientists from the School of Mechanical and Aerospace Engineering at Nanyang Technological University (NTU), Singapore. With Associate Professor Daniel New and his team, prototypes for the Interactions **Inception Cube** were first 3D-printed in nylon at 6 cm, before advancing to **Inconel, a nickel-based superalloy, at just 0.98 cm** to achieve the level of detail and precision required.

With Assistant Professor Matteo Seita and his team, the **Interactions Structure & Reflectance Cube** was created to embody the essence of Interactions' duality—where each design carries both a positive and negative side. This concept

was linked to the Moon's own duality of near and far sides. **Produced in stainless steel through Laser Powder Bed Fusion (LPBF) technology**, the cube's two faces reflect light differently because of molecular orientation—an effect achievable only through additive manufacturing. To demonstrate these reflective properties more visibly, a larger 15 cm version was also produced.

The two Interactions Moon Cubes made their **first voyage to the International Space Station (ISS) in 2022**, where they orbited Earth for nearly a year before returning. Their **next and final journey will be to the Moon.**

For me, NAMIC's support has made the Interactions Cubes a landmark: Singapore's contribution to creativity and collaboration across extreme environments, a testament to interdisciplinary innovation where creativity, science and technology forge legacies that outlast us.



Structure & Reflectance Cube in Stainless Steel (15 cm) Printed Using LPBF Technology: A scaled-up prototype of the two cubes that went to the International Space Station and will soon go to the Moon.



Exhibition: Interactions Paintings/Sculptures @ MAD, Museum of Art & Design

**NAMIC Presents:**  
**The Future of Manufacturing with Additive Technology**

Singapore has successfully established a robust, coordinated additive manufacturing (AM) ecosystem, underpinned by strong government support, a vibrant research and development (R&D) landscape, and established “Peaks of Excellence.” A 2025 industry survey reveals a maturing market where the majority of companies are deploying AM for end-use part production, driven by the need for greater design flexibility and on-demand manufacturing. Adopters report tangible benefits in product innovation and supply chain streamlining, fueling strong optimism for the technology’s future role.

The report highlights a gap between operational gains and financial returns in additive manufacturing (AM). Most adopters haven’t seen significant revenue or market growth due to hesitation from high costs and uncertain ROI, which suppresses demand and delays high-value solutions.

To unlock AM’s full potential, Singapore should focus on its strengths—precision, agility, and circularity—by promoting innovation in established industries like aerospace and marine, while expanding into defence, biomedical, space, and sustainability. This shift from transactional sales to solution partnerships, supported by deep Design for Additive Manufacturing (DfAM) capabilities, aims to evolve Singapore into a leading global manufacturing hub. Leveraging digital infrastructure, IP protection, and talent, Singapore can secure its strategic relevance, foster sustainable growth, and lead in the next industrial era.

**Download the full report to learn more.**



[https://namic.sg/namic\\_insights/the-future-of-manufacturing-with-additive-technology/](https://namic.sg/namic_insights/the-future-of-manufacturing-with-additive-technology/)

# XIONEER

**Made and engineered in Germany.**  
High-performance soluble support materials  
& post-processing devices.



**FIND OUT MORE!**



**BENEFITS:**

- Smooth printing – no bubbling or degradation
- Accurate & clean print results
- No clogging – reliable alternative to PVA or BVOH
- Low moisture absorption – no swelling
- Easy storage & handling
- Compatible with nearly all printable polymers



## A Five-Year Journey of Transformation and Industry Impact

From humble beginnings to becoming a key player in Southeast Asia's additive manufacturing landscape, Beyond Bynd's trajectory is a testament to strategic vision, relentless innovation, and a deep understanding of industry needs.

### 2022: Entering the Industrial Arena

This year marked a pivotal shift. Beyond Bynd made its debut at the Industrial Transformation Asia-Pacific (ITAP) under the NAMIC Pavillion, signaling our transition from a prototyping service provider to a full-fledged contract manufacturer. This year also saw our company's entry into the semiconductor industry—an achievement underscored by its appointment as the official distributor of AON3D in Singapore, bringing high-temperature 3D printing capabilities to local enterprises and around the region.

### 2021: Laying the Foundation

Beyond Bynd was established with a clear mission: to make advanced manufacturing accessible and agile. Initially focused on prototyping using commodity plastics such as ABS and PETG, our company operated primarily as a service bureau, helping clients validate designs and explore manufacturing feasibility. These early engagements laid the groundwork for deeper industry collaborations and technical capabilities.

### 2024: Powering Energy and Oil & Gas Innovation

Beyond Bynd extended our reach into the energy and oil & gas sectors—industries increasingly turning to additive manufacturing for rapid tooling, spare parts, and corrosion-resistant components. Our company was appointed as the official distributor of IAMG in Singapore, further strengthening our materials and hardware offerings.

### 2025: Ecosystem Leadership and Strategic Partnerships

Beyond Bynd continues to solidify our position as a thought leader and ecosystem enabler. With new distribution partnerships with Arburg, Xioneer, and VisionMiner, our company now offers a broader range of industrial-grade solutions. The invitation to participate in a roundtable with NAMIC and other leading additive manufacturing companies reflects our growing influence and commitment to shaping the future of advanced manufacturing in the region. Beyond Bynd continues to push the boundaries of additive manufacturing across Asia-Pacific and beyond. From our home base in Singapore, we've expanded our reach to many countries including Malaysia, Thailand, Australia, Philippines, Japan, Taiwan, and across Europe, with a growing interest and partnerships in more regions worldwide.

### 2023: Expanding into High-Performance Sectors

Building on our momentum, Beyond Bynd broke into the railway and aerospace sectors, offering solutions tailored to the demanding standards of these industries. Our company also became the official distributor for Liqcreate, expanding our portfolio with advanced photopolymer resins for industrial applications.

# Silicone 3D Printing

Built for medical & industrial applications



## Medical Applications



Orthopaedic Silicone Liners



Skin-like Training Models



Silicone Prosthetics



## Industrial Applications



Soft Robot Grippers

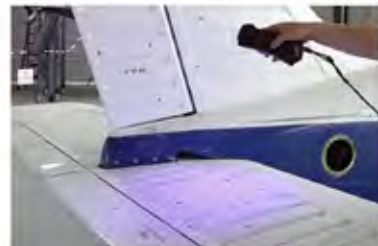


Masking Surface Treatment

With the S300X – LIQ21 | LIQ11, Lynxter is making industrial and medical silicone 3D printing accessible to all. Thanks to its IDEX technology and water-soluble support, you can easily produce complex geometries, sealing gaskets, bellows, or custom soft medical parts. Compact and open, the S300X – LIQ21 | LIQ11 leverages industrial micro-dispensing to be a material oriented 3D printing solution, tackling functional parts production and development. This resolute open approach leads to the experimentation of flame retardant and conductive formulations, but also technical polyurethanes and specific inks.

# Handheld 3D Scanners

Capture every detail, big or small



Aerospace



Automotive



Molds & Heavy Industry

## The Benefits of ScanTech

- 0.020 mm accuracy, 6.3M pts/sec
- Scans shiny, dark, or large parts with ease
- Laser modes for cars to turbine pockets



Wide range of scanner solutions for endless applications

03

Our AM Stewards  
Enterprise Feature

- Aerospace
- Aerospace & Transport
- Biomedical / Healthcare
- Consumer Product
- Manufacturing
- Marine & Offshore
- Precision Engineering
- Semiconductors & Electronics
- Standards & Certifications



Tel: +65 6743 2325  
Email: sales@eye2eye.com  
Website: www.eye2eye.com.sg

Book a Free  
Scan & Print Demo





## EMBEDDING ADDITIVE IN ENGINE REPAIR



Engine repair is one of the most exacting domains in advanced manufacturing. Conventional processes are effective but can be resource-intensive and slow, particularly when demand for air travel is rising and supply chains remain under pressure. For MRO operations, the challenge is clear: reduce turnaround times without compromising safety or performance.

GE Aerospace has long been a pioneer in the use of additive manufacturing for engine parts production, but adapting the technology to engine repair required a different approach. In 2022, GE Aerospace Component Repair Singapore became the first site in the global network to introduce Laser Powder Bed Fusion (L-PBF) for commercial jet engine components. Beginning with CF6 blades and expanding to CFM56 high-pressure compressor blades, the process has cut

material build-up times by up to 60%, halved post-processing steps, reduced 40% overall equipment footprint and doubled part throughput compared to conventional methods. These outcomes were made possible by years of preparation: since 2017, engineers and technicians had undergone structured training and exchanges with Singapore's institutes to build AM readiness.

For more than forty years, Singapore has been central to GE Aerospace's operations in Asia Pacific. Today, the country hosts the company's largest global engine component Maintenance, Repair and Overhaul (MRO) facility, employing over 2,000 people and responsible for more than 60% of GE Aerospace's global repair volume. Across its three sites—two at Loyang and a New Make plant at Seletar Aerospace Park—the company supports a wide range of engine programs, from the GE90 and GENx to the CFM56 and LEAP\*.

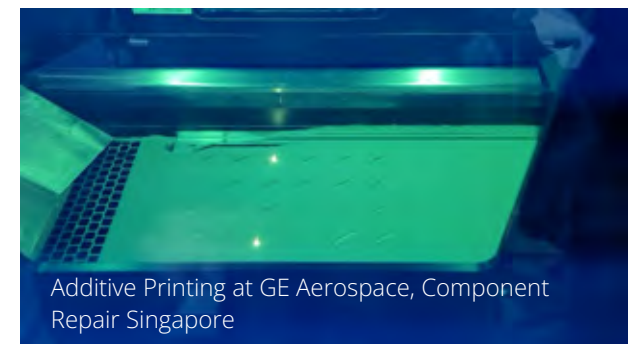
*Photos and images - courtesy of GE Aerospace*



These efforts were supported by Singapore's broader AM ecosystem. NAMIC helped establish the educational pathways that allowed companies like GE Aerospace to quickly build capability and embed AM into day-to-day operations.

Today, additive repair is fully embedded in operations at the Singapore sites, alongside ongoing research into further applications and complementary digital tools. As aircraft engines become more advanced and sustainability pressures grow, GE Aerospace is deepening local investments in both technology and talent. Its experience demonstrates how MRO in Singapore is evolving: not just through new manufacturing methods, but through the people, institutions, and partnerships that sustain long-term transformation.

\*CFM International is a 50/50 joint company between GE Aerospace and Safran Aircraft Engines. LEAP is a registered trademark of CFM.



NAMIC's efforts in building Singapore's AM education ecosystem have enabled industry upskilling and workforce readiness



## INTEGRATING AM INTO AEROSPACE PRODUCTION

### RESPONDING TO SHIFTS IN AEROSPACE MANUFACTURING

Advanced Manufacturing Design Centre (AMDC) an arm in Advanced Manufacturing underpinned by Engineering Capabilities within ST Engineering, was set up as a strategic response to the evolving challenges in the manufacturing landscape, particularly in aerospace. Employing automatic digital manufacturing as a core technology was due to its ability to address industry pain points, technological opportunities and workforce realities,

all through robust processes.

Since its inception, AMDC has evolved from demonstrating capabilities to delivering customer projects and establishing itself as a Centre of Excellence (COE). It has also expanded to adapt the businesses' models and services to meet the changing needs of the industry, technology and workforce dynamics.

### APPLICATIONS OF AM IN AEROSPACE

Over the past seven years, AMDC has delivered more than 2,000 airworthy parts with over 100 unique part numbers in the digital catalogue to support the customers with just-in-time production.

#### Examples of such application include:



*Winning in Time to Market – additive manufactured Passenger with Reduced Mobility Lavatory parts cuts lead time by > 80% as compared to traditional thermoforming, eliminating the need for tooling and technical difficulties associated with the part geometries. These large prints spanning more than a week succeeded on our first attempt.*

**Left:** Individual components  
**Right:** Assembled parts



*Certified & delivered customised medical equipment mounts onboard aircraft in 2020.*

**Top:** Parts are featured during ministerial visits  
**Bottom:** Set of 3 delivered mounts that are optimised using generative artificial intelligence, with unique features incorporated, such as human ergonomic

Photos and images - courtesy of ST Engineering

## COLLABORATION AND FUTURE VENTURES

The facility has already delivered customer projects and is continuously working towards serving a broader customer base with improved efficiency. There are ongoing efforts with Smart Analytics to include automation of identified processes with structured data collection, and incorporation of AI for further elevation. With efficiency in mind, it is also hoping to leverage on the comprehensive monitoring system embedded in the SLM280 platform, which aims to use AI for data processing and timely feedback.

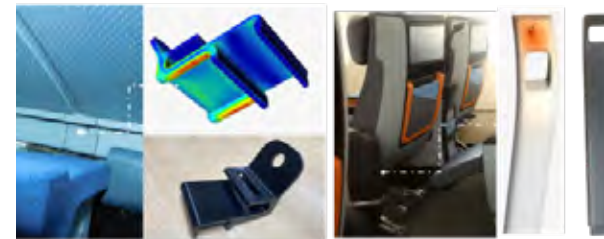
Further collaboration has also been central to regulatory and standards development. In 2020, NAMIC supported AMDC's launch of process qualification demonstration, contributing to the centre's EASA STC establishment. Working with Standards Development Organisation, NAMIC, and regulators such as CAAS and RSAF, AMDC established Singapore's first aviation standard for AM process qualification, which was published in November 2024.

Looking ahead, AMDC is pursuing continuous advances to improve its output along with its long-standing partnership to further integrate AM into aerospace production.



**Left:** The housing assemblies through working with NAMIC that created us opportunity to demonstrate the AM process leading to our EASA STC.

**Right:** Recently completed project on development of optimised SS254 printing process which enables yield strength to reach ~600MPa, with superior corrosion resistance on par with nickel superalloy and strength surpassing super duplex steels at extreme temperatures.



*Lowering part life cost by identifying the root cause of aircraft part failures and performing optimisation to improving the durability of these parts.*

**Left:** Gap cover on the aircraft side wall,  
**Right:** Seat cover for premium economy seat for first tiered airline

Hence, by integrating engineering expertise with AM production, the centre has moved beyond basic "file-to-print" services, delivering value-added AM solutions.

### BUILDING CAPACITY AND OPERATIONAL PRESENCE

A milestone was achieved in 2025 with the consolidation of multiple printing systems under one roof at the new facility at 538 Airport Road. This site integrates the engineering team into the commercial production setup, with AS9100 qualification expanded and qualified printing systems added to aviation production. Nearly 10 printers are now certified for printing aviation parts, supported by more than 20 printers that handle a wide range of customer enquiries, encompassing materials and part sizes up to 1.5 metres for metal parts.



*Our new facility at 538 Airport Road that has multiple qualified printers for aviation production under one roof.*



## ADDITIVE MANUFACTURING INNOVATIONS TRANSFORM RAIL OPERATIONS IN ASIA PACIFIC



Photos description: Alstom 3D printing Hub in the Barcelona site. Additive manufacturing

### AM SOLUTIONS FOR RAIL

Rail transport plays a vital role in connecting cities and communities, but the sector faces unique challenges: complex global supply chains, obsolescence in legacy fleets, long lead times, and growing demands for sustainability. Alstom's Additive Manufacturing (AM) initiative in the Asia Pacific (APAC) region was launched as part of its global Innovation Vision to transform how railway parts and tools are designed, produced and delivered.

For the railway industry, the ability to produce parts on demand and closer to the point of need is game-changing. 3D printing reduces dependence on overseas suppliers, shortens turnaround times, and mitigates supply chain risks. Just as importantly, it creates opportunities to redesign parts for enhanced performance, extended lifecycles and lower costs.

Since its AM journey began in 2017, Alstom has produced more than 200,000 3D-printed parts worldwide, achieving an estimated €26 million

in cost savings. In APAC, this capability has grown rapidly from early prototyping to a core operational function. The company now delivers application-specific solutions for operators and maintenance teams, with supply chain resilience emerging as a key differentiator. By producing critical components locally and on demand, Alstom helps ensure uninterrupted rail service even under evolving conditions.

Regional milestones underscore this trajectory. In Singapore, Alstom signed a Memorandum of Understanding (MOU) with the Land Transport Authority (LTA) to co-develop a local 3D printing ecosystem, strengthening national capabilities in transport innovation. Across Australia, Thailand and India, AM hubs have been established to provide local expertise, spare parts, tools and fixtures with significantly reduced lead times. These initiatives also extend into sustainability, with recycled materials incorporated into production and lifecycles extended through repair and performance enhancements.



Photos description: Alstom 3D printing Hub in the Barcelona site. Additive manufacturing

### EMBEDDING AM IN THE ECOSYSTEM

The potential for AM in APAC is substantial. Alstom plans to continue expanding AM hubs across strategic locations, broaden the portfolio of qualified AM parts, fostering synergies between hubs and integrating sustainable material options. Embedding AM deeper into lifecycle management as part of the eco-design key expertise in Alstom, from repair and reuse to recycling, supports faster operations with a lower environmental footprint.

NAMIC has been instrumental in these efforts, connecting Alstom with solution providers, supporting industry opportunities identification, and supporting grant applications for research projects. This partnership reduces financial risk when exploring new AM applications and strengthens the APAC AM ecosystem by bringing together industry, academia, and technology providers. Through innovation, sustainability, and collaboration, Alstom's AM programme is helping the railway industry meet evolving operational demands with greater efficiency, resilience, and greener means.



Photos description: Alstom 3D printing Hub in the Barcelona site. Additive manufacturing





## REDEFINING FRACTURE CARE THROUGH 4D PRINTING



For millions of patients each year, the experience of wearing a traditional orthopaedic cast can be uncomfortable and inconvenient. Bulky, heavy, and often unsustainable, these casts have remained largely unchanged for decades. Castomize was founded to rethink this standard of care: harnessing 4D-printing technology to deliver solutions that are lighter, breathable, waterproof, and tailored precisely to each patient.

*"We saw how outdated fracture care could be. With over 200 million patients affected annually, we believed there had to be a better way,"* the team recalls. By combining advanced materials, 3D design simulations, and novel additive manufacturing techniques, Castomize developed self-moulding casts that fit ergonomically while reducing waste and improving sustainability.

Photos and images - courtesy of Castomize

From its earliest days, Castomize has built its business model around the unique advantages of additive manufacturing. AM enables rapid prototyping, fast design iterations, and batch production at scale, ensuring consistent quality while keeping costs manageable. The flexibility to use multiple materials has also allowed the team to balance strength, comfort and functionality. *"Our modifiable printers give us scalability and automation, helping us meet stringent medical standards while producing efficiently at scale,"* they explain.

The company's journey has already marked several key milestones. Castomize has secured ISO 10993 certification and Class I medical approvals in Singapore, South Korea, Australia and Taipei, opening the door to international markets. Clinical collaborations with hospitals have supported further R&D, leading to the development of new medical devices made possible through 4D printing. Along the way, the company has earned global recognition through numerous accolades such as Forbes 30 Under 30, the Lee Kuan Yew Global Business Plan Competition, the MUSE Design Awards, the Global Most Creative Startup accolade and the ASEAN Outstanding Engineering Achievement Award (2023).

Looking ahead, Castomize is broadening its scope to address a wider range of limb applications and medical conditions. Collaborating closely with clinicians, the team is focused on patient-centric innovation: developing products that improve recovery outcomes and elevate comfort in orthopaedic care.

NAMIC has played a pivotal role in this journey. Through initiatives like the Innovation and Enterprise Fellowship Programme (IFP), Castomize has gained access to skilled talent supporting

R&D and operations. NAMIC has also co-funded strategic projects—including the development of new printers and hydrogel sensors—that strengthened the company's core technological capabilities. Beyond funding, NAMIC's platforms, such as the Global AM Summit and ITAP, have connected Castomize with industry leaders and raised its profile in the global additive manufacturing community.

**"NAMIC has been instrumental in accelerating our growth, not only through funding and programmes but also by connecting us to the broader ecosystem," the team shares.**

From an idea sparked by the need to improve patient experience, Castomize has grown into a company reshaping orthopaedic care for the future. By merging 4D-printing innovation with patient-centred design, and with NAMIC's continued support, Castomize is charting a new course for smarter, more sustainable healthcare solutions worldwide.



Left to Right:

Eleora Teo (Chief Operations Officer), Abel Teo (Chief Executive Officer), Johannes Sunarko (Chief Technology Officer)



## ENABLING PERSONALISED MEDICINE THROUGH 3D PRINTING

Craft Health Pte Ltd was established in 2019 by two pharmacists, Dr Lim Seng Han and Dr Goh Wei Jiang, motivated by a very human challenge: the burden of managing multiple medications for chronic illness. Dr Lim, caring for his father, envisioned how 3D printing could reduce pill burden by combining several medicines into a single, personalised polypill. "I saw how overwhelming it was for my father to manage so many pills every day," Dr Lim recalls. "That experience convinced me that we could harness technology to make treatment simpler and more humane." Together, he and Dr Goh set out to transform this idea into reality—laying the foundations of a company at the frontier of personalised healthcare.



The early years were devoted to building and validating the CraftMake platform, incubated under the NUS Graduate Research Innovation Programme (GRIP). Meeting the stringent standards of the pharmaceutical industry required extensive investment in both technology development and regulatory preparation. Like many young startups, Craft Health initially focused on R&D projects as a primary revenue stream. Over time, the team refined its product-market fit, and by 2024, identified compounding pharmacy as the strongest pathway to commercialisation. This milestone coincided with the appointment of Albert Sutiono to lead global commercial operations, ushering in a new phase of expansion across Asia, Australia, Europe and North America.



Photos and images - courtesy of Craft Health

Today, Craft Health offers an integrated platform that combines hardware, software and materials to produce tailored dosage forms on demand. This capability is aligned with a broader transformation in healthcare: the shift away from one-size-fits-all treatments toward personalised approaches that improve patient outcomes, experience and adherence. "We are seizing this immense opportunity in personalised healthcare by harnessing 3D printing technology to make customised medicines and supplements a reality today," Sutiono explains.

From the outset, NAMIC has been a critical partner in this journey. Its early project grant enabled Craft Health to build its first prototype—the CraftMake 1.0—and explore commercial opportunities. NAMIC also provided access to equipment, talent, and mentorship, helping to accelerate the company's progress from laboratory research to market applications. More recently, collaboration has extended to the development of standards for pharmaceutical 3D printing, strengthening safety and regulatory oversight for this emerging field. "NAMIC has been invaluable in shaping our growth and connecting us with global investors and partners," reflects Dr Goh.

Sustainability has also become central to the company's ethos. In 2024, Craft Health completed an impact assessment with the Swiss Impact Investment Association, aligning its efforts with UN Sustainable Development Goals on health, innovation and responsible consumption. By decentralising pharmaceutical production closer to patients, the company seeks to improve access while reducing environmental impact.

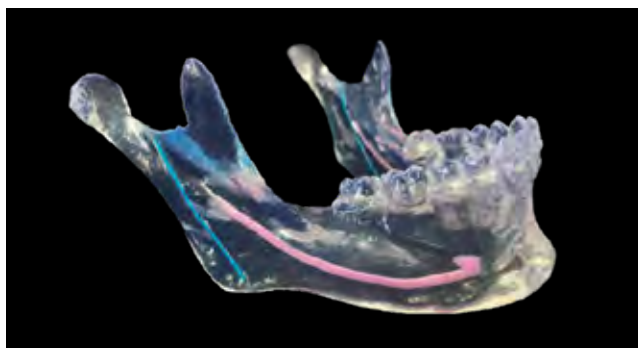
Looking ahead, Craft Health's development roadmap is focused on reducing barriers to adoption. Upcoming initiatives include standardised templates for no-code 3D printing, premix powders to accelerate formulation development, and CraftEnable™, a data-driven formulation tool for complex cases. At the same time, the company continues to champion regulatory frameworks that will allow personalised 3D-printed medicines to be safely integrated into clinical practice. Over the next three to five years, these efforts are expected to consolidate Craft Health's leadership in the emerging field of 3D-printed pharmaceuticals.

What began with one patient's need has evolved into a vision for global healthcare. Supported by NAMIC and Singapore's innovation ecosystem, Craft Health exemplifies how additive manufacturing can reshape medicine: not only making it more advanced, but also more personal, sustainable and resilient.





## DIGITAL MANUFACTURING MEETS PERSONALISED HEALTHCARE



In the operating room, precision begins long before the first incision. Yet for years, surgeons relied on 2D scans, mentally reconstructing anatomy in ways that could be both taxing and imprecise. Founded in 2016, Medairum set out to close that gap. By transforming CT and MRI data into 3D printed, patient-specific models, it gave clinicians something tangible: a way to see, hold, and plan more effectively for the patient in front of them.

These models enhance surgical planning, reduce operating time, and improve communication between doctors and patients. Custom cutting guides further allow for accurate execution, better implant fit, and smoother recovery.

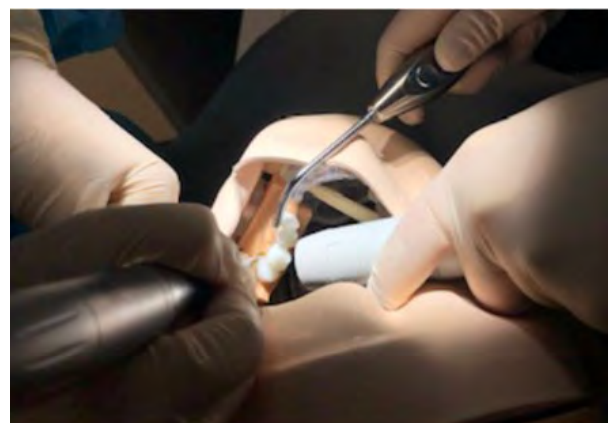
But the company's impact has extended beyond the theatre. In partnership with the National University Centre for Oral Health Singapore (NUCOHS), and supported by a NAMIC grant, Medairum developed wisdom tooth extraction training models. For dental undergraduates, this meant practising complex procedures on lifelike replicas before treating real patients; bridging the often-wide gap between theory and practice.

At the heart of these innovations is 3D printing, which makes it possible to produce intricate, organic forms with speed and precision. Rapid turnaround and high customisation have made it

a vital tool in delivering the personalised care that modern medicine increasingly demands.

When the COVID-19 pandemic struck in 2020, global supply chains for even the simplest medical tools collapsed. Medairum quickly redirected its expertise, pivoting from surgical models to producing nasopharyngeal swabs. With a farm of 66 SLA printers running inside a cleanroom, the company delivered more than four million swabs: a stopgap measure until large-scale injection moulding came online.

Growth continued after the crisis. In 2021, Medairum relocated its SLA print farm to Ang Mo Kio, expanding capacity and opening the door to small-batch production. That year also saw the start of a collaboration with Tan Tock Seng Hospital,



*Photos and images - courtesy of Medairum*



establishing an in-house point-of-care 3D printing facility. Since then, the centre has supported over 500 cases, producing patient-specific anatomical models and guides to assist surgeons in tackling complex procedures.

New milestones followed. In 2024, Medairum achieved ISO 13485 certification for its Ang Mo Kio site, enabling it to deliver regulated anatomical models, surgical guides, and custom medical devices. That same year it entered the podiatry sector, combining Selective Laser Sintering (SLS) and CNC EVA milling into a streamlined orthotics workflow. Podiatrists could now submit digital scans and prescriptions and receive fully finished custom orthotics, supported by a library of top covers and additions. The service was launched at NAMIC's Global Additive Manufacturing Summit in October 2024.

## LOOKING AHEAD

Medairum is positioning itself as a regional leader in 3D printed orthotics, with Southeast Asia as its first horizon. To meet demand, the company is refining its digital workflows, introducing AI-assisted guidance and templated prescriptions while offering clinicians full CAD control in a user-friendly interface.

Further ahead, Medairum is exploring wearable technology. By capturing and analysing patient data in real time, podiatrists, orthopaedists, and physiotherapists could gain sharper insights for diagnosis and personalised treatment.

Taken together, these developments point to a clear trajectory: a healthcare system made more precise, adaptable, and patient-centred, with 3D printing as a critical enabler.



## SCALING SURGICAL SOLUTIONS WITH ADDITIVE MANUFACTURING

### FROM SINGAPORE TO THE WORLD: BUILDING ACCESS THROUGH 3D PRINTING AND EXPANDING OIC'S GLOBAL FOOTPRINT

In June 2025, OIC International, a MedTech company pioneering the use of 3D printing for surgical solutions, announced its expansion into Southeast Asia, Central and South America, and other emerging markets. The company's innovative trauma care systems are designed to provide scalable solutions in regions facing pressing healthcare challenges.

Shri Shetty, CEO of OIC International, highlights the company's growing footprint in Singapore and across Asia Pacific, where the need for timely, reliable surgical solutions is especially urgent.



### VISION ROOTED IN ACCESS

"When we started, our goal was simple: make essential medical devices more available," says Shetty. From the beginning, additive manufacturing (AM) was not just a novel technology but a way to tackle a persistent gap. Traditional supply chains and manufacturing often failed to deliver affordable, high-quality implants, especially in underserved markets. AM offered a path to make care more accessible and scalable.

Conventional methods simply cannot keep pace with global demand. With AM, implants can be produced locally, tailored to patients, and delivered more cost-effectively. "The pandemic and recent trade tariffs showed how quickly supply chains in the US and Europe can fail. For surgeons and patients in emerging markets, that flexibility is critical," Shetty notes. Several of OIC's core devices are now being transitioned from traditional manufacturing to 3D printing, making them both more affordable and easier to distribute.

*Photos and images - courtesy of OIC International*



### MILESTONES ON THE JOURNEY

OIC's growth has been anchored by key milestones: achieving ISO 13485 certification, signing MOUs with Singapore hospitals and research institutes, and raising seed funding in 2023 to expand AM hubs across Southeast Asia. This year, the company also established its Asia-Pacific office in Singapore. Each step has reinforced OIC's mission to show how AM can translate into practical, scalable surgical solutions.

### PARTNERSHIPS WITH NAMIC, CHI, AND NNI

One of the most impactful collaborations began in 2023, when OIC partnered with NAMIC, the Centre for Healthcare Innovation (CHI) at the National Healthcare Group, and the National Neuroscience Institute (NNI). Together, they co-developed a 3D-printed cranioplasty implant. Without such implants, patients can face lasting cognitive impairments after surgery. By designing and manufacturing the device locally, OIC significantly reduced its cost, an example of local innovation directly improving patient care.

Shetty emphasises that the value went beyond the implant itself: "The collaboration showed us how powerful the Singapore ecosystem can be when research, hospitals, and industry pull together. NAMIC has been more than a partner, they've been a catalyst, connecting us to potential partners, investors, and projects, and helping us move from R&D into pre-production."

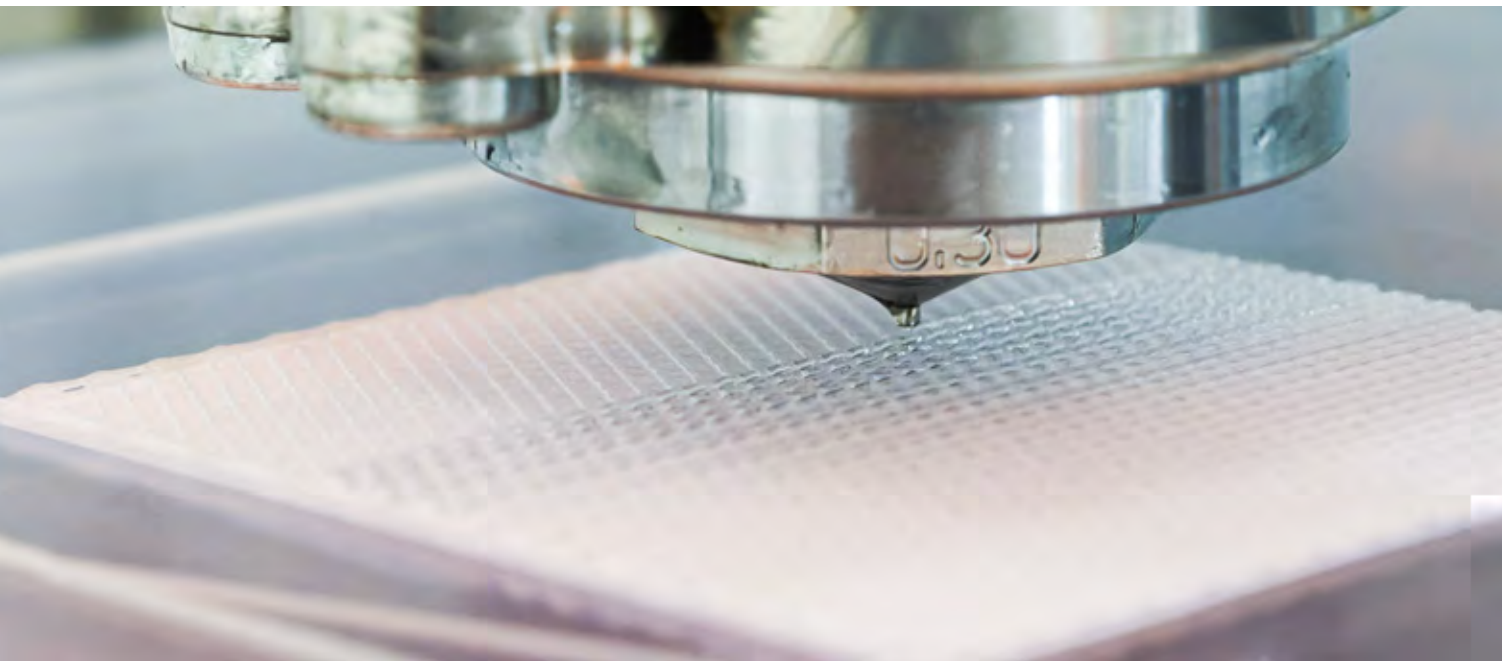
### LOOKING AHEAD

With NAMIC's continued support through grants, networks, and pilot projects, OIC is preparing to scale its AM platforms beyond Singapore. Trauma, spine, and even head/neck/dental applications are next areas where 3D printing can reshape access. As OIC expands across Asia and into other emerging markets, the company's ambition is clear: to broaden the reach of advanced medical devices and ensure that patients, regardless of geography, have access to the implants they need.

Shetty remains candid about what drives him: "I've seen how access, or the lack of it, can change a life. Knowing our technology can help a surgeon save time, reduce complications, or restore someone's quality of life; that's what keeps me going. At the end of the day, it always comes back to the patient. It's about dignity, about giving people the chance to live fully."



## ADVANCING REGENERATION WITH ADDITIVE MANUFACTURING



### BIOMIMETIC INNOVATION IN REGENERATIVE MEDICINE

What if implants didn't just support healing but became part of it? That question drives Osteopore, a Singapore-based company developing micro-structured bioscaffolds engineered to mirror the lattice of cancellous bone. These porous structures invite cells to attach, multiply, and thread through the scaffold—not just coating its surface but filling its volume with living tissue. By fostering vascularisation, they spark mineralised bone growth deep inside the implant, strengthening both biological and structural recovery.

Osteopore's scaffolds are designed to work with, not against, the body. They provide a framework for new bone to form, then gradually yield as the patient's own tissue integrates and takes over. What remains is not an implant, but living bone,

restoring anatomy without leaving permanent foreign material behind. This symbiotic approach reduces long-term complications and supports recovery that feels natural.

With more than 120,000 clinical cases worldwide, Osteopore's technology has moved from concept to proven practice. Approvals from the US FDA, EU MDR, Australia's TGA, and Singapore's HSA have enabled its use in more than 25 countries, confirming both its safety and clinical effectiveness.

### BREAKTHROUGH SURGERY APPLICATIONS

The company's technology has been central to several world-first surgical achievements – from preventing limb amputations to supporting facial reconstruction that restores function and patient confidence.

*Photos and images - courtesy of Osteopore*

### LOOKING AHEAD

Osteopore's journey points to a future where regenerative care is less about replacing parts and more about re-growing them. With biomimetic design and additive manufacturing, the company continues to explore new frontiers of surgical care — advancing a vision of recovery that is safer, more natural, and inseparable from the body's own healing power.

Osteopore develops its own 3D printing systems to produce implants with microstructures that support natural tissue regeneration.



**Top left:** World's longest bone reconstruction - 36cm shin bone defect

**Top right:** World's first 3D-printed implant to reconstruct skull

**Bottom left:** World's first half-lower jaw reconstruction

**Bottom right:** Post-cancer reconstruction of a 15cm shin bone

These cases affirm Osteopore's contribution in using additive manufacturing to advance regenerative medicine, providing clinically effective solutions for complex and challenging clinical conditions.





SINGAPORE GENERAL HOSPITAL  
3D PRINTING CENTRE:  
BUILDING PRECISION MEDICINE  
CAPABILITIES THROUGH 3D  
PRINTING

Singapore General Hospital (SGH), the largest tertiary hospital in Singapore, providing comprehensive multi-disciplinary care and an Academic Medical Centre that integrates clinical care with research and education, has been steadily investing in additive manufacturing (AM) since 2015. For Dr Mark Tan Bangwei, clinical lead of the SGH 3D Printing Centre (3DPC), this work is closely tied to the broader shift toward precision medicine, tailoring care to individual patients for better treatment outcomes while keeping healthcare affordable and sustainable.

*“Capability development in healthcare AM is one of the enablers,”* he explains. *“It improves the efficacy, efficiency, and resilience of patient care while synergising with Singapore’s biomedical ecosystem.”* By embedding AM in its processes, SGH ensures it remains relevant to current healthcare needs while preparing for future evolutions.

FROM MODELS TO IMPLANTS

Today, SGH uses AM both in-house and with partners to produce patient-specific surgical planning models, implant sizing tools, lesion-targeting and reconstruction guides, custom appliances, and implants. These applications support doctors in planning complex surgeries, enable hospitals to order implant inventory on demand, and improve the accuracy of key devices.

Examples range from surgical models that reduce operating time to foot orthotics that help prevent diabetic complications. AM also strengthens resilience: when implants are produced locally, hospitals become less dependent on fragile supply chains. Looking ahead, the 3DPC is exploring high-performance and bioresorbable implants,

while also building networks with other hospitals, research institutes, and biomedical companies to expand capabilities.

A VISION FOR THE FUTURE

Dr Tan sees the future of healthcare AM in Singapore as one of broader adoption and deeper integration. He highlights the need for education and career tracks to support engineers working in medical AM, expansion of digitalised manufacturing within hospitals, and national capabilities in producing specialised materials and implants. Longer-term, he envisions a roadmap toward organ replacement implants: from cornea and skin to pancreas—developed and implemented for clinical care in Singapore.

Photos and images - courtesy of Singapore General Hospital 3D Printing Centre

LOOKING AHEAD

Along this journey, SGH has found strong support from NAMIC. “NAMIC has been a strong resource via its advisory and networks in shaping our strategy and programs,” says Dr Tan. Looking forward, he sees opportunities to co-create in education, capability development, and enterprise, further strengthening the role of AM in Singapore’s healthcare ecosystem.

PHOTO 1: Patient-specific surgical planning models, surgical reconstruction guides, orthotics and implants developed by the SGH 3DPC.

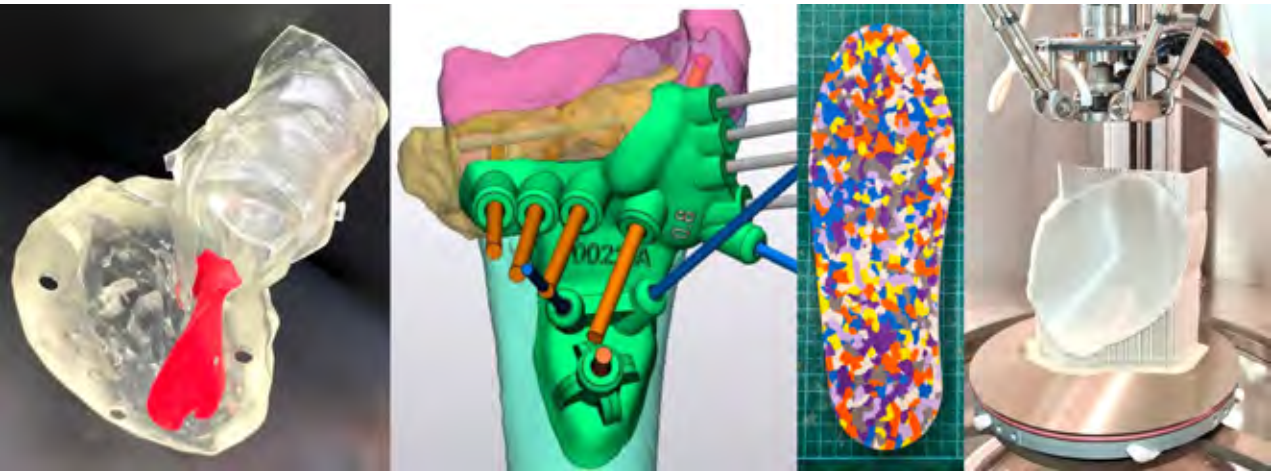


PHOTO 2: International Subject Matter Experts with the 3DPC Team at the Asia-Pacific 3D Printing in Hospitals Forum hosted by SGH in April 2025.





## FROM CHOCOLATE TO CREATIVE ENTERPRISE WITH AM



*Our first set of Singapore buildings made in chocolate*

Founded in Singapore by two designers, MODESI set out to show how additive manufacturing (AM) could extend beyond industry into culture and everyday life. They began by reimagining chocolate: not as confectionery, but as a design surface where additive manufacturing could bring heritage to life.

Traditional chocolate-making relies on repetitive processes, high labour intensity and limited design possibilities. By applying AM, MODESI created highly detailed forms, cultural motifs and customised experiences that were previously impossible. Their value lies in turning design into storytelling, with chocolate as the gateway to show what AM can achieve.

MODESI's journey was not without obstacles. Investors and partners often questioned whether it was a food venture or a design startup. Concerns about scalability, intellectual property and regulatory compliance in the food sector added to the complexity. These hurdles forced the founders to refine their model. They secured design patents, built processes that balanced scalability with artistry, and learned to adapt their messaging for different audiences: from heritage boards and tourism organisations to luxury hospitality groups.

*Photos and images - courtesy of Modesi Designs*

Persistence brought results. MODESI was shortlisted for the Red Dot Design Award (2023) for cultural design concepts, and in 2024 it secured a design patent for Peranakan Chocolate Tiles and applied for the Design Week Emerging Voices Showcase.

By 2025, its work was featured in Home & Décor Magazine and Hospitality Careers. That same year, MODESI was appointed among the 100 Founders and Leaders of NDP Sandbox Singapore, affirming its position within the country's creative and entrepreneurial landscape.

NAMIC has been instrumental in shaping this path. Selection for the 2021 Startup Innovation Forum gave MODESI early visibility, while mentorship and ecosystem connections offered the credibility and support needed to grow. This validation gave the founders the confidence to push their ideas further and positioned MODESI within Singapore's broader AM ecosystem.



*Experiment to make Marina Bay Sands with Art Science Museum*



*Patterns inspired from nature*

## LOOKING AHEAD

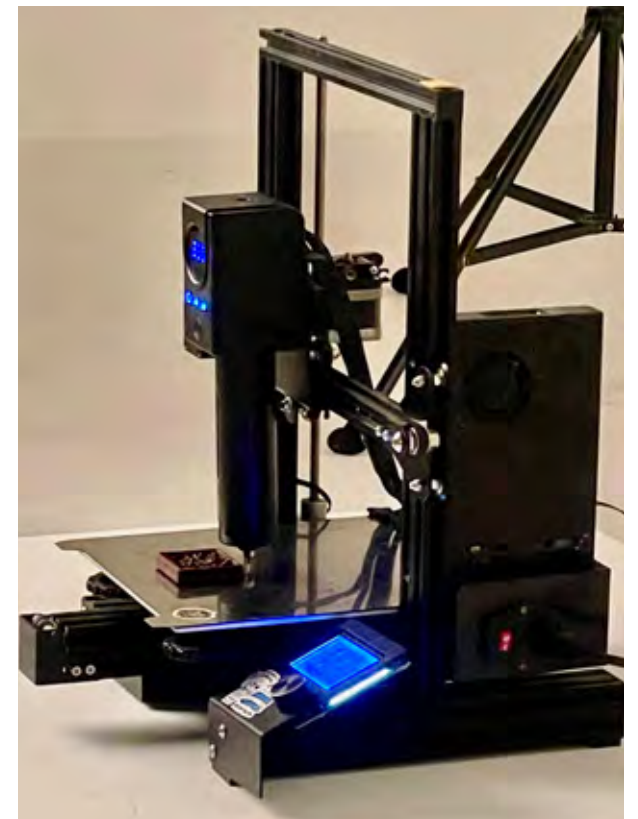
Chocolate was only the first step. MODESI is now developing 3D-printed boxes with natural wood composites that carry cultural narratives, hosting workshops where communities and tourists design their own creations, and collaborating with the hospitality and tourism sectors. Beyond food, the team is exploring AM in clay, biomaterials and composites, applying its design-first philosophy to architecture and product design.

Plans for global expansion are underway, with Hong Kong and Dubai identified as future hubs. Sustainability underpins these ambitions, through ethical sourcing, reusable packaging and waste reduction enabled by digital design workflows.

MODESI has never seen itself as just a chocolate venture. Chocolate was the first step; a medium that everyone understands, and a way to make AM accessible and engaging. The company's mission is larger: to show how design, technology and heritage can intersect, turning AM into a tool for cultural storytelling. As the founder Ms Aakanksha Jain puts it: 'Beyond chocolate, we print culture, craft heritage and create connections—transforming design into an edible story for the world.'



*Flagship box of CNY, Hari Raya and Deepavali inspired patterns*



## TOW TOW

## BLENDING CRAFT AND TECHNOLOGY IN LEATHER DESIGN

## INTRODUCING 3D PRINTING TO LEATHERCRAFT

Tow Tow began as a passion project between Clarissa, a product designer, and Weifang, a leather crafter, who shared a curiosity about where their disciplines might meet. What emerged was not just another bag label but a practice of making objects that are functional, sculptural, and personal. From the start, each product was treated as an experiment in design, material, and craft; with 3D printing as a key collaborator.

One of the first obstacles was hardware. Generic off-the-shelf options limited their creativity, while custom manufacturing demanded large minimum orders. 3D printing provided a way around both. It allowed Tow Tow to design original, lightweight components with both functional and aesthetic intent, prototype them rapidly, and refine them without committing to large runs. What began as a workaround soon became central to the brand's identity: a balance of playfulness and practicality, enabled by additive manufacturing.



As Tow Tow grew, its focus expanded from bags to the experience of making them. The "Build A Bag" and "Build A Charm" concepts invite customers to co-create by choosing details such as leather type, stitching colour, and hardware design. What started with two bags at its first pop-up has evolved into experiential retail events in Singapore and Jakarta, drawing a community of customers who return not just for the products, but for the act of making.

Tow Tow's range now includes the Basket, Pail, and Mummy Twiggy. Behind each design, AM enables quick prototyping of hardware, small-batch testing of styles and colourways, and lean production without overstock. This approach keeps operations sustainable and adaptable, while ensuring that each piece remains distinct and balanced in both form and function.

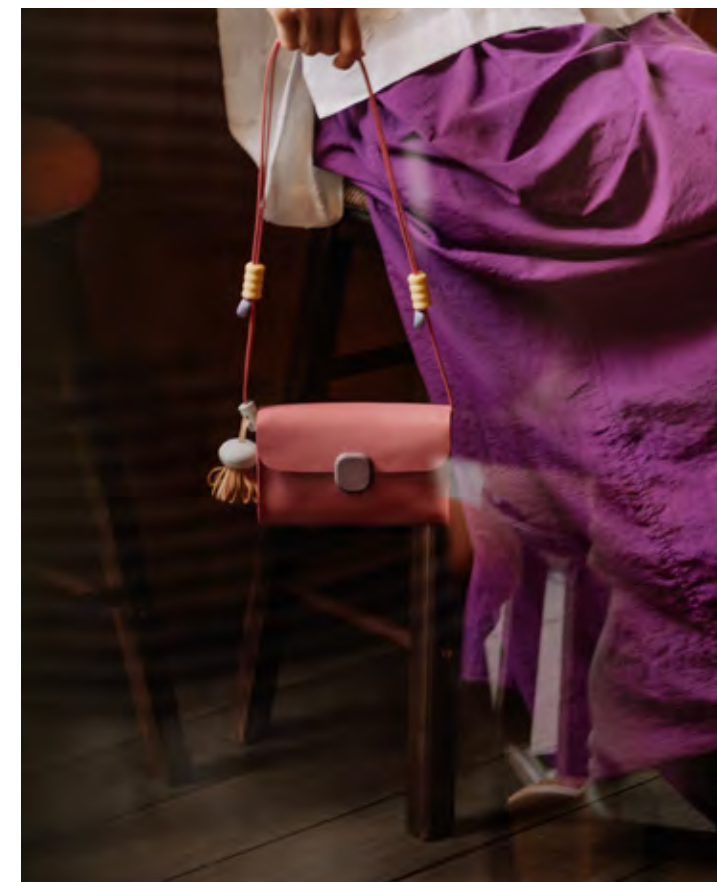
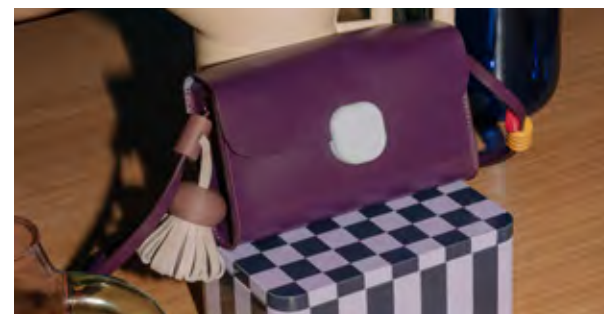
*Photos and images - courtesy of Tow Tow*



## MILESTONES AND FUTURE PLANS

Recent milestones include Tow Tow's first international pop-up at Brightspot Jakarta and the launch of new in-house hardware designs made possible by 3D printing.

Looking forward, the brand plans to bring its experiential model to other Southeast Asian cities and collaborate with local artists on culturally specific designs. By continuing to experiment at the intersection of craft, technology, and play, Tow Tow is reshaping what leathercraft can be in the 21st century.





## THINK BIG , BUILD FAST

### FROM IDEA TO INDUSTRY APPLICATION

Addept3D is a Singapore-based start-up formed in 2022 as a joint venture between Accuron Technologies, a global precision engineering group, and WAAM3D, a UK leader in Wire Arc Additive Manufacturing (WAAM). Beginning with just one machine and three AM-trained engineers, the company set out to help industries explore and adopt large AM for complex metal parts.

From the start, Addept3D focused on enabling large-scale production that conventional machining cannot easily support. Their journey began with the ambition to show how WAAM can bring speed,

scale, and flexibility to industries that demand performance at the highest level. Using a variety of systems from WAAM3D the team is capable of producing high quality alloy components up to two meters in size.

Today, Addept3D works as a solutions provider with companies across aerospace, oil and gas, and semiconductors, supplying machines as well as acting as an OEM for 3D-printed and fully post-processed metal parts. The team also supports businesses looking to build in-house capabilities, integrating WAAM equipment developed by its partner WAAM3D.

Collaboration with WAAM3D and the research community has been central to its growth. Addept3D has taken part in projects to characterise new superalloys and co-develop an intelligent monitoring system for real-time quality control. This R&D-driven approach ensures that applications remain not only innovative but also reliable for critical industries.



Photos and images - courtesy of Addept3D



### BUILDING CAPABILITIES AND GROWTH

In 2024, Addept3D strengthened its foundations by achieving an AS9100 certification, the Quality Management Standard for the aerospace industry. It is now working towards AM certification to provide an additional assurance of compliance in highly regulated sectors.

To support global growth, the company earlier this year opened a larger facility, expanding the team to six AM-trained engineers, adding an additional **MiniWAAM®** machine and upgrading its existing RoboWAAM® printer with PMA and GMA technologies. Now equipped with dual process capabilities based on - PTA (Plasma Transfer Arc)

and GMA (Gas Metal Arc) - the team can print an even more diverse range of alloys further broadening the scope and application reach.

PMA in particular allows for functional grading of alloys or printing discreet dual-alloy parts while GMA offers better process control with the added benefit of higher deposition speeds of up to 15 kg/hour.

These milestones mark Addept3D's transition from a start-up with a single machine into a growing service provider capable of serving regional and global markets.

### LOOKING AHEAD

Addept3D continues to build on the support of its shareholder and partner, WAAM3D, whose expertise has been instrumental in developing solutions for critical industrial applications across aerospace, space, and defence. WAAM3D's products and solutions are deployed in more than ten countries, spanning North America, Europe, and Asia.

With growing market validation, Addept3D aims to expand its capabilities and further support the adoption of WAAM for large-scale metal manufacturing, helping industries integrate the technology effectively into production environments.

ADDITIVE 3D ASIA

## FROM PIONEERS TO GLOBAL INNOVATORS IN ADDITIVE MANUFACTURING



### OUR BEGINNING

Founded in 2014 by husband-and-wife duo Jason and Paulene, Additive3D Asia (A3D) began with a simple yet ambitious mission: to serve as a one-stop hub for all things related to 3D printing. Starting as a small walk-in retail space at Burlington Square, next to Sim Lim Square, the duo introduced the public to the possibilities of turning digital designs into tangible products. From selling 3D printers and accessories to providing training and hands-on services, the company sought to demystify this revolutionary technology and make it accessible to businesses and enthusiasts alike.

As the industry matured, so too did the company's focus. Transitioning from a retail-driven model to industrial-grade contract manufacturing and low-volume production, Additive3D Asia repositioned itself to serve advanced industrial clients. This evolution was further supported by early investments in digital manufacturing platforms, enabling customers to upload files,



select materials, and receive instant quotations through algorithm-driven systems—well before digitalisation became an industry necessity during the COVID-19 pandemic.

Driven by the vision of “Manufacturing from Singapore to the World”, Additive3D Asia has since evolved into one of Southeast Asia's pioneering additive manufacturing service providers, recognised for its adaptability, quality, and relentless drive towards innovation.

*Photos and images - courtesy of Additive3D Asia*

### LATEST MILESTONES

Over the past decade, Additive3D Asia has achieved remarkable milestones that reflect both resilience and progress. The relocation to its state-of-the-art facility at CT Hub 2 and 7, Kallang Place, marked a major scaling-up of operations, symbolised by a grand opening event attended by industry leaders and media. This expansion enabled the company to better serve industrial clients with advanced equipment and streamlined production capabilities.

A key achievement was attaining ISO 9001:2015 certification, underscoring the company's commitment to world-class quality standards and process optimisation. This milestone positioned Additive3D Asia as a trusted partner for industries that demand consistency, precision, and reliability in their production processes.

Equally significant has been the company's digital transformation journey. By automating the quotation and ordering process, Additive3D Asia drastically improved efficiency and the customer experience, allowing clients worldwide to access its

services 24/7. Today, the company proudly serves customers across the US, Europe, India, Southeast Asia, and Australia, fulfilling its mission of bridging Singapore's advanced manufacturing expertise with global markets.

Throughout the COVID-19 crisis, Additive3D Asia demonstrated adaptability by producing essential items such as face shields and innovating with antibacterial 3D-printed solutions. This not only supported frontline needs but also showcased the versatility and speed of additive manufacturing in addressing urgent challenges. With a focus on expanding its expertise into the medical industry, Additive3D Asia is now a leading manufacturer of custom Cranial Remoulding Orthosis (CRO) helmets, rehabilitation 3D-printed casts, and other Orthotics and Prosthetics (O&P) devices.

Celebrating its 10-year anniversary in 2024, Additive3D Asia stands as a testament to resilience, innovation, and sustained growth in an industry where many peers have come and gone.

### GROWTH AND FUTURE PLANS

Looking ahead, Additive3D Asia has set its sights on scaling beyond Singapore to become a truly global player. Central to this vision is the establishment of a 24/7 smart factory equipped with industrial-grade additive manufacturing systems and integrated with Artificial Intelligence (AI), enabling higher volumes, faster turnaround times, and consistent quality for international clients.

The company's expansion strategy emphasises alignment with high-growth industries, benchmarking itself against leading counterparts in the US and Europe, and anchoring operations in sectors where additive manufacturing delivers maximum value. This includes industries such as

aerospace, healthcare, automotive, and consumer products, where precision, customisation, and efficiency are critical.

With a strong digital backbone, proven quality standards, international manufacturing certifications, and a decade of industry expertise, Additive3D Asia is well-positioned to lead the next chapter of Singapore's additive manufacturing revolution. Guided by its vision and entrepreneurial spirit, the company remains committed to innovation, excellence, and shaping the future of advanced manufacturing—at blistering speeds of multiple layers at a time.



## CHEMTRON: ADVANCING FUNCTIONAL 3D PRINTING ACROSS INDUSTRIES

In an era where supply chain volatility and rising production costs affect industries, Chemtron Pte Ltd has developed capabilities in AM, supporting companies with precision 3D printing and on-demand part production. Chemtron has a 15-year history in 3D printing, with recognition in the medical sector during Singapore's National Day Rally in 2009.

These insights, drawn from Tony, Chemtron's Business Development Manager, reflect the company's decade-long journey in adopting AM.



### A PIVOT INTO HIGH-GROWTH INNOVATION

Originally a distributor of diagnostic products, Chemtron moved into AM in 2015. The company identified AM as a technology with transformative potential. It initially supplied high-performance 3D printing equipment, providing comprehensive support including installation, training, service, and maintenance.

Over time, Chemtron evolved beyond equipment sales into a specialised 3D service bureau, offering direct, value-added services such as 3D printing and scanning. This shift enables customers to adopt AM more seamlessly, producing functional, end-use parts with precision and adaptability. Chemtron has focused on applications across aerospace, automotive, healthcare, and tooling sectors, demonstrating how AM can move from prototyping to production.

### CURRENT IMPLEMENTATION OF AM IN OPERATIONS

Chemtron enables customers to create strong, functional end-use parts using reinforced composite materials—achieving performance comparable to 6061 aluminium. This not only reduces lead times dramatically but also delivers durable, production-grade components on demand.

This focus directly addresses current industry pain points, offering robust solutions for low-volume, high-mix production challenges, reducing reliance on complex supply chains and mitigating rising costs. By enabling on-demand production, Chemtron provides the agility and efficiency that modern manufacturing demands.

### WHERE CHEMTRON IS AT

Chemtron currently operates in Singapore and Malaysia but is also expanding regionally. In May 2025, it signed an MOU at LIMA 2025 with an automotive and MRO company in Malaysia to set up a Centre of Excellence for high-strength composite 3D printing. This milestone reinforces the mission to move beyond prototyping and deliver real-world, production-grade solutions across critical industries.



### FUTURE OUTLOOK AND ECOSYSTEM SUPPORT

With AM technology now mature, Chemtron sees the primary challenge as enabling end-users to utilise it effectively. The company focuses on training, tailored support, and consulting to help businesses integrate AM into operations, improve production cycles, and achieve better design outcomes.

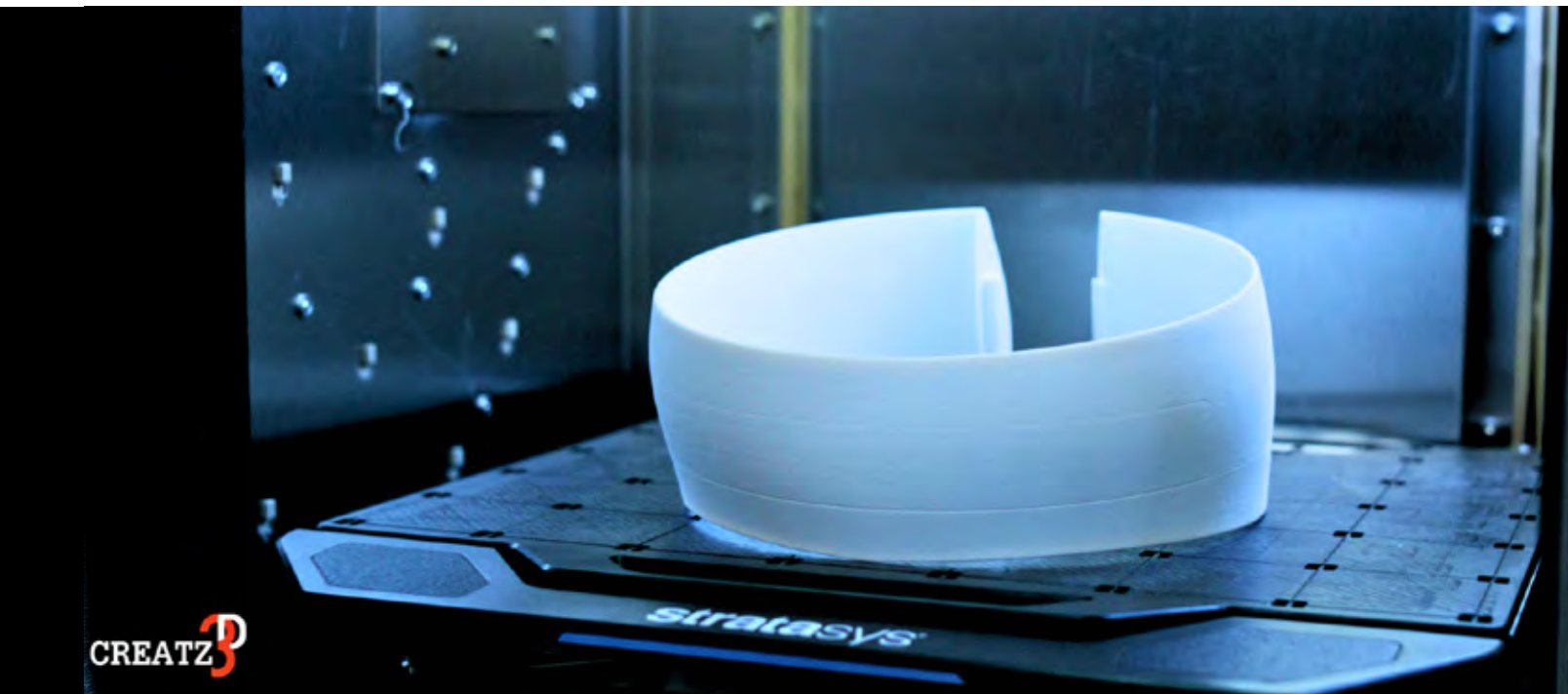
Collaboration with the NAMIC has been important to this journey. NAMIC has helped raise industry awareness of AM and facilitated connections with numerous companies across Singapore, enabling Chemtron to work with businesses seeking to understand and implement AM.

Looking ahead, Chemtron anticipates further breakthroughs as AM becomes more deeply integrated into manufacturing processes across diverse industries, supporting efficient, adaptable, and innovative production practices in the region.





## BUILDING SUPPLY CHAIN RESILIENCE THROUGH POLYMER AND CERAMIC AM



Since 2012, Creatz3D has been part of Singapore's journey in advancing additive manufacturing. What began as a niche technology for prototyping has now become a strategic capability transforming how industries design, produce and deliver. Across sectors such as aerospace, semiconductors and healthcare, AM is moving from the test lab to mainstream production, offering new ways to build resilience and accelerate innovation.

This progress has been shaped by a supportive national ecosystem. With NAMIC catalysing partnerships between industry, research institutions and government, companies like Creatz3D have been able to accelerate adoption and demonstrate impact in real-world applications. *"Forward-looking businesses should no longer ask if*

*AM fits into their model, but rather where and how soon,"* reflects Ms Sally Chuen, Application & Sales Manager of Creatz3D.

The company's experience has shown that the greatest impact comes when businesses adopt AM not as a one-off tool, but as a core part of their strategy. In today's environment—defined by fragile supply chains, sustainability imperatives and the need for leaner operations—AM provides agility through on-demand production, flexibility in part design, and efficiency in small-batch manufacturing. As Mr Sean Looi, General Manager of Creatz3D, notes: *"Additive manufacturing isn't just about making things differently, it's about thinking differently. We address complex pain points that conventional methods fall short."*

*Photos and images - courtesy of Creatz3D*

Two recent case studies highlight this shift. In the fast-moving consumer goods sector, Creatz3D worked on an adaptive label gripper for robotic arms. By redesigning the component with advanced polymer technology, the team reduced downtime, improved robot efficiency, and cut the bill of materials from over 200 to just 18 components. Turnaround time dropped from months to just 15 days.

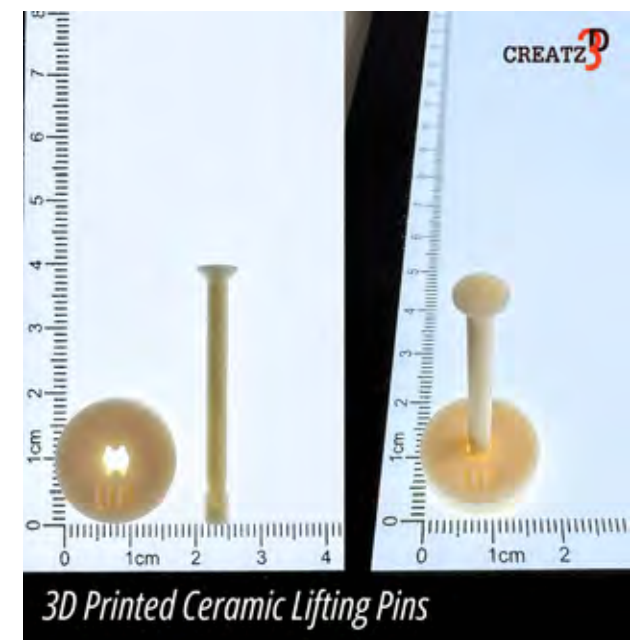
In the semiconductor industry, the company supported a client facing volatile supply chains and high-precision demands. By introducing customised ceramic lifting pins for CVD chambers, produced locally through 3D printing, they achieved tight tolerances and delivered 600 validated sets in weeks rather than months. The project demonstrated how digital inventories and localised production can mitigate risks in global supply chains.

These examples illustrate the broader value proposition of AM—where technology, when embedded into business strategy, creates not only new products but new ways of operating. NAMIC's role in convening partners and guiding capability development has been central in helping such projects scale beyond pilots to become part of everyday manufacturing practice.

As Singapore's AM ecosystem matures, Creatz3D's journey marks an important milestone: showing how companies, supported by NAMIC's platform, can translate advanced technologies into real-world business value. Together, they reflect the nation's broader trajectory: from niche beginnings to a strategic imperative shaping the next wave of industrial transformation.



3D Printed Polymer Label Grippers



3D Printed Ceramic Lifting Pins



## SINGAPORE'S AND SEA'S LEADING INTEGRATED AM FACILITY



### OUR BEGINNINGS

Founded in 2009 out of a passion for engineering and innovation, ELH Tech (S) began as a small workshop providing CNC manufacturing for the Aerospace and Oil & Gas sectors. Recognising industry shifts, in 2015 we expanded into the Additive Manufacturing (AM) sector as an equipment distributor in the APAC region, offering AM equipment, maintenance, and prototyping services, specialising in polymers.

In August 2019, ELH acquired the UCT Additive Manufacturing Centre, solidifying its leadership in

Singapore's 3D printing landscape. Subsequently, in 2023, the company became a fully integrated service bureau, offering both distributorships and end-to-end AM solutions.

Our strengths lie in being a comprehensive service bureau, with a full suite of solutions ranging from Reverse Engineering to 3D Printing, Product Design & Development, Conformal Cooling & Topology Optimisation, CNC Machining, and Post-Processing. These capabilities span a wide variety of materials, from polymers to metals.

Photos and images - courtesy of ELH Tech

### LATEST MILESTONES

In Q1 2025, ELH Tech initiated a strategic collaboration with the A\*STAR Additive Innovation Centre (AIC), hosted at the Singapore Institute of Manufacturing Technology (SIMTech) and supported by the National Additive Manufacturing Innovation Cluster (NAMIC).

This partnership aims to advance Additive Manufacturing developments in Singapore by accelerating the adoption of advanced metal and polymer AM technologies across the nation's industrial landscape.

Key aspects of this collaboration include:

- Strengthening ELH Tech's AM capabilities and capacities through close collaboration with AIC and SIMTech.
- Co-developing cost-effective, high-throughput metal and polymer AM technologies.
- Positioning ELH Tech as a leader in batch production and quality assurance.
- Enhancing ELH Tech's technological expertise and upskilling its workforce to deliver cutting-edge solutions to clients.
- Exploring new applications and components to unlock AM's full potential, targeting both established and emerging industries.



### GROWTH AND FUTURE PLANS

Looking ahead, ELH Tech will focus on sustainability efforts and the positive social impact it can bring to the AM community. The next phase will be to leverage AM technologies to support R&D in the manufacturing of sustainable products.

In addition, we will be ramping up our corporate social responsibility initiatives, extending support to underprivileged communities and non-profit organisations through greater involvement in social service programmes.

## PRECISION, PERFORMANCE, SUSTAINABILITY



Established in 2015 as a joint venture of Singapore-based precision engineering companies, Forefront AM (FAM) develops AM solutions for industries such as plastics tooling, semiconductors, medical, oil & gas, marine, and general engineering. Increasingly, its work also contributes to sustainability through a positive environmental impact, with 3D-printed parts playing a vital role in energy savings and reductions in carbon footprint.

Across these sectors, FAM has observed the growing demand for solutions that reduce energy costs, cut carbon emissions, and enable designs beyond the limits of conventional manufacturing. Traditional production methods often fall short

when it comes to customisation, material efficiency, and complex geometries: gaps that AM is uniquely positioned to close.

FAM addresses these challenges through a comprehensive “one-stop” AM solution, covering design, printing, and post-machining. Its core expertise lies in Laser Powder Bed Fusion (LPBF), supported by a wide selection of metal powders. The company collaborates with partners to deliver turnkey solutions and has achieved significant milestones, including ISO 9001 certification, underscoring its commitment to international quality standards. Notably, FAM partnered with Tan Tock Seng Hospital to

*Photos and images – courtesy of Forefront AM/EOS*

## FUTURE OUTLOOK

Looking ahead, FAM is investing in new capabilities such as high-purity copper (CuCP) and copper alloy zirconium (CuCrZr) printing on the EOS M290 1kW platform. With their superior electrical and thermal conductivity, these materials open doors to demanding applications like heat exchangers, inductors, and leak-free liquid cooling systems. The company has set an ambitious goal of producing at least 1,000 copper parts by 2026: an initiative that underscores its motto: *“Pushing Boundaries, Creating Breakthroughs.”*

### Printing Capabilities:

- FDM
- DMLS

### Materials:

- Nylon, ABS
- Metals (Copper CuCP, Copper Zirconium CuCrZr, Stainless Steel 316L, Maraging Steel, 420J2, CX and PH1)
- Others: ASA, PC ISO, PC M30i

**Certification:** ISO 9001:2015





## DIRECTING INNOVATION THROUGH LASERS

*"Where additive meets subtractive, Laser DED creates manufacturing's perfect hybrid – building what we need, fixing what we have, and redefining what's possible."*

- Dr Yin XiMeng - CTO, IDI Dynamics



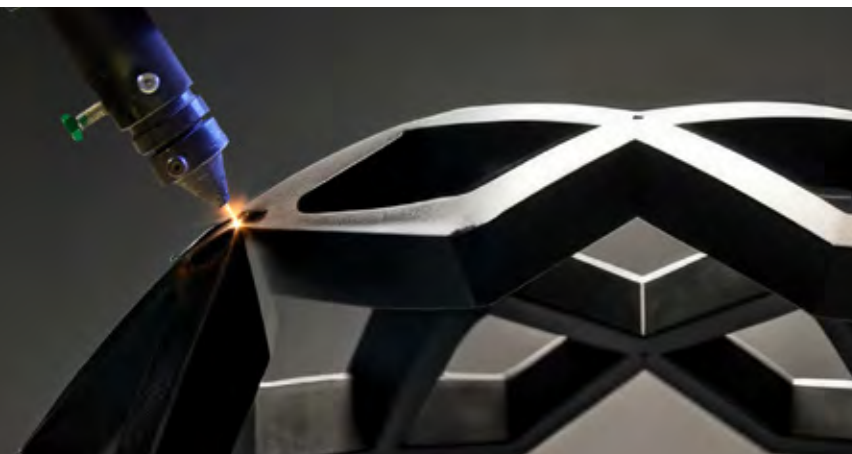
**Dr, Yin XiMeng**  
Chief Technical Officer, IDI Dynamics

Laser Directed Energy Deposition (DED) has come a long way since its experimental beginnings in the 1980s. Once used mainly for cladding and repair, it has since evolved into a hybrid process that combines additive and subtractive methods. In practice, this means complete components can be produced in a single setup: a shift that reduces waste and shortens lead times.

Founded in 1999 in Singapore, IDI Dynamics (formerly IDI Laser) has grown alongside Southeast Asia's industrial base, supplying laser systems for cutting, welding, and marking. Its work stretches across sectors, from manufacturing to public research, and includes custom integration projects for clients in the region and beyond.

Over the past decade, the technology has matured into a repeatable, scalable manufacturing route. AI-enabled monitoring and real-time parameter control now safeguard consistency, while multi-material and graded deposition techniques allow engineers to fine-tune properties within a single part. As costs decline and reliability improves, industries ranging from aerospace to energy are finding new uses for DED, not just in repairing legacy components but in manufacturing complex, high-value parts that align with circular economy goals.

*Photos and images - courtesy of IDI Dynamics*



### DED LASER TECHNOLOGY A BRIEF TIMELINE

**1980s:** Early research into laser-based metal deposition begins.

**1990s:** DED takes shape with systems like LENS developed in labs.

**2000s:** Commercialisation starts; used mainly for repair and cladding.

**2010s:** Adoption grows in aerospace and manufacturing; hybrid machines emerge.

**2020s:** Technology matures with better monitoring, AI integration, and broader industrial use.

## TOWARDS SUSTAINABLE MANUFACTURING

Sustainability is fast becoming a defining driver of DED adoption. Unlike traditional subtractive methods, which may waste up to 90% of feedstock, DED can use more than 90% of material input. With powder recycling and the ability to repair rather than replace critical components, it offers a pathway to circular manufacturing. For industries under pressure to cut carbon footprints and meet regulatory targets, this balance of efficiency and environmental benefit is increasingly compelling.



### LOOKING AHEAD: MOBILITY AND FIELD DEPLOYMENT

The next leap for DED may be in taking it beyond the factory. In partnership with ISDN Holdings Limited, IDI Dynamics is developing portable systems that mount on robotic arms or autonomous platforms, designed to perform in-situ repairs on offshore wind turbines, defence equipment, and other hard-to-reach assets.

Get in touch with IDI Dynamics:  
[https://namic.sg/am\\_directory/idi-dynamics-pte-ltd/](https://namic.sg/am_directory/idi-dynamics-pte-ltd/)

*"The next frontier for laser DED involves taking the technology out of controlled factory environments... performing in-situ repairs on everything from offshore wind turbines to military equipment in the field."*

- Chris Chan, CEO, IDI Dynamics

Some researchers even imagine drone-mounted systems capable of maintaining remote infrastructure. If realised, these combinations of mobility, precision, and material flexibility could change how industries handle maintenance: reducing downtime, cutting logistical hurdles, and extending asset lifespans.



## FROM CARBON TO SILICON IN MARITIME INNOVATION

### UNIQUE VALUE PROPOSITION

Mencast Marine is Singapore's only integrated marine propeller solutions provider, offering design, manufacturing, and repair under one roof. Its "Partner Perfect" approach is trusted by leading shipyards and operators worldwide, particularly in fast crew boats, tugboats, and specialised vessels.

What distinguishes the company is its pursuit of the Super Propeller—a new class of propellers significantly superior to conventional designs. These propellers are engineered using artificial intelligence (AI), advanced optimisation, and decades of operational data to deliver solutions that are greener, quieter, higher performing, and precisely tailored to each vessel.

### ADDITIVE MANUFACTURING TRANSFORMATION

The marine industry faces mounting pressures: greater efficiency, stricter emission standards, and supply chain vulnerabilities. To address these challenges, Mencast launched its transformation journey, From Carbon to Silicon.

Traditionally, propellers were produced through sand moulding, foundry casting, and extensive manual finishing. While effective, these methods are labour-intensive, resource-heavy, and limited in the shapes they could achieve.

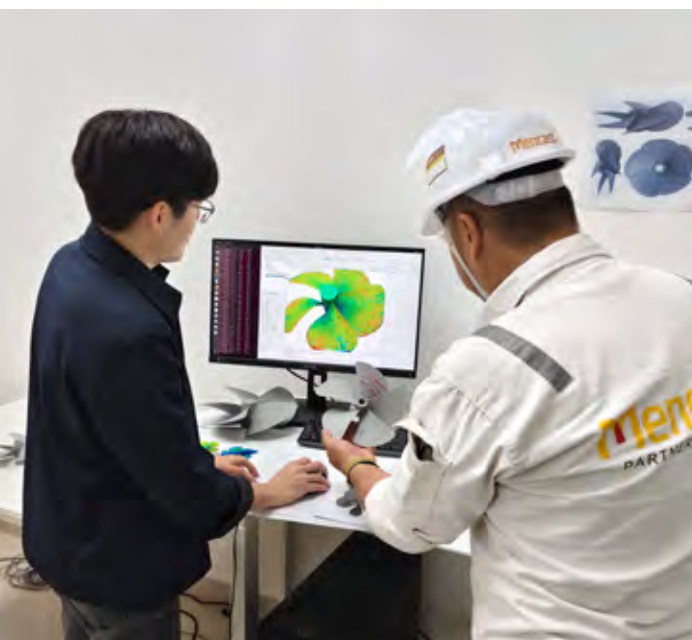
Today, Mencast pioneers Wire Arc Additive Manufacturing and hybrid laser-wire/powder processes. These methods accelerate production, significantly reduce material waste, and enable geometries impossible with casting.

### COMPANY BEGINNINGS

Founded in 1981 in Singapore, Mencast Marine began as a trusted propeller manufacturer serving one of the world's busiest maritime hubs. Over four decades, the company has become a cornerstone of the regional marine ecosystem, delivering high-quality propellers and stern gear to shipbuilders, shipowners, and repair yards across the region.

The foundation was built on craftsmanship in casting and machining. Through resilience and dedication, Mencast overcame manpower shortages, economic fluctuations, and evolving industry demands. This persistence has resulted in a track record of more than 10,000 propellers produced, repaired, and installed. This deep heritage remains the backbone of today's transformation.

*Photos and images - courtesy of Mencast Marine*



### LATEST MILESTONES

- **Marine Silicon Lab** established to integrate AI, optimisation, and computational fluid dynamics into advanced propeller design.
- **Centre of Intelligent Manufacturing** launched to scale robotic AM and automated post-processing systems.
- **Certification of fully AM propellers** by major classification societies, positioning Singapore at the forefront of global maritime innovation

These milestones reflect both technological progress and Singapore's role as a hub for next-generation marine propulsion.



A landmark milestone was the successful production of a fully additively manufactured propeller, built from hub to blade. Qualified by the American Bureau of Shipping and Lloyd's Register, this achievement proves that AM for large marine components is not theoretical but certified, real, and ready. It also lays the foundation for producing the AI-driven Super Propellers that represent the future of marine propulsion.

### NAMIC'S ROLE

The journey into additive manufacturing and digital transformation has been strongly supported by NAMIC. Acting as a connector and catalyst, NAMIC has curated projects, enabled collaborations with the Singapore University of Technology and Design, A\*STAR's Institute of High Performance Computing (IHPC) and Singapore Institute of Manufacturing Technology (SIMTech), and provided platforms such as ITAP for global visibility. Their involvement has accelerated Mencast's adoption of AM and strengthened its recognition on the world stage.



### FUTURE GROWTH PLANS

Looking ahead, Mencast Marine is scaling up with a Lighthouse Factory for robotic AM and automated post-processing systems, with plans to expand globally within the next five years. This vision includes distributed manufacturing partnerships worldwide, enabling localised production of intelligent propellers near end-users.

The company is also advancing AI-driven propeller design, leveraging its 40-year database and generative AI tools to create Super Propellers that are more efficient, sustainable, and capable of setting new global benchmarks.

The future lies not just in producing components but in reimagining propulsion itself. By combining deep heritage with digital innovation, Mencast is shaping marine solutions that are smarter, greener, and truly best-in-class.



## OPTIMISING SPARE PARTS SUPPLY THROUGH AM

**Scott Harding**  
VP – Engineering



When a ship is held up for weeks waiting on a spare part, the costs can be staggering. Few people understand these risks better than Pelagus 3D's Vice President - Engineering. He oversees the company's engineering, quality, and manufacturing operations, bringing with him a strong manufacturing background and a career that includes accolades for innovation, delivering and overseeing Rolls-Royce's first AM part into series production and the world's first safety-critical AM component for a nuclear reactor. His passion now lies in applying advanced manufacturing and digital tools to one of the most stubborn challenges in maritime and energy: keeping critical parts flowing when supply chains falter.

Maritime and energy operators depend on spare parts sourced through vast, multi-tiered networks. A single disruption, from conflicts to tariffs, can

ripple through the chain, delaying repairs and immobilising assets. Fleet managers, oil and gas operators, and state-owned enterprises are pressing suppliers to reduce these risks and make supply chains more resilient.

### ON-DEMAND MANUFACTURING AS A SOLUTION

Pelagus' model reframes parts as digital assets. Working with OEMs, its platform identifies which components can be reliably produced additively, then stores validated designs in digital warehouses. Instead of holding physical stock in ports around the world, operators can draw on these inventories to manufacture parts on demand—shipping directly to vessels, offshore platforms, or OEM assembly lines.

*Photos and images - courtesy of Pelagus 3D*

## OPERATIONAL FOOTPRINT AND CLIENT ENGAGEMENT

Adoption requires more than technology; it requires trust. Many customers initially view AM as a technical hurdle. But Pelagus adapts and demonstrates its maturity through practical solutions that strengthen their supply chains, reduce physical inventory and cut down procurement lead times.

For instance, the company's proprietary Part Assessment Tool has reviewed more than five million sets of end user spare part data, identifying the best parts for on-demand manufacturing. Rather than reverse engineering or duplicating parts, the Pelagus Platform works directly with OEMs to populate their digital inventories. This protects the OEM aftermarket businesses from grey-market spare parts while connecting them with willing end users requesting validated, on-demand components.

### LOOKING AHEAD

With a global team in place, Pelagus is scaling up, leveraging AI, automation, and platform effects to expand its reach. It sees on-demand manufacturing as a shift on par with the arrival of CAD: not a replacement for mass production, but a complement, especially for low-volume, high-complexity parts. For maritime and energy, the impact could be profound: supply chains that are leaner, more resilient, and able to keep fleets sailing and platforms running even when disruption strikes.





## ADVANCING DIGITAL MANUFACTURING WITH WAAM TECHNOLOGY

### INDUSTRY CONTEXT AND TRANSITION INTO AM

For more than a century, Vallourec has built its reputation on metallurgy, non-destructive testing, and corrosion expertise. In 2020, the company took a decisive step into additive manufacturing with the launch of its first Wire Arc Additive Manufacturing (WAAM) cell. That move signalled a shift in how Vallourec approached the design, production, and delivery of critical components, and laid the groundwork for its global digital manufacturing strategy. The momentum continued in 2023 with the opening of an Additive Manufacturing Competence Centre at its historic R&D and production site in Aulnoye-Aymeries, France.



In Singapore, WAAM has been embedded into Vallourec's Accessories plant, where high-quality tubular products are manufactured for the Oil & Gas sector. By situating AM within an established production line, Vallourec draws on its proven Quality Management System to ensure that additively manufactured parts meet the same traceability, performance, and reliability standards as conventional components. Industry recognition has followed: the facility is certified by Bureau Veritas and qualified by Fieldnode ICP, while also meeting standards such as API 20S, DNV-ST-B203, and ASME Section IX QW600.

**“WAAM gives us the power to respond rapidly when it matters most—delivering mission-critical components on demand, with speed, and reliability. In high-stakes environments, it’s not just a technology; it’s a lifeline.”**

... said Mr. Jithin Mathew, Regional Manager at Vallourec Asia Pacific

*Photos and images - courtesy of Vallourec*



### EXPANDING MARKET APPLICATIONS

Although WAAM was initially deployed to offer on-demand and customised solutions for their core Oil & Gas customers, where large-sized, high-performance components often require short lead times, the technology has since supported diversification into new markets. In maritime, WAAM opened doors to the production of corrosion-resistant, mission-critical components; in defence, it supports secure, localised manufacturing and prototyping; and in rail, it offers solutions for the repair and replacement of large, complex parts with minimal downtime. These applications reflect the wider potential of WAAM as a leading tool for distributed, sustainable and resilient manufacturing.

### LOOKING AHEAD

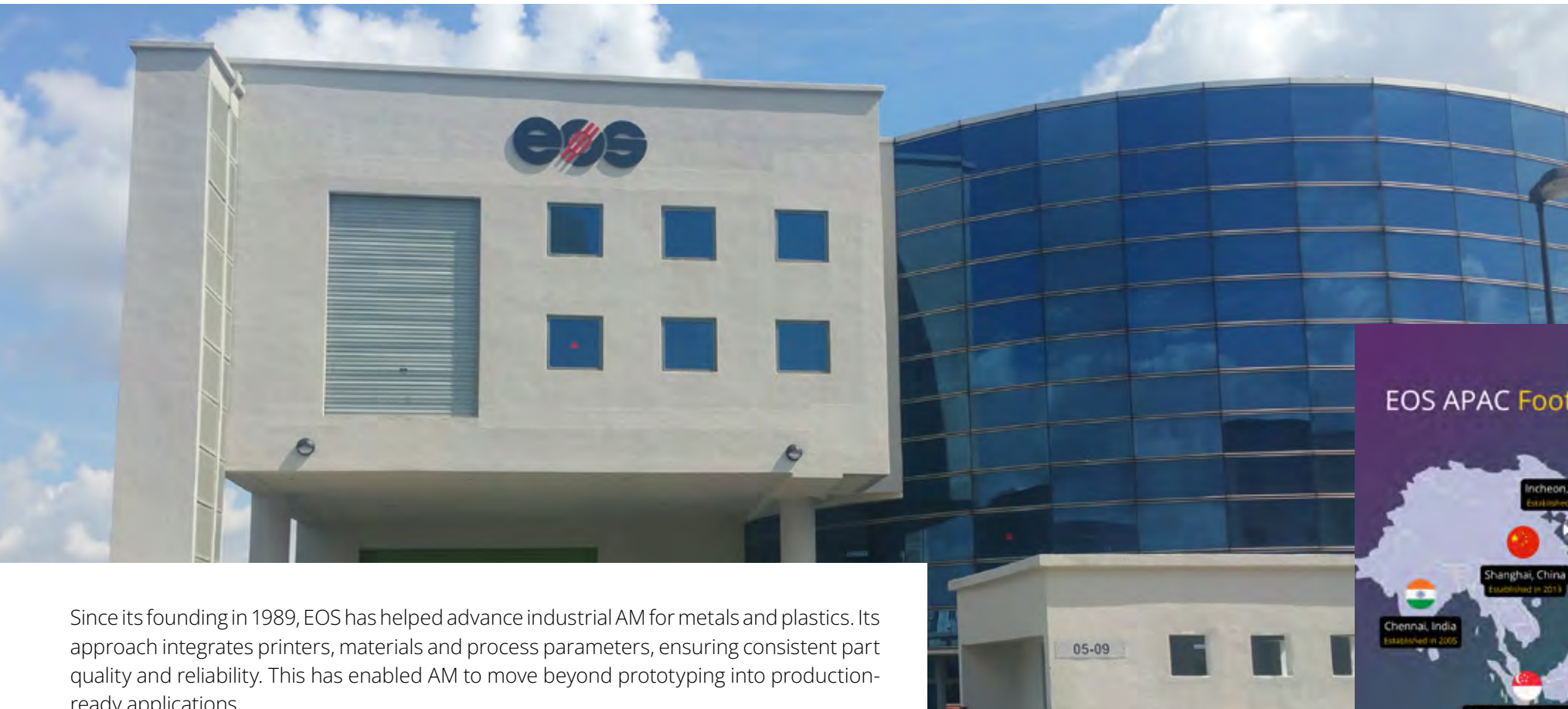
To meet growing industrial demand locally and regionally, Vallourec is exploring next-generation WAAM systems capable of producing larger and more complex parts. Future developments include introducing WAAM-on-substrate capability that combine manufacturing and repair applications, reflecting its proactive approach to scaling its AM capabilities in line with customer needs and market evolution.

As industries increasingly adopt sustainable, flexible and digitally advanced manufacturing solutions, Vallourec's WAAM facility in Singapore continues to innovate and drive the forward-thinking vision of manufacturing with WAAM technology.



## ADVANCING RESPONSIBLE MANUFACTURING THROUGH ADDITIVE TECHNOLOGIES

Manufacturing industries face increasing pressure to improve efficiency while reducing environmental impact. Traditional production methods are often resource-intensive and restrictive in design flexibility. Additive manufacturing (AM) offers an alternative pathway, enabling reduced waste, faster prototyping and more adaptable production models.



Since its founding in 1989, EOS has helped advance industrial AM for metals and plastics. Its approach integrates printers, materials and process parameters, ensuring consistent part quality and reliability. This has enabled AM to move beyond prototyping into production-ready applications.

Beyond machines, EOS has invested in consultancy, digital workflows and training to make AM adoption more accessible. Many companies, particularly those new to the technology, rely on this broader ecosystem to test and scale applications in a practical way.

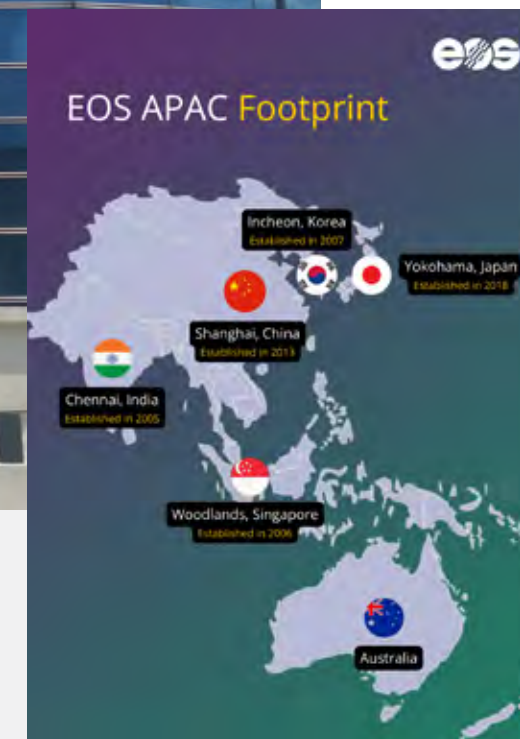
*Photos and images - courtesy of EOS*

## ADDRESSING GLOBAL MANUFACTURING CHALLENGES

*EOS APAC office in Singapore*

Sustainability remains one of the greatest challenges in the sector. Conventional manufacturing often produces more waste than necessary, consumes excess energy and requires multiple production stages. By contrast, AM enables lightweight designs, part consolidation and more efficient material use. Companies deploying AM have found that these efficiencies can reduce environmental impact while supporting higher performance and faster development cycles. Flexibility is another critical factor. With increasing demand for customised solutions, AM allows for geometries and features that conventional processes cannot easily achieve, opening opportunities across sectors from aerospace to medical devices.

Asia Pacific has become one of the most active regions for advanced manufacturing and AM adoption. EOS, among others, has expanded its presence here, with offices across the region and a headquarters in Singapore. This regional footprint enables closer collaboration with local industries, faster response to customer needs and the development of skilled AM talent. Such strategies also align with national agendas: China's push towards high-tech manufacturing and Singapore's Smart Nation initiative both emphasise advanced digital and production technologies. A local AM presence supports these ambitions, while also strengthening supply chains and encouraging cross-border collaboration in a fast-changing market.



Looking ahead, EOS views AM as a driver for more responsible production, reducing material waste, conserving energy and supporting flexible, customised manufacturing. Its 35 years of experience illustrates how AM can be applied to solve enduring industrial challenges, while supporting regional ambitions in sustainability and digital transformation.



## ADDITIVE MANUFACTURING SERVICE BUREAU EXCELLENCE FOR THE MOST DEMANDING INDUSTRIES



For decades, Makino has been known for its precision in CNC machining. Now, the company is extending that expertise into additive manufacturing, building a Service Bureau at its Additive Manufacturing Centre of Excellence in Singapore. The goal is clear: to combine the strengths of additive and subtractive methods, and push the boundaries of what can be designed, repaired, and produced.

Makino's AM Service Bureau grew from a simple observation, that not every manufacturing challenge can be solved by machining alone. Surface engineering methods such as thermal spray or plating often lack the bonding strength or geometric flexibility needed for high-value parts. Makino saw AM as a way forward and developed its own systems based on Laser Metal Deposition (LMD) and hybrid manufacturing. "AM is not just an advantage, it's a necessity for staying ahead," as the team puts it. By building machines that integrate additive and subtractive processes, Makino ensured precision and reliability for real-world production.

Industries such as aerospace, energy, medical, and tooling often work in fast prototyping cycles where designs shift quickly and conventional methods can't keep pace. Here, AM provides new possibilities: from producing intricate geometries and custom parts to repairing high-value tooling with multi-material solutions. Hard-to-machine alloys and designs with complex internal channels are no longer barriers but opportunities for innovation.

Makino emphasises that it is not just providing machines but delivering complete solutions. "We go beyond printing: from material selection and powder customisation to quality assurance and precision post-processing," the company explains. The AML900 LMD machine, equipped with an inert chamber for reactive metals such as titanium, exemplifies its focus on safety and precision in high-performance applications. This integration of additive and subtractive techniques creates streamlined workflows that deliver parts ready for deployment.



Compared to subtractive machining, Makino's AM approach significantly reduces material waste, especially for complex geometries. It also helps localise production, reducing dependence on fragile global supply chains. In repair work, AM extends the lifespan of costly parts instead of scrapping them, lowering both costs and environmental impact.

As the landscape of advanced manufacturing continues to evolve, Makino is investing in materials research, multi-material capability, and digital workflows that support industries where traceability and qualification are essential. The focus is shifting from prototyping to production-level AM, embedding additive processes within broader industrial practice. "Our goal is to make additive an accessible, industrial solution... integrated seamlessly with existing operations," says the team.



Hybrid manufacturing platform combines additive and CNC machining on a single, fully integrated platform —and with it comes a significant leap in automation.



Our in-house capabilities span the production and characterisation of an extensive material portfolio of high-quality metal powders dedicated to advancing metal additive manufacturing.

*Photos and images - courtesy of Makino Asia*



## EMPOWERING LIGHT : SHIFTING THE PARADIGM OF PRECISION OPTICS FABRICATION THROUGH ADDITIVE MANUFACTURING.



Fig 1 : Assortment of optics and optical modules manufactured by Moveon.

The optics and photonics industries are undergoing rapid transformation, driven by breakthroughs in materials, manufacturing, and digital technologies. Innovations such as additive manufacturing of optical components, integrated photonics, and advanced laser systems are reshaping applications across healthcare, communications, defence, and consumer electronics.

The surge in demand for faster data transmission, compact sensing devices, and energy-efficient solutions is accelerating research and commercialisation. At the same time, collaborations between academia, startups, and established players are shortening development cycles, pushing the industry toward smarter, smaller, and more cost-effective solutions that are redefining how light-based technologies power the modern world.

Moveon's inroad into additive manufacturing began when we were confronted with the need to leverage on technologies beyond the limitations of "Classical optics" fabrication. Unlike classical optics which relies on ray & wave theories, "Modern optics" manipulates light at the quantum and nanoscale for information, sensing, and transformative technologies. Through the use of

additive manufacturing techniques like 2-Photon polymerisation (2PP) & Direct Laser Writing (DLW), we were able to create 3D printed prototypes that proved cost effective for design validation during early stage of product development.

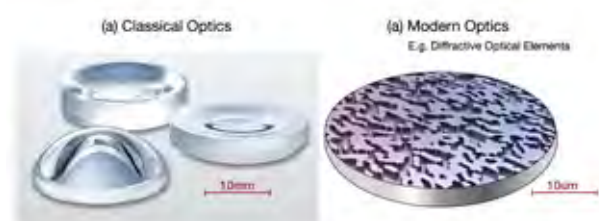


Fig 2 : Comparison between classical and modern optics. RHS – Diffractive optical elements, "DOEs" can now be manufactured via 3D printing techniques like 2-Photon Polymerisation.

Following advances made in materials, equipment & in-house developed production capabilities, we realised very quickly that beyond prototype fabrication, we were able to create "Master" copies via 3D printing which can then be used for scalable production via wafer level optics, "WLO", nanoimprinting techniques. This development opens up possibilities for low-cost fabrication of not only optical components, but also other products that can benefit from nanofabrication, an example being microfluidics.

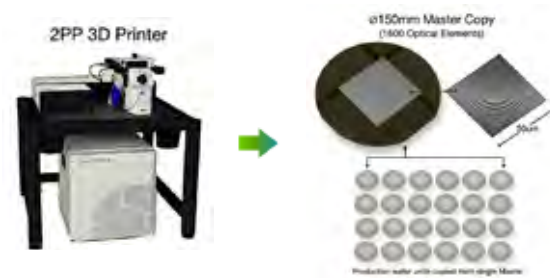


Fig 3 : Cost-effective manufacturing of Diffractive optical elements "DOEs" made via wafer level optics nanoimprinting from 3D printed Master copy.

Photos and images - courtesy of Moveon

Moveon's continued embrace of additive manufacturing took a fillip in 2023 when we embarked on the prospect of developing our proprietary 3D printing technologies for ophthalmic lenses suited for smart glasses.

Today's smart wearables (AR/MR wearables) do not cater to the prescription needs of the end-user in a satisfying & cost-effective way. Prescription "optical inserts" of "add-ons", if available, are costly & cumbersome to install.

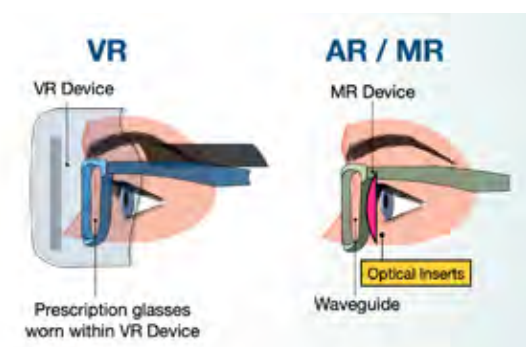


Fig 4 : Smart wearables (VR, AR, MR devices) does not come with viable solutions to address prescription needs of end-users. This is impeding smart wearable adoption.

Considering that more than 70% of the global demographics require prescription, the lack of a sustainable yet effective solution is a major deterrent to smart wearables adoption. Customised, affordable prescription is necessary to ensure wide-spread & unhindered adoption. 3D-printed ophthalmic offers the possibility to resolve challenges associated with conventional manufacturing of prescription optics for smart wearables while ensuring scalable production at favourable price points within comparable fabrication lead time.

In 2023, Moveon tapped on the support of the National Additive Manufacturing Innovation Cluster, NAMIC and applied for an R&D grant via Enterprise Singapore's Enterprise Development Grant (EDG) scheme, this is an R&D grant that helps Singapore SMEs grow and transform through innovation & productivity upgrading.

Moveon embarked on the development of our 3D printing technology in Dec 2023 upon successful application of the grant titled "3D Printing of Ophthalmic Embedded Waveguides". Over the next 20 months, a dedicated team of R&D engineers were channelled towards the development of our unique 3D printing process, culminating in our current Gen3 3DPO Printer capable of printing ophthalmic lenses to a resolution suited for smart wearables. The next improved version, Gen4-3DPO is scheduled for debut at Formnext 2025 in November 2025.

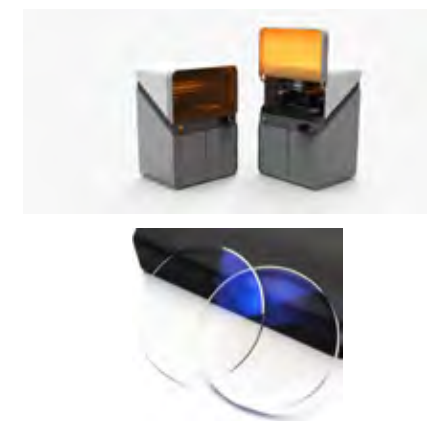


Fig 5 : Top : Industrial design of Gen4-3DPO Printer. Bottom, lens printed from current Gen3-3DPO Printer.

The groundwork laid through the development of 3D Printed ophthalmic presents an opportunity for Moveon to continue improving the technology, enabling the manufacture of precision optics of diversified forms and applications. Through this development, we've successfully addressed one of the most challenged aspect of 3D printed optics : Form accuracy & surface finishing – both instrumental in optics performance in a given application.

By continuing to work with NAMIC, Moveon will continue to push boundaries in advanced manufacturing and create value propositions for our Customers. We will stay relevant in a climate where evolving needs & opportunities will continue to favour companies vested in shifting paradigm.



## ADVANCING SEMICONDUCTOR SUSTAINABILITY THROUGH AM INNOVATION

### DRIVING INNOVATION THROUGH ADDITIVE MANUFACTURING SOLUTIONS

As semiconductor manufacturing advances toward higher performance, sustainability, and digitally enabled models, many industry players are turning to additive manufacturing (AM) as a complementary capability.

Entegris, a global provider of advanced materials and process solutions, began exploring AM as a way to address the limitations of conventional production methods, which often involve multi-step processes, complex assemblies, and supply chain vulnerabilities.

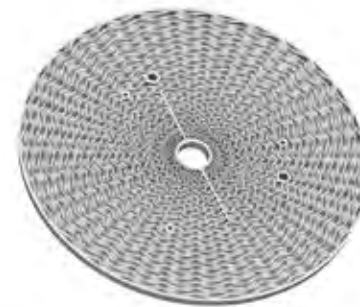


DfAM heat exchanger simulation

*Photos and images - courtesy of Entegris*

The company's adoption of AM started with in-house applications such as jigs and fixtures, before moving into product development for semiconductor equipment and components. By applying Design for Additive Manufacturing (DfAM) principles, Entegris has sought to improve material efficiency, enhance thermal and pressure performance, and shorten prototyping cycles.

Its approach has been methodical: transitioning selected components from traditional methods to AM to reduce lead times, optimising designs through DfAM to improve performance, and experimenting with alternative materials to maximise the advantages of 3D printing. These steps have enabled the company to introduce components that align with broader industry goals of agility, sustainability, and supply-chain resilience.



DfAM – E-chuck base



### STRATEGIC PARTNERSHIPS AND LOCAL IMPACT

Collaboration has been central to Entegris' AM journey. A key partnership with NAMIC and A\*STAR's Singapore Institute of Manufacturing Technology (SIMTech) began with a feasibility study in 2018, validating the use of AM in the semiconductor domains. This collaboration expanded into a three-year joint lab in 2020, advancing computational modeling for powder spreading, failure mechanism analysis, and DfAM-driven product design, while also exploring metals, ceramics, and hybrid materials for demanding purification and filtration applications—resulting in practical breakthroughs such as 3D-printed metal membranes for high-performance systems.

In 2023, Entegris established the Singapore Digital Manufacturing Technology Centre (SDMTC) at Jurong Innovation District as a global AM hub, combining advanced 3D printing with simulation, data analytics, and digital thread capabilities. The centre has secured 44 patents, underscoring its innovation capacity and strategic focus on AM. In 2024, the company received the Industry Partner Recognition Award from Minister for Manpower Dr Tan See Leng at SIMTech's 30th anniversary, highlighting its role in Singapore's AM ecosystem.

### SHAPING THE FUTURE OF SUSTAINABLE SEMICONDUCTOR MANUFACTURING

Looking ahead, AM stands as a powerful enabler of sustainability in semiconductors: extending the life of legacy equipment, refurbishing aging components, and producing high-performance parts with less waste and a lower carbon footprint.

Entegris is broadening its AM footprint globally while strengthening local know-how, enabling five SMEs in adoption and offering testing, post-processing, and precision machining to build a more resilient manufacturing ecosystem.

Its journey illustrates how AM can tackle longstanding industry challenges, and how the shift to sustainable, high-performance manufacturing is driven as much by partnerships and infrastructure as by technology itself.





## COLLABORATION IS KEY – ESTABLISHING LEADERSHIP IN AM EXCELLENCE



The AMCoE exhibiting at Industrial Transformation Asia Pacific 2023

The ASTM Additive Manufacturing Center of Excellence (AMCoE) was established in 2018, with NAMIC as one of five partners. The AMCoE is a young endeavour in ASTM's 127-year history, yet it has grown into a global thought leader in AM driven by internationally recognised standards and extensive experience of over 50 experts around the world. The AMCoE has even established a physical Asia-Pacific headquarters in Singapore with support from the Economic Development Board – a strategic decision reflecting the leadership and reliability of Singapore's AM ecosystem.

One of the AMCoE's key programs is Research-to-Standards (R2S), where standards development is accelerated by targeted research efforts by industry and academia collaborating to address standards gaps hindering further adoption of AM.

It reduces the average time of standard publication from a few years to as short as 6 months, resulting in 78 published AM international standards and counting, with almost as many currently in development.

Our activities in Singapore in the past 7 years have perfectly aligned with our vision to facilitate collaboration between government, academia, and industry to advance AM standardisation and expand ASTM and our partners' capabilities. With support from NAMIC, R2S efforts yielded almost 10 standards published and in-development from Singapore alone, ranging from material specifications to design and test method standards. Notable examples include AM Design standard F3413-19e1 - *Guide for Additive Manufacturing — Design — Directed Energy Deposition*, and test

Photos and images - courtesy of ASTM

method standard in development WK75901 - New Test Method for Additive Manufacturing — Test Artifacts — Miniature Tension Testing of Metallic Materials. This has been made possible primarily with the support of NAMIC's network of research hubs and is a testament to the strong relations between various organisations here.

Our training programs, spanning all major AM topics including safety, and Qualification & Certification, have been well-attended in Singapore. Our collaborations with various NAMIC hubs have enabled over 100 unique individuals to gain both foundational and advanced knowledge in AM just within the last 2 years, part of 300 across the entire Asia region. This is a key indicator that standards-based AM education is essential to continuous professional development and talent pipelines of organisations to accelerate AM adoption.



ASTM Certificate Course in Methods of Qualification and Certification in AM, held jointly with A\*STAR Singapore Institute of Manufacturing Technology

Certification programs such as AM Facility Safety and AM Quality certifications are also gaining traction in the region, following greater industry recognition of the necessity for AM-specific standards and certifications. These inspire greater assurance in companies and quality of AM products, enabling end users to adopt AM more confidently, or even for research institutes seeking to produce high quality research outputs.



Dr Alex Liu, Director of Global Advanced Manufacturing Programs (Asia Region), presenting the AM Facility Safety certification to AMCen, Philippines

As we celebrate our recent achievements in R2S and education & workforce development programs, the ASTM AMCoE remains focused on the expansion of AM adoption in industry. Being the largest growth area by region in AM, Asia will definitely see more research, training, and certification activities, where we will continue to establish new programs and partnerships to reaffirm our commitment to enhancing the capabilities and interconnectedness of the global AM ecosystem. NAMIC will remain as an indispensable partner in this region, supporting our efforts through facilitating public-private partnerships, expertise, and building a robust AM ecosystem in Singapore bringing together government, industry, and academia.

# Acknowledgements

This commemorative publication, Celebrating 10 Years of Additive Manufacturing Innovation, reflects a decade of creativity, collaboration, and relentless pursuit of innovation within our Additive Manufacturing (AM) community.

We extend our heartfelt gratitude to:

- **Our Leaders and AM Stewards** for their guidance, vision, and unwavering support.
- **NAMIC Hubs, the NAMIC CLP Team, and IFPs** whose dedication has shaped the various projects, including this publication project.

To every contributor—whether through design, experimentation, documentation, or behind-the-scenes support—thank you. Your collective efforts are advancing additive manufacturing, strengthening the ecosystem layer by layer.

Together, we have created work that honours the past, celebrates the present, and inspires the future. This journey, and this book, are a testament to your support and contributions, and together they lay the groundwork for even greater possibilities ahead.

**Presented by the NAMIC Editorial Team**

## Copyright & Disclaimer

© NAMIC. All rights reserved. No parts of this publication may be reproduced without prior permission from the publisher.

Whilst every effort has been made to ensure accuracy of information, no liability will be accepted by NAMIC for any errors that may appear in this publication.

The information in this publication has been updated as accurately as possible until mid-October 2025. Should there be any inaccuracies, please write to the NAMIC Team at:  
**[namicinfo@namic.sg](mailto:namicinfo@namic.sg) | [lee\\_wei\\_fen@namic.sg](mailto:lee_wei_fen@namic.sg)**

# Precision Laser Solutions



## Laser Cladding (Shaft & Spindle Repair)



Pin Point Accuracy



Tailored to heavyweight assemblies



Repeatable Laser Automation



Open, Mobile Laser Welding Systems

## Precision Microwelding



0.5mm Microwelding



Used for Needles / Medical Devices

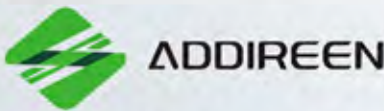
## Surface Hardening



Laser Hardening Accuracy



Quality Laser Hardening For All Industries



# Green Laser Solutions

## 3D Print the Impossible in Pure Copper



Copper Cold Plate



Copper IGBT



Copper Induction Coil



Optical Communications Module

## Why 3D Print Pure Copper?

- Exceptional thermal and electrical conductivity performance
- Highly efficient internal cooling and heating channels
- Intricate complex designs impossible with traditional machining



Tel: +65 6743 2325  
Email: [sales@eye2eye.com](mailto:sales@eye2eye.com)  
Website: [www.eye2eye.com.sg](http://www.eye2eye.com.sg)

Book a Free  
Scan & Print Demo



# Laser Precision Within Reach



DED Specialists  
Solutions Provider

Cost Effective,  
Fast Turnaround



Trusted by Singapore  
R & D Institutions

Industry Leading One-Stop Laser Solutions Provider  
Laser Cutting | Laser Welding | Laser Marking  
Customised Laser and LiDAR Solutions

IDI DYNAMICS Pte Ltd  
(Formerly IDI Laser Services Pte Ltd)

Blk 514 Chai Chee Lane  
# 05-01, Singapore 469029

Tel: (65) 6445 0771  
Email: [admin@idi.com.sg](mailto:admin@idi.com.sg)  
[www.idilaser.com](http://www.idilaser.com)

A Subsidiary of:

