

MANUFACTURING MATTERS

January 2019 | Issue 1

A publication of the Singapore Institute of Manufacturing Technology

FEATURE OPTIMISED CONTAINER



PRECISION MATTERS

Advanced Corrosion Protection -
From Assessment to Training

RESEARCH SPOTLIGHT

Novel Laser Pulses For Cost -
Effective, High-Precision, Versatile
Laser Machining and Heating
Applications

INDUSTRY ALLIANCE

Big Rewards after
Operations and Technology
Roadmapping

NOTE FROM EDITOR...

Dear Friends and Industry Partners,

Over the past 20 years, global container traffic has grown. In future, although worldwide container traffic is predicted to grow with increasing population, wealth, consumption and industrialisation trends, weaker economic growth and rising cost are expected to intensify competition in the shipping industry.

To survive such volatile business environment, more innovative ways to overcome such challenges are adopted by companies. CEC Systems Pty Ltd has chosen this option through its innovative COLLAPSECON®, a 40-foot container when empty, can be folded to save space and thus, cost on return port trips. Collapsing empty shipping containers during transfer between ports lowers the use of space, reduces costs of relocation, increases security, generates greater visibility and minimises waste at every point in the supply chain for the shipping and logistics industries.

Read on in the following pages for the full story on CEC Systems' journey to upgrade its COLLAPSECON® in a collaboration with SIMTech.

WISHING OUR FRIENDS AND INDUSTRY PARTNERS A HAPPY AND PROSPEROUS LUNAR NEW YEAR



Swee Heng

Editor, Manufacturing Matters

Email: shlee@SIMTech.a-star.edu.sg



OPTIMISED CONTAINER

Collapsible container lightened through weight and material optimisation

To maximise space utilisation of empty shipping containers on return port trips after dropping off goods, collapsible containers are a logical choice. Especially so in a volatile global trade environment characterised by cut-throat competition. The collapsible container system improves operational efficiency, enhances return on investment and reduces the impact on the environment.

CEC Systems Pty Ltd, an industrial technology company, develops integrated solutions to the complex global challenges facing the shipping and logistics industries. Its COLLAPSECON® system enables 4 empty containers to be folded sideways and then combines them to form a single container fit for transport and storage. This feature achieves at least a quarter size space saving of the 40-foot container. Unlike other collapsible containers, the COLLAPSECON® system's end frame designs enables it to be stacked like a standard container even in its collapsed state. This means that it can be stored at empty container parks or at the bottom of a vessel during transit, with no disruption to the loading/unloading process.

Collaboration with CEC Systems

A major issue faced by the company was its first iteration of COLLAPSECON® units were nearly 2 times heavier than an industry standard container due to over-engineering to meet industry ISO standards and to pass



product certification. High strength steel hinges for the load-bearing frame connectors were costly to procure and machine. Additionally, the moving wall and floors introduced advanced sealing requirements. SIMTech was engaged in 2017 to optimise the weight of the container, reduce material cost and provide material degradation assessment of potential adhesive and sealing solutions.

Partnering with SIMTech, CEC Systems aimed to optimise the COLLAPSECON® C-400 design for mass production and optimal operational use. To achieve the numerical weight optimisation outcomes, SIMTech utilised the



commercial software package Altair HyperWorks/OptiStruct to enable the team to find potential solutions for weight reduction, while lowering manufacturing costs. Separately, the other team members investigated the performance of adhesive and seal materials under extreme temperature, UV and salt water exposure conditions.

The project produced a container that is potentially 30 per cent lighter than the original COLLAPSECON® C-400 design in various critical sections, whilst reducing material requirements and increasing manufacturing efficiency. High cost hinge parts were redesigned to allow for reduced manufacturing cost and lower grade material solutions. The numerical models also allowed the team to critically assess container loading conditions unique to the collapsible design, such as modelling of occurring stresses in floor and roof during the collapsing process, reducing end-door deflections during collapsing

of the container system and lifting of the system in its collapsed state.

CEC's partnership with SIMTech has resulted in major system upgrades for the COLLAPSECON® containers, leading to the design of the new generation C-401 containers currently undergoing final optimisation studies. Confident of its potential, CEC Systems established its global operations office in Singapore to be strategically located at the gateway to European, ASEAN and Chinese markets.

With the current design improvements, the container becomes more competitive for the shipping and logistics market by reducing its weight and manufacturing cost. The collapsible containers integrate seamlessly into the shipping and logistics industry, so that no major changes are necessary to use the units in day-to-day shipping and logistics operations.

For enquiries, please contact
Dr Chen Wei Long, Director, SMC
 wlchen@SIMTech.a-star.edu.sg
 Web: www.a-star.edu.sg/SIMTech-SMC

“SIMTech’s assistance in optimising the COLLAPSECON C-400 has been fundamental to the development of the enhanced COLLAPSECON C-401. We have been able to develop a superior product that is simpler to manufacture with an increased load capacity.”

Mr Nicholas Press, Managing Director & CEO
 CEC Systems Pty Ltd

SMC Sustainable
 Manufacturing Centre
 Embracing Sustainable Manufacturing



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 on Sustainable
 Manufacturing Centre



T-UP ADVANCES ADDITIVE MANUFACTURING CAPABILITIES FOR SME

Being a young start-up company in additive manufacturing, Forefront Additive Manufacturing Pte Ltd (Forefront AM) needs to hasten its pace in equipping itself with AM design and processing skills. To drive this process, a SIMTech researcher was seconded to the company via the T-Up programme, through which relevant skills were transferred to the company.

Forefront AM, established in 2015, is a joint venture of precision engineering companies in Singapore. Its vision is to be the top global supplier in the complete process of additive manufacturing— from AM design to AM post-processing. Well-equipped with precision engineering and tool designing skill sets, one of Forefront AM's key competencies is in fabricating conformal cooling channel mould inserts.

Through the T-Up, capabilities in AM design optimisation and reverse engineering were honed to make part fabrication more effective. In addition, a know-how was developed to reduce the time and cost of fabrication, improving the price competitiveness of products. As a result, this enhanced the company's business growth and customer satisfaction, as well as increase the acceptance of additive manufacturing by the moulding industry.

“ T-Up programme promotes mutual learning and sharing of experience and skills that enable the companies to improve performance through better use of technologies ”

Mr Wu Yong Lin, Managing Director, Forefront AM

*Note: The T-Up initiative, a multi-agency effort by A*STAR, the Economic Development Board, SPRING Singapore (now Enterprise Singapore), IE Singapore (now Enterprise Singapore), and the Infocomm Development Authority (now Media Development Authority), involves seconding RSEs to local enterprises to access the pool of R&D talent in Research Institutes.*

For more information, please contact **Dr Chen Wei Long, Director, Staff Development Office** at chenwl@SIMTech.a-star.edu.sg



T-UP DEVELOPS LASER-AIDED ADDITIVE MANUFACTURING TECHNOLOGY CAPABILITIES

3D Metalforge, which focuses on metal and polymer printing for industrial and commercial end uses, has always been innovating and looking out to develop cutting-edge Additive Manufacturing (AM) technologies to support its world-class customers.

In the beginning, the company provided 3D printing services for plastics, resins and other polymers through 3D Matters, one of the earliest additive manufacturers in Singapore. In 2017, 3D Metalforge was set up to focus on metal printing and collaborated with SIMTech to acquire 3D metal printing capabilities to extend their business. It invested in laser-aided additive manufacturing (LAAM) system for printing of large format 3D metal engineering structural parts to provide printing service to the marine, energy and transport sectors which require such large structures. The system has been successfully developed and delivered to 3D Metalforge.

In 2018, 3D Metalforge participated in the T-Up programme which seconded a SIMTech researcher to help the company establish the capability in operating the LAAM system. This includes tool-path planning and generation, optimisation of process parameters for different materials and training of staff in operating the system.

“ The T-Up programme has helped to facilitate the smooth implementation of the LAAM technology housed in 3D Metalforge's state-of-the-art Additive Manufacturing Centre. We are now capable of meeting growing demands for cost-effective, large printed parts for end-use across various industries ”

Mr Mathew Waterhouse, Chief Executive Officer, 3D Metalforge

This T-Up project has enabled 3D Metalforge acquire the capabilities in printing three types of materials. SIMTech researcher has successfully trained 4 staff competent in operating the LAAM system. Since then, 3D Metalforge has gained potential customers from the oil & gas, marine & offshore and automotive industries.

*Note: The T-Up initiative, a multi-agency effort by A*STAR, the Economic Development Board, SPRING Singapore (now Enterprise Singapore), IE Singapore (now Enterprise Singapore), and the Infocomm Development Authority (now Media Development Authority), involves seconding RSEs to local enterprises to access the pool of R&D talent in Research Institutes.*

For more information, please contact **Dr Chen Wei Long, Director, Staff Development Office** at chenwl@SIMTech.a-star.edu.sg



BIG REWARDS AFTER OPERATIONS AND TECHNOLOGY ROADMAPPING

Apart from productivity gains, company initiated expansion, new plans and innovative products

Rigel Technology (S) Pte Ltd which participated in SIMTech's Operations and Technology Roadmapping (OTR) programme in August 2015 gained big from the journey. A provider of eco-friendly bathroom solutions, it aims to chart their R&D direction and innovate on their future product line-up for the next 5 years. Other objectives were to increase worker productivity and capitalise on the various external trends of the ageing population and environmental sustainability to capture changing market sentiments. Moving up the value chain by using sensor technologies and Internet of Things to become a world renowned sanitary brand powered by smart technologies is also the company's goals.

After 5 gruelling half-days of brainstorming and consensus-building, Rigel emerged from the OTR exercise ready for business model innovation, a new focus on sustainability and the development of multiple new products and initiatives. Some of their new products include the RiNano Antibacterial Sanitary-ware that involved a material embedded

with sanitary agents, the disable-friendly Smart Mirror that also assists the elderly, and sensor development and embedding to bring predictive maintenance and analytics to the bathroom. Rigel has also clinched a project with National Centre for Infectious Disease to simulate and design sanitary spaces in hospitals.

With regards to user experience, Rigel plans to go digital with its online customer service form, introducing AI-enabled help chat robot and is creating an FAQ/database for frequently queried issues. Rigel has expanded its overseas presence to China, Vietnam, Malaysia, Indonesia and South Asia.

Rigel has implemented CO₂ emission control at its overseas factories and has begun a ceramic recycling

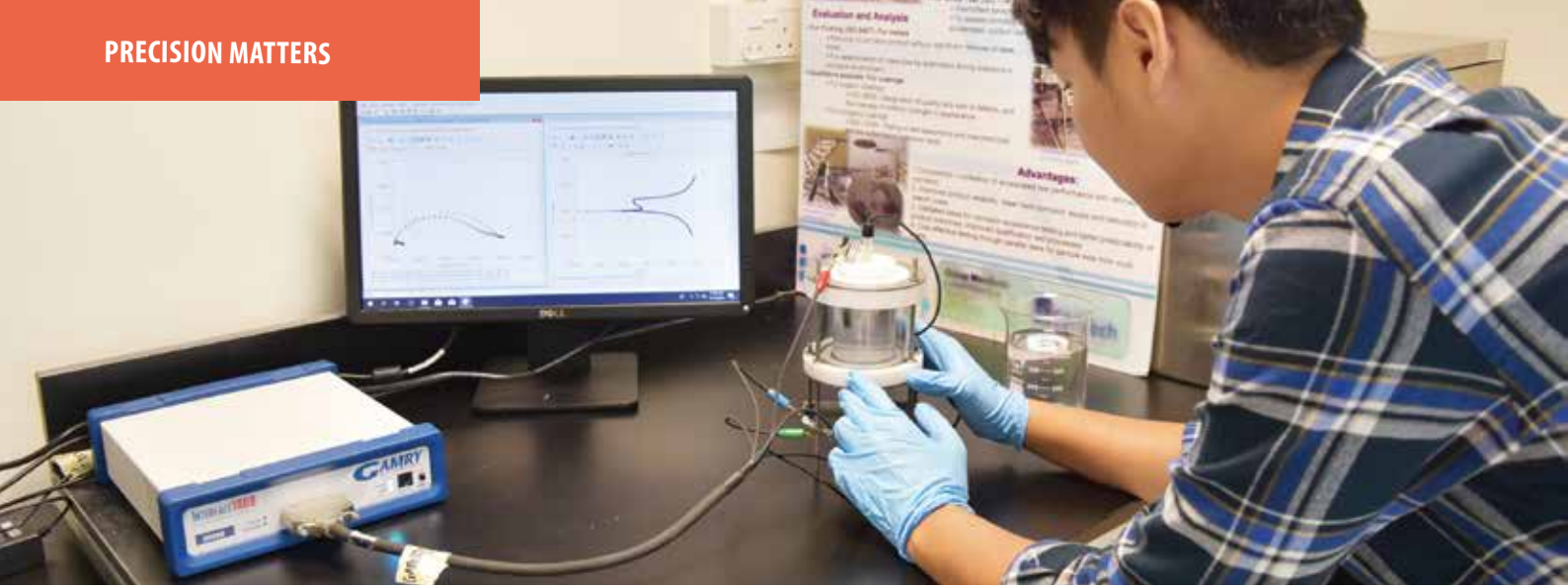


programme to convert scrap ceramics into construction materials. Researchers and engineers alike are housed in Rigel's new R&D Innovation Centre, where they innovate on anti-bacterial and self-cleaning technologies. After extensive internal restructuring, Rigel experienced productivity gain per worker by 20 per cent, with revenue increase from 2015 to 2017. Overall, Rigel has achieved approximately 70 per cent of what they planned to do in the OTR, and are already seeing great success.

“ The OTR is very systematic and methodical. The OTR team did their best to consolidate our ideas to make the sessions very comprehensive and constructive ”

Mr Christopher Ng, Group CEO,
Rigel Technology (S) Pte Ltd

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Mr Jeffrey Pan at
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ADVANCED CORROSION PROTECTION - FROM ASSESSMENT TO TRAINING

Many companies have benefited from the assistance

SIMTech has established a comprehensive set of capabilities and expertise on corrosion assessment of coated and uncoated metals and alloys to assist both research and industrial needs. Accelerated tests and assessment, electrochemical tests, advanced scanning techniques and atmospheric field exposure tests are some of these capabilities.

These capabilities are critical to support various needs of product/process developments such as coatings, alloys surface treatments, materials selection, mechanistic studies, benchmark of materials and quality control etc. Numerous corrosion related initiated Collaborative Industry Projects (CIPs), industry assist and consultancy projects have benefited many companies.

One of the CIPs, Assessment of Zinc Coatings, participated by more than

20 companies from various sectors enabled participants to gain valuable insights on performance benchmarking of commercially available zinc coatings, strategies for solution selection and proper coating application methods to optimise performance. In one of the industry projects with Nipo International Group, a manufacturer of industrial coatings and warehouse/logistics service provider, SIMTech has contributed to improving their PC based anti-corrosion coating.

As part of a holistic approach, SIMTech also provides training on understanding corrosion failures and protection to local technical industry professionals. The training equips participants with the critical skills for real-time evaluation and pertinent remedies or preventive strategies to combat corrosion-related issues. Over the past 6 years, the corrosion protection training has

“ We are thankful to SIMTech for a holistic approach to our coating development. SIMTech not only developed corrosion testing methodologies which met our objectives, but also discovered weakness in our coating system and made suitable recommendations to improve the production and application process. Nipo is planning to launch this new product by mid-2019. It would not have been possible if not for the expertise and recommendations made by Dr Sudesh and his team. SIMTech not only provides reliable testing services, but more importantly practical solutions to problems ”

Mr Steve Tan, Business Development Director, Nipo International Group

“ As a specialist in coatings, we find the training by Dr Sudesh and team very helpful in deepening our understanding of corrosion failures and testing methodologies as we develop a new anti-corrosion formulation for automotive application. SIMTech has also helped us to set-up our corrosion R&D lab, including training to operate the equipment ”

Mr Kevin Teo, R&D Manager, Whitford Pte Ltd

benefited over 98 participants from 61 companies. The next Corrosion seminar will be conducted in March 2019 followed by training programme - Module 2 (Apply Advanced Coating Technologies for Corrosion and Wear Prevention) and Module 1 (Implement Fundamentals of Corrosion & Corrosion Prevention) in January and April 2019 respectively. For details, visit <https://www.a-star.edu.sg/kto/Courses/Modular-Programmes/Corrosion-Protection>.

For enquiries, please contact

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PE COI Precision Engineering
Centre of Innovation
Sustaining and Advancing PE Industry



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on Precision Engineering
Centre of Innovation



PAPERLESS TRACKING OF SOP COMPLIANCE

wfMOBILE™ ensures SOP compliance reliability and quality audit consistency

Founded in Singapore with offices across Asia, SFS Global Logistics Pte Ltd a freight forwarding company operates a pharma logistics division specialising in the transportation of cold chain pharmaceutical shipments globally.

SIMTech helped SFS Global Logistics to implement Workflow MOBILE™ (wfMOBILE™) system to go paperless to track Standard Operating Procedures compliance during the transportation of temperature-control logistics for pharmaceutical and life science products and samples by its logistics and warehouse staff. wfMOBILE™ is a platform for mobile workforce to

perform user-configurable business/operational transactions using Android devices.

The implementation of a cloud-based wfMOBILE™ solution enables paperless quality auditing by customers to improve productivity by 70 per cent. Reliability in SOP compliance, a critical requirement in the Pharma Industry, is improved by 30 per cent. Workflow in different offices in the region is standardised to ensure consistency in quality audit, another must of the Pharma Industry.

The easy-to-use wfMOBILE™ also

enables SFS Global Logistics non-IT Staff to self-create about 10 applications. A full-time engineer is hired to handle SOP standardisation, auditing and compliance to further strengthen its leadership in pharma-logistics. Its 1,000 sq ft fulfilment centre for pre-conditioning of thermal packaging solution has recently expanded six-fold.

“ No need to keep repeating procedures. Practical solution to maintain high quality and consistent standards at all levels of audit trail ”





Mr Roger Chew, Managing Director, SFS Global Logistics Pte Ltd

For enquiries, please contact
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 Web: www.a-star.edu.sg/SIMTech-MPTC

MPTC Manufacturing Productivity Technology Centre
 Enhancing Manufacturing Productivity



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SFS Pharma Logistics	
1) Outer Box Cleaning	
Question Text	Answers
Clean Outer Box	<input checked="" type="checkbox"/> Cleaned
	
Photo of Clean Outer Box	
2) VIP Box Sterilisation	
Question Text	Answers
Sterilised VIP Box	<input checked="" type="checkbox"/> Sterilised
	
Photo of Sterilised Box	
3) PCM Sterilisation	
Question Text	Answers
Sterilised PCMs	<input checked="" type="checkbox"/> Sterilised
	
Photo of Sterilised PCMs	
4) Box Sterilised Signature	
	
Computer generated by SFS Pharma Logistics	



From Left to Right: Mr Lok Boon Keng, Principal Research Engineer, SIMTech; Mr Pawan Gandhi, CEO & Founder, KaHa Pte Ltd; Mr Tan Soon Kiat, Product Manager, Tex Line Associates Pte Ltd; Ms Sim Seo Lay, Head of Business Development & Operations, KaHa Pte Ltd; Mr Rick Yeo, Director, Emerging Applications Centre, SIMTech and Mr Ryan Seet Yu Liang, Technology Programme Manager, KaHa Pte Ltd



SMART WEARABLE LAUNCHED IN ONE-NORTH RUN

Connected to a mobile app, it monitors runners' aerobic and fitness vitals

Now, runners or those engaged in exercise can track not only their physical activities, but also their heart rate, electrocardiography (ECG) and maximal aerobic capacity. Thanks to the collaboration of SIMTech, Singapore-based smart wearables start-up KaHa and local textile company, Tex Line, the first made-in-Singapore Smart Sport Apparel was launched at the one-north Run 2018 on 2 December.

The Smart Sport Apparel is connected to a mobile app that tracks runners' aerobic endurance, live heart rate and variance and their fitness history. Bringing fun into fitness and health, new features included Preparation Plan which enabled the users to train for the run, with their progress recorded weeks before the event; the Run Tracker; and the Gamification App allowed the runners to compare steps and distance with each other.

This Smart Sport Apparel is one of the outcomes of many SIMTech Collaborative Industry Projects (CIP) on Smart Apparel Innovation, a consortium of 22 companies launched in February 2018 to drive innovation in smart wearables. The CIP focused on Flexible Hybrid Electronics (FHE) to accelerate the adoption of advanced technologies to tap the huge potential of smart wearable electronics and to help enhance the local smart

wearable manufacturing ecosystem. The Smart Sport Apparel has built-in electrodes and sensors, or flexible hybrid electronics that transmit data to a detachable smart module. The data that is collected and processed is then shared by the module with a smartphone app. SIMTech manufactures the sensors that pick up signals from the body by Roll-to-Roll printing, while KaHa provides the software expertise for raw data to be processed and presented via the app. Tex Line integrates both technologies into the shirt's fabric.

The various sensors built into the apparel enables it to achieve many other uses such as assigning wellness goals, individual recovery from fatigue and provides each individual their curated wellness information.

KaHa and Tex Line are currently working towards licensing SIMTech's

“ With the dedication of SIMTech and Kaha, Tex Line is able to develop an innovative product through the combination of our apparel manufacturing expertise and cutting edge technology. We need to catch the wave early and put ourselves in the forefront of this booming technology, ”

Mr Justin Tan, Product Manager,
Tex Line Associates Pte Ltd

“ Together with our strategic partners SIMTech and Tex Line, this first made-in-Singapore Smart Fitness T-Shirt presents a great leap forward for the smart wearables frontier and KaHa is proud to be leading the way. We look forward to revolutionising the way people take care of their health and helping shape the future of smart wearables in Singapore and the world ”

Ms Sim Seo Lay, Head of Business Development & Operations, KaHa Pte Ltd

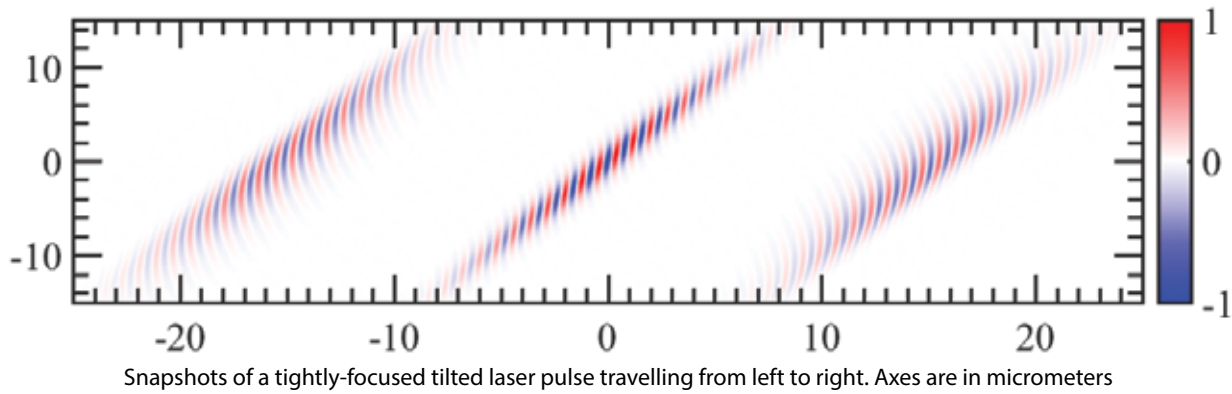
printed electronics technology for a next-generation line of sportswear, which includes the Smart Sport Apparel that is available in the market in the second quarter of 2019. Other projects include SIMTech's wearable tech pipeline in smart babywear, work uniforms and winter wear.

For enquiries, please contact
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Web: www.a-star.edu.sg/SIMTech-EAC

EAC Emerging Applications Centre
Seeding and Growing Emerging Industries



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NOVEL LASER PULSES FOR COST-EFFECTIVE, HIGH-PRECISION, VERSATILE LASER MACHINING AND HEATING APPLICATIONS

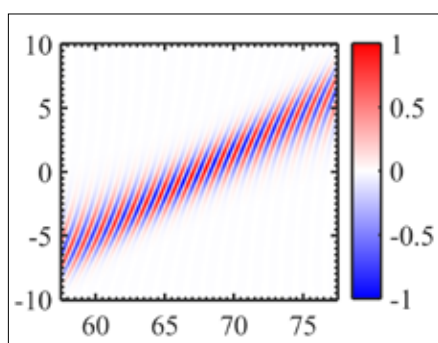
Innovation opens up laser micromachining, deep hole drilling and laser-annealing

The widespread use of pulsed lasers, which are short flashes of non-continuous light, in industrial processes and scientific research stems from their ability to deliver precisely-targeted doses of high-intensity laser energy. This ability is useful in heating a sample to a certain temperature or exciting it to a certain state without damaging the sample. Many existing technologies also use pulses of light which are mere femtoseconds in duration to shape materials via laser-based cutting techniques.

Researchers from SIMTech and the Massachusetts Institute of Technology (MIT) recently discovered a new type of laser pulse whose high-intensity region can be strongly localised in space and time, and whose pulse shape can be arbitrarily tilted. Previously, all tilted

pulses have only been predicted or realised under conditions of long pulse durations and extremely weak focusing. Furthermore, whereas regular laser fields diffract – that is, their spatial extent increases and their fine features blur with travelling distance, the researchers discovered that it is possible to create non-diffracting tilted laser beams whose intensity profiles travel unchanged through space. The researchers further found that one can engineer conditions such that the laser's intensity peak moves faster or slower than the speed of light.

These new properties open up many exciting prospects for laser-based fabrication and heating applications, such as laser micromachining, deep-hole drilling and laser annealing. The introduction of tilted laser pulses with highly-localised regions of high intensity, can fabricate smaller feature sizes and allow the attainment of target intensities with much lower laser energies translating to cost savings in processes where a rise in required intensity leads to higher energy needed. The highly localised laser pulse also implies a smaller heat affected zone, causing less damage to the surrounding regions. In laser hardening and annealing processes, the introduction of a tilted intensity profile



This breakthrough also has the potential to advance other applications including terahertz lasers, X-ray generation and ultra-fast electron imaging, which rely on tilted laser pulses to synchronise interactions between light and matter, enhancing the efficiencies of their respective processes

allows a wider range of heating profiles to be achieved beyond the traditional profiles, resulting in an ability to address a greater diversity of scenarios.

References: Wong, L J & Kaminer, I. Ultra-short tilted-pulse-front pulses and non-paraxial tilted phase front beams. *ACS Photonics* 4, 2257–2264 (2017). Article

Media coverage: A*STAR Research Highlight <https://research.a-star.edu.sg/research/7852/pulses-of-light-with-a-tilt-and-a-twist>

For more information, please contact **Dr Wong Liang Jie**, Precision Measurements Group at wonglj@SIMTech.a-star.edu.sg

Major corporate events were organised in 2018 to engage industry and forge partnerships

MPTC Annual Conference, 5 October

The theme, **Digital Transformation and Innovation**, was well received by the 535 participants from government agencies, trade associations and industry who attended the Manufacturing Productivity Technology Centre (MPTC) Annual Conference 2018.

Mr Kwek Kok Kwong, CEO, NTUC LearningHub Pte Ltd, shared his experience in leading his company's digital transformation journey.

Several Memoranda of Understanding (MOUs) were signed. One of these is the MOU with Korea Smart Factory Foundation for joint research in Industrie 4.0 and Smart Factories. Other MOUs signed were with Singapore Precision Engineering and Technology Association; NTUC LearningHub; Microsoft Operations as well as Singapore Association of Ship Suppliers and Services. The MOU with Dassault Systemes, Efinity Pte Ltd, EROWA South East Asia, Fanuc Singapore Pte Ltd, Hexagon Manufacturing Intelligence, Makino Asia Pte Ltd, Pepperl+Fuchs Pte Ltd and SICK Product Centre Asia Pte Ltd is for the setting up of a new Smart Engineering System (SES) in the Model Factory@SIMTech, and digital technologies R&D collaborations.

At this event, 19 companies received the Productivity Partners Recognition Award. In its fourth year, this award is presented to companies that have successfully adopted technologies or engineered innovations that led to productivity improvements and continue their productivity journeys.

Senior Minister of State for Trade & Industry and Deputy Secretary-General of National Trades Union Congress, Dr Koh Poh Koon, who was the Guest-of-Honour, toured the Smart Engineering System at the Model Factory@SIMTech.

MPTC Annual Conference 2018 was organised by A*STAR SIMTech. It was supported by Employment & Employability Institute, Economic Development Board, Enterprise Singapore, Skills Future Singapore and Workforce Singapore. Some of the partners are Singapore Manufacturing Federation, Singapore Precision Engineering and Technology Association and Singapore Association of Ship Suppliers and Services.

SMC Annual Conference, 2 November



To create awareness on the latest technology and industry development of resource efficiency in the global manufacturing sector and introduce resource efficiency methodologies and best practices in manufacturing sectors, SIMTech's Sustainable Manufacturing Centre (SMC) Annual Conference 2018, with the theme **Resource Efficiency in Manufacturing**, was attended by 116 industry and government agency professionals.

Dr Martin Vogt, Managing Director, VDI Resource Efficiency Centre (Germany) delivered the Keynote on **Resource Efficiency – Opportunities and Challenges for the Manufacturing Sector**.

Other speakers included Mr Lau Hwa Peng, Senior Vice President Engineering, Singapore Airlines; Mr Sabino Valentino, Managing Director, Zero G Design Pte Ltd; Mr Chen Li, Engineering Manager, Dou Yee Technologies Pte Ltd; and Mr Kevin Teo, R&D Manager, Whitford Singapore Pte Ltd.

A MOU was signed between Singapore Airlines Limited, SIA Engineering Company Limited and SIMTech to set up a Joint Lab to develop manufacturing capabilities for aircraft cabin interior components; grow the local manufacturing ecosystem into high value-added business and develop manpower to support the local aerospace manufacturing industries.

A complimentary post-conference Masterclass on Resource Efficiency in Manufacturing – Methodologies and Industry Practice, conducted by Dr Martin Vogt, was well received by industry. The conference was organised by SIMTech and supported by Employment & Employability Institute.



Collaborative Industry Projects (CIPs), initiatives, programmes and ready-to-go technologies are available to assist industry



3D Additive Manufacturing (AM) Capabilities of Metal and Polymer Parts

This programme aims to demonstrate 3D AM process capability from design and process optimisation, material preparation and handling, product processing to secondary operations and to provide a platform for quicker adoption of 3D AM technology.

For enquiries, please contact **Mr Tan Lye King** at tanlk@SIMTech.a-star.edu.sg

Freeform Lens Design and Fabrication

Freeform lenses are advantageous in the replacement of bulky spherical optics with a single element or in improving the lens performance. This programme equips companies with competencies in freeform lens design, fabrication and characterisation.

For enquiries, please contact **Mr Tan Chee Tat** at cttan@SIMTech.a-star.edu.sg

Food Waste Management Toolkit

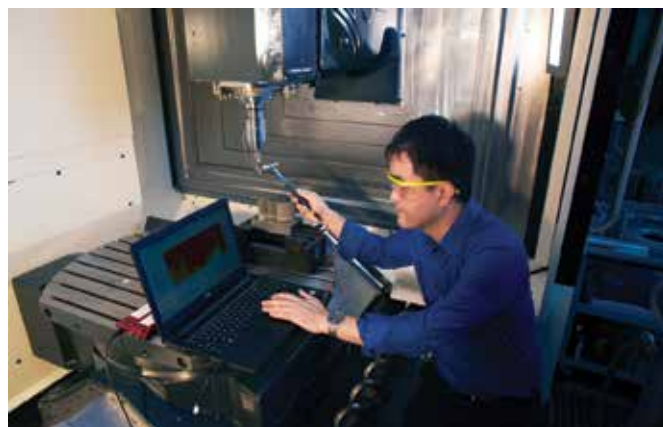
This toolkit enables food manufacturing companies to do real-time tracking of food waste, auto alert of process inefficiencies, hot spot identifications and automated food waste reporting.

For enquiries, please contact **Mr Yon Xing Ye Cedric** at xyyon@SIMTech.a-star.edu.sg

Functional Coatings for Glass and Ceramics

Functional coatings provide additional functions apart from protection and decoration. Glass and ceramics are used to assist companies in developing coatings for various functional purposes.

For enquiries, please contact **Mr Goh Chee Chien** at gohcc@SIMTech.a-star.edu.sg



Advanced Machining Dynamics Analysis Technology for Productivity and Quality Improvement

This programme aims to enhance the machining productivity and quality of local manufacturing industry in precision machining of steel and non-ferrous metals through technology transfer and customisation.

For enquiries, please contact **Ms Charlotte Lim** at charlotte-lim@SIMTech.a-star.edu.sg

eDataLogger+

This technology demonstrates the use of Android devices to capture data and generate reports, eliminating manual entry and errors.

For enquiries, please contact **Mr Chai Lai Sing** at lschai@SIMTech.a-star.edu.sg

Project Resource Management

A system to help company better manage projects by tracking actual resources as well as calibration and inspection of safety equipment.

For enquiries, please contact **Mr Wong Ming Mao** at mmwong@SIMTech.a-star.edu.sg

IIoT-enabled Equipment Condition Monitoring and Alert (IECOM)

An equipment condition and alert system using Industrial Internet-of-Things (IIoT) devices to enable remote monitoring of machine conditions and alert on deterioration and/or impending failures to minimise service disruptions.

For enquiries, please contact **Mr Wong Ming Mao** at mmwong@SIMTech.a-star.edu.sg

SIMTech Partnership Night 2019

13 February 2019 | 6.30pm-10.00pm | Furama Riverfront, Singapore, Venus Grand Ballroom, Level 3

This annual Lunar New Year celebration dinner brings together SIMTech's partners from industry, trade associations and government agencies for networking as well as to connect for future collaborations. At the event, SIMTech will share its major initiatives in 2018 and upcoming activities. The Lunar New Year will be celebrated with a Lion Dance performance and a Lo Hei dinner.

For enquiries, please contact **Ms Joan Chien** at joan_chien@SIMTech.a-star.edu.sg



Scan for more events

PE WSQ Graduate Diploma in Additive Manufacturing

Module 2: Powder-bed Additive Manufacturing Processes for Complex Functional Metallic Components

15 January 2019 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Graduate Diploma in Mechatronics

Module 1: Design Precision Machines

15 January 2019 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

Master Class in Mastering Sales and Operations Planning (S&OP) Process to Align Strategies for Operational Excellence

17 - 18 January 2019 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Evaluate Advanced Metal Machining Techniques

18 February 2019 | 8.30am - 5.30pm, SIMTech, Fusionopolis 2

PE WSQ Improve Machining Productivity through Dynamics Analysis and Simulation

19 February 2019 | 2.00pm - 9.00pm, SIMTech, NTU Valley Block

PE WSQ Perform Integrated Forming Process Technology for Metals

19 February 2019 | 8.30am - 5.30pm, SIMTech, NTU Valley Block

PE WSQ Understand the Microfluidics Manufacturing Processes

4 March 2019 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Graduate Diploma in Advanced Welding Technologies

Module 3: Review High Speed Laser Welding and Additive Manufacturing

5 March 2019 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Programme in Precision Engineering

Module: Employ Laser for PE Industry

11 March 2019 | 8.30am - 5.30pm, SIMTech, Fusionopolis 2

PE WSQ Apply Integrated Carbon Footprint Assessment Methodology (i-CARE)

11 March 2019 | 9.00am - 6.00pm, SIMTech, Fusionopolis 2

For course details and registration, please visit <http://kto.SIMTech.a-star.edu.sg>

For general enquiries, please contact
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Ms Nurul Ain	Designer

About SIMTech

The Singapore Institute of Manufacturing Technology (SIMTech) develops high-value manufacturing technology and human capital to enhance the competitiveness of Singapore's manufacturing industry. It collaborates with multinational and local companies in the precision engineering, medtech, aerospace, automotive, marine, oil & gas, electronics, semiconductor, logistics, and other sectors.

SIMTech is a research institute of the Agency for Science, Technology and Research (A*STAR). With a pool of more than 480 researchers, we are committed to serving the manufacturing industry to develop the human, intellectual, and industrial capital in Singapore.



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