

MANUFACTURING MATTERS

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FEATURE

MAXIMISING RESOURCE EFFICIENCY WITH SMART E²MAS

PE MATTERS
EASY TUNING FOR
MACHINE MOTION CONTROLLER

RESEARCH SPOTLIGHT
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MADE POSSIBLE BY FUSING
NANOPARTICLES

PRODUCTIVITY MATTERS
EMPOWERING STAFF TO
IMPROVE PRODUCTIVITY

NOTE FROM EDITOR...

Dear Friends and Industry Partners,

In recycling, Singapore aims to reach an overall rate of 70 per cent by 2030. To reach this goal, Singapore needs to improve on the recycling of food and sludge waste which are among the lowest recycled wastes in Singapore. In 2016, Singapore generated 791,000 tonnes of food waste. Of these, only a paltry 14 per cent was recycled. Sludge waste fares no better. About 13 per cent was recycled. This presents an opportunity for industry. Food and sludge wastes await an effective solution to convert them for better use.

One solution to capture the market potential is to use an energy-efficient drying technique to reduce the water content in sludge waste. SIMTech has assisted Singnergy Corporation, a Small and Medium Enterprise specialising in sludge/food waste drying equipment to do just that.

Read on in the Feature opposite for details...

To know more, *Dr Chen Wei Long* at wlchen@SIMTech.a-star.edu.sg will be most happy to answer your enquiries.

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



Swee Heng

Editor, Manufacturing Matters

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MAXIMISING RESOURCE EFFICIENCY WITH SMART E²MAS

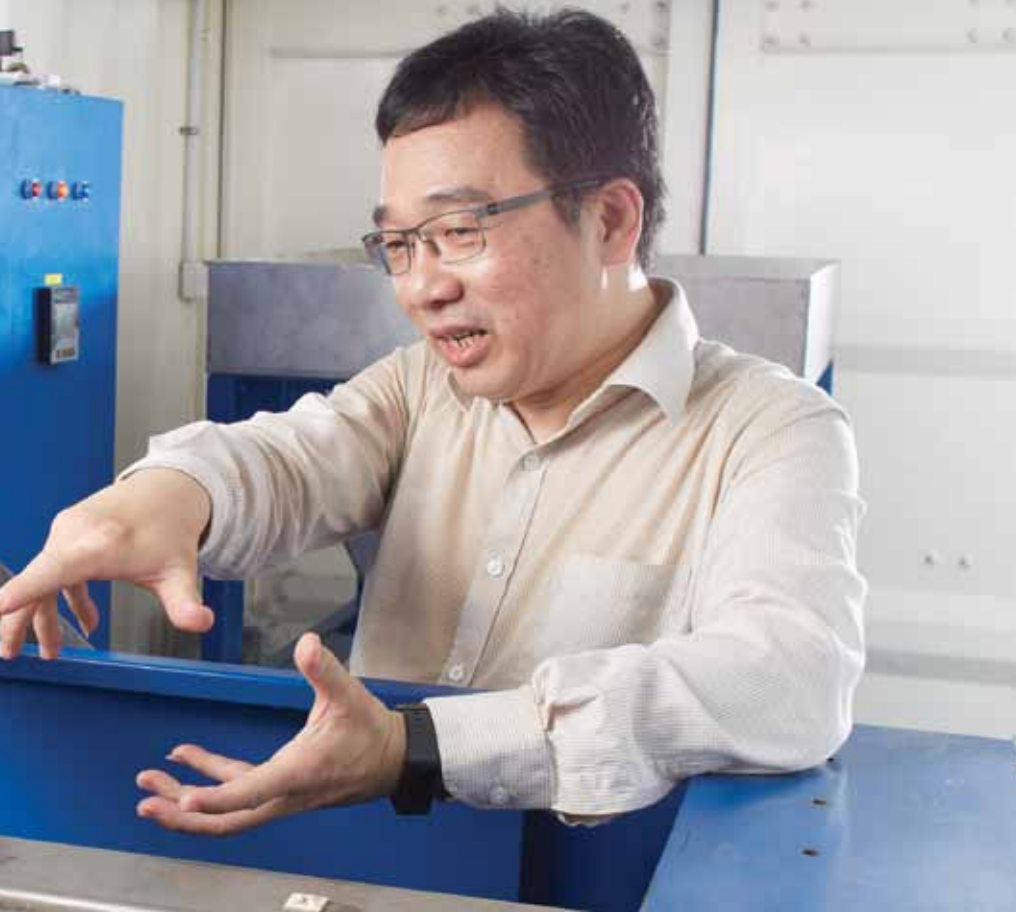
Tackling sludge and food waste issues with energy-efficient drying technique

An energy-efficient with rapid drying technique reduces the water content in food and sludge wastes. As such, these volumes and weights are reduced, easing transportation and other conversion processes into biomass, animal feed and fertiliser. To encourage industry to recycle food and sludge wastes, the system needs to be cost-effective, small in equipment footprint, environmental and user-friendly and able to handle almost all kinds of these wastes. For these sustainable objectives to be further improved, the drying system needs to be redeveloped to attain greater energy efficiency and equipped with central monitoring and control for performance checks. This objective is made possible through **Smart Energy Efficiency Monitoring and Analysis System (Smart E²MAS)**.

Singnergy Corporation's Experience

With SIMTech's technical assistance, Singnergy achieved equipment and operational efficiency in two ways: **energy-efficient drying** and **equipment remote monitoring**.

Note: Sludge means any solid, semi-solid, or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant (US EPA).



the heating substance, shortens drying duration and consumes lesser energy. It is a low energy dryer which is expected to have more than 40 percent energy saving compared to conventional thermal dryers.

With the installation of power meters, and different sensors for key operating parameters - input and output weights, temperature, belt position etc, E²MAS is able to acquire the data in real-time and store these in the cloud server.



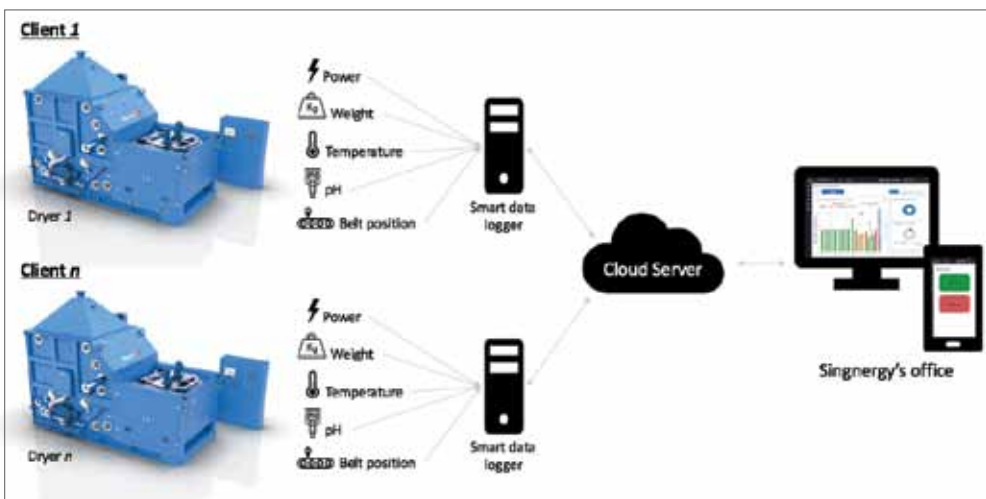
Dried Food Waste

Singnergy's drying equipment can be accessed remotely to **monitor its energy-efficiency in real-time and identify hotspots of excessive energy usage**. These hotspots can then be analysed to understand the causes for energy-efficiency improvement. With full visibility, Singnergy can alert their clients in advance and provide advice for proper equipment usage.

“ The innovation broadens Singnergy’s business applications and is able to position the company with a leading-edge competitive advantage in the waste recycling sector through its high yield and energy-efficient solution ”
 Mr KT Chua, Managing Director, Singnergy Corporation Pte Ltd

Enhanced Energy-efficient drying is achieved through the simplification of Singnergy's initial equipment design to a more robust solution while employing a systematic approach for the selection of suitable materials and its manufacturing processes. The

new drum material provides effective insulation and ensures maximum heat energy transfer to the heating belt which the operating temperature can be reached within seconds from room temperature. This new development enhances the heat distribution within



System Architecture of Smart E²MAS

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SMC Sustainable Manufacturing Centre
 Embracing Sustainable Manufacturing



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GAINING CAPABILITIES FOR NEW GENERATION MATERIALS

Through the T-UP Programme, Dou Yee Technologies (DYT) Pte Ltd developed and optimised Metal Injection Moulding (MIM) Process for various materials AISI 8620 alloy steel, AISI HK30 stainless steel and also study the recyclability of the feedstock for a greener manufacturing industry.

DYT, a manufacturer of high-quality, zero-defect MIM/CIM components, is a components and Powder Injection Moulding company in South East Asia since 1996. It serves customers from the Electronics, Telecommunication, Medical Devices, Semiconductor, and Automotive industry.

SIMTech implemented various solutions to improve MIM process parameters for these materials, including heat treatment to make the materials harder, a process new to DYT. Material characterisation and mechanical testing were conducted to validate the process optimisation. Technical assistance was provided to support the findings.

The implemented solutions increase case depth of the material from zero to 0.58mm, meeting customers' expectations. Process optimisation enabled DYT to transfer the technology to its new manufacturing plant. The material characterisation and laboratory tests allowed DYT to save time and resources, reducing lead time by more than 80 per cent as compared to outsourcing these activities.

“ This T-up allows us access to R&D expertise and helps us mitigate equipment risks by using the equipment in SIMTech ”

Mr Chen Li, Engineering Manager, Dou Yee Technologies

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

For more information, please contact **Mr Cedric Yon** at xyyon@SIMTech.a-star.edu.sg

OPERATIONS & TECHNOLOGY ROADMAPPING (OTR) JOURNEY CREATES VALUE

Maha Chemicals (Asia), a Singapore Specialty Chemicals company with an overseas presence in Southeast-Asian countries, brought together the heads of its regional offices in Q3 2016 to participate in SIMTech's Operations and Technology Roadmapping (OTR) programme to craft out its strategic R&D direction over the next business cycle.

Through the intense brainstorming and consensus-building exercise, OTR helped Maha Chemicals crystallise several crucial initiatives ranging from the launch of innovative new products to its digitisation strategy. In new products, Maha launched its seamless resin floor system that can withstand demanding heavy duty usage in industrial kitchens and factories. It is also pushing ahead with comfort flooring systems for hospitals. Consistent with global sustainability trends, Maha has also initiated collaborations with scientists and institutions to explore carbon nanotube application areas, ammonia replacing chemistry for latex gloves manufacturing and even minerals to reduce mortality rates in shrimp farming industries. In line with identified Big Data trends, the widespread emergence of social media and Industry 4.0, Maha has upgraded its IT systems and has built data analytics capabilities through Tableau, eventually aspiring to offer sales analytics and forecasting.

“ As a result of these initiatives, additional jobs were also created as Maha has hired Warehouse Manager, Data Management Business Analyst, Market Development and Digital Marketing, amongst others ”

Ms Tan Seow Hoon, Managing Director, Maha Chemicals (Asia) Pte Ltd

To grow its capacity to meet these future demands and projections, Maha has invested over S\$150,000 in factory layout optimisation, increasing its three bottling pallet space by 250 per cent. The Maha management team has also allocated 20-25 per cent of its time to develop and implement the identified initiatives.

For more information, please contact **Mr Jeffrey Pan** at sppan@SIMTech.a-star.edu.sg



INDUSTRY BENEFITS FROM PE WSQ COURSES

Industry trainees' experiences

More than 3,700 PMETs from industry have undergone training in Precision Engineering Workforce Skills Qualifications (PE WSQ) courses offered jointly by SIMTech and SkillsFuture Singapore (SSG). Two recent beneficiaries are highlighted.

Mr Joseph Tham, Director of Engineering from Carlton Hotel Singapore, signed up for the **PE WSQ Course in Productivity Improvement through Energy Usage Pattern Monitoring & Analysis**. His aim is to pick up new methods in assessing his company's need in managing its energy usage and determining the correct load profile for the chillers' replacement work.

Through this course, he learnt how to perform more accurate data collection and analysis for Carlton's existing chillers' operation, load profile and

“ With this skill, I can forecast cooling loads based on past hotel occupancies and activities to optimise the chillers' operation, reducing energy wastage and lowering the maintenance costs. The average savings per day is about 5 per cent ”

Mr Joseph Tham, Director of Engineering, Carlton Hotel Singapore

each chiller's efficiency. He also learnt how to make use of SIMTech's E²MAS and SIMProg software to calculate the refrigerant tonnage required to cool the hotel efficiently.

Mr Ng Tiong Chye, Manufacturing Engineer, from Hewlett Packard Enterprise (HPE) Singapore Pte Ltd found the **PE WSQ Programme in Manufacturing Data Mining Techniques** course by SIMTech was very relevant to his work. He is able to apply what was learnt in class to overcome the challenges he faced at

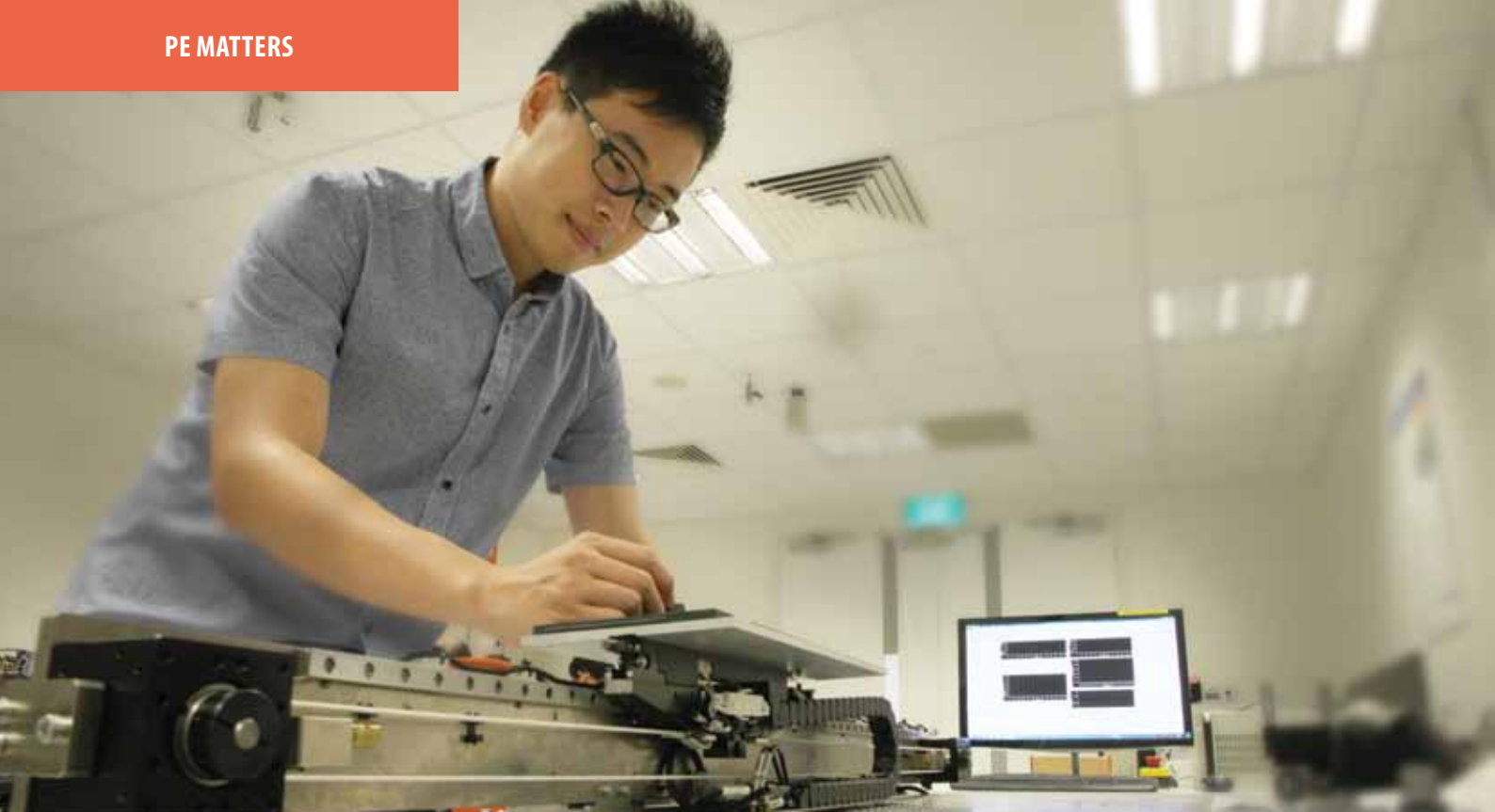
work. These challenges arose from customers' requests to expedite the earliest ship-out date from factory for the hardware function testing time which varies with the configuration of the customer's order. As such, a tool was required to help predict the function testing time faster with higher accuracy.

Through their training and efforts, Joseph Tham and Tiong Chye won the Most Inspiring Trainee Awards at the SIMTech-SSG PE WSQ Graduation Ceremony 2017.

“ By using the data mining methods, we can now predict the function testing time faster with accuracy of more than 90 per cent. This enables the company to provide a more accurate commitment date to the customer. The company's management is impressed by the work that we have done and is intending to send my colleagues to attend the same data mining course that I have pursued ”

Mr Ng Tiong Chye, Manufacturing Engineer, Hewlett Packard Enterprise Singapore Pte Ltd

For more information, please contact:
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EASY TUNING FOR MACHINE MOTION CONTROLLER

Data-driven auto-tuning methodology enhances motion performance

Motion controller plays an important role in industrial motion systems. When the motion controller is properly tuned, motion efficiency is maximised, energy consumption is minimised and system robustness is guaranteed. Many companies face various kinds of motion controller tuning issues. An example arises from typical high speed inspection systems where blurry inspection images can occur due to motion vibration, or environmental noise. To resolve this, the common industry practice is to slow down the motion and/or increase the settling time, resulting in lower throughput.

Despite the existence of various auto-tuning tools to overcome these challenges, the performance is often not satisfactory. The control engineers need to fine-tune the controller in

order to achieve optimal performance. Furthermore, after the machines are shipped overseas, the customers or service engineers will again face the controller tuning issue as they often do not have the vast experience of an expert control engineer. A fully automated software-based or cloud-based controller tuning solution is needed.

To assist the industry in this, SIMTech developed a data-driven auto-tuning methodology. This entirely data-driven methodology assumes no prior knowledge of the motion system under control and do not attempt to build a system model as in the traditional approach. Instead, it makes use of actual motion data to enhance the performance in an iterative manner. Hence, this approach is generic and

can potentially be applied to various brands of drivers and motors. As this approach is performance-centric, it can be designed to maximise performance according to specific requirements of a particular motion control application.

With this data-driven auto-tuning methodology, time can be saved. Control engineers no longer need to travel overseas to help customers solve controller tuning issues. Moreover, a more consistent performance can be expected from this systematic and generic approach.

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“ **Black box concept makes this method universal** ”

Mr Navaneetha Krishnan, Application Engineer, AMA Pte Ltd

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



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 on Precision Engineering
 Centre of Innovation



EMPOWERING STAFF TO IMPROVE PRODUCTIVITY

SIMTech Lean Programme transformed The Craftmark Group

Competition is fierce in the retail industry. To compete and survive, The Craftmark Group (Craftmark) improves process and develops staff capability proactively. The SIMTech Lean Implementation Programme, focusing on wastes reduction and value add to customers, meets Craftmark's needs spot on.

“**The SIMTech Lean Programme has transformed staff mindset, creating an ongoing improvement culture within the Group**”

Mrs Tan Ee Leng, Managing Director,
The Craftmark Group

Craftmark enrolled 10 staff from its Sales & Marketing, Warehouse, Finance, HR, R&D, Design and top management in SIMTech's Lean Implementation Programme. Lean is imparted to the team via Learn, Practice, Implement and Sustain model. Instead of the usual hard skill training with tools and techniques, the SIMTech Lean programme stands out from other similar courses by implementing changes and setting up sustainable mechanism for Craftmark to continue its improvement journey through the guidance of SIMTech mentors.

The changes are transforming and obvious to Craftmark. Payroll processing time is reduced by 63 per cent from 4 days to 1.5 days monthly through implementing Standardisation. The HR, Sales, Finance & Operation departments worked together to achieve the change, strengthening teamwork among the departments.

This implemented Lean initiative won the SIMTech Most Inspiring Trainee Award for Ms Liang Sopen, HR Manager, who leads the Lean committee. Another positive change, proposed and implemented by the staff is the reduction in the search time for online ordered items by 97 per cent from 6-12hour/search to 15-minute/search by implementing Standardisation & Visual Management. A total of 52 initiatives were proposed by their employees within the three-month programme. To date, 12 initiatives have been successfully executed by the employees.

To sustain Lean journey, Craftmark established a Lean Committee to build communication platforms for the team to share the identified area of wastes and Kaizen (improvement) projects. The Gambawalk (sitewalk) was implemented



as one of the Lean practices, which offer much opportunities for further improvements. With the foundation set by SIMTech Lean Implementation Programme, Craftmark processes have been improved and staff is motivated and empowered to pursue continuous improvements.

For enquiries, please contact
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MPTC Manufacturing Productivity
Technology Centre
Enhancing Manufacturing Productivity



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LIGHTING UP AIRPORT TERMINAL ATTRACTION

Large area printed lighting for architectural structures

An innovative application is the large area printed lighting which now graces the new Changi Airport Terminal 4 Indoor Garden Sensorium, Singapore's latest attraction to enhance passengers' and visitors' experience. This is an outcome of more than a year collaboration between SIMTech and Worldbizz Engineering, a specialist in the design, supply and installation of acrylic panels for swimming pools, water features, roofs, aquariums and fish tanks. The partnership developed the company's capability in the design and application of large area printed lighting for architectural panels and structural/

landscape motifs. On improving the cost and delivery efficiency of integrating printed lighting into its other product offerings, SIMTech also transferred the printed lighting processing technology to this local Small and Medium Enterprise.

Worldbizz worked with a business unit of a local enterprise that engaged in design, communication and production, to deploy printed lighting for Changi Airport Terminal 4 attraction. Consultancy on the printed lighting design for different types of lighted motifs was provided

by SIMTech. Worldbizz applied the printed lighting technology to fabricate the light sheet for large area printed lighting for illuminated architectural structure.

This capability broadens Worldbizz's traditional business space from architectural to landscape and theme park arenas. Now, there is new interest to extend this application to overseas theme park, zoo, museum lighted motifs. A local supply chain for printed light motif exhibits was also established with home-grown enterprises.

For enquiries, please contact
Mr Rick Yeo, Director of EAC
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 Web: www.a-star.edu.sg/SIMTech-EAC

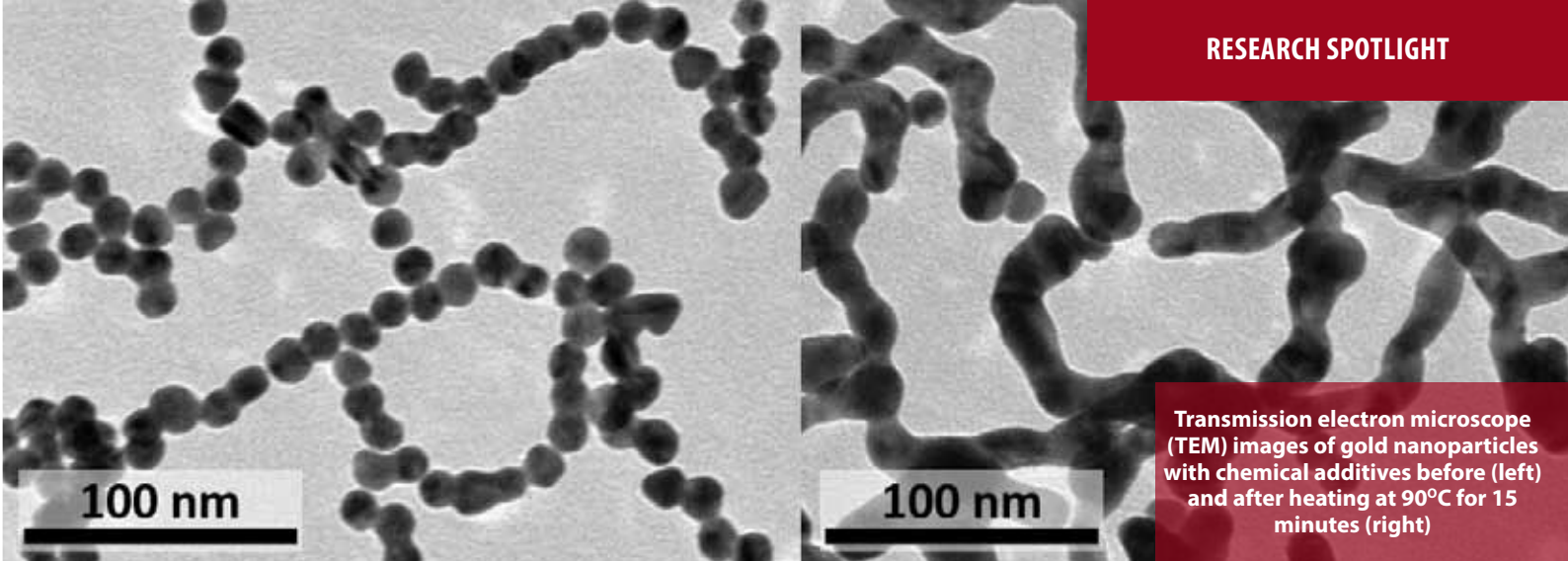
“ WORLDBIZZ shares the vision that the T4 concept of using motifs and printed light is innovative and that a huge market awaits. Whether indoors or outdoors, there is pleasantry in the concept that personify nature with insects in living colours. WORLDBIZZ is motivated to grow this concept and is in the process of starting an assembly facility to move into the Motif and Printed Light concept ”

Mr Jared Chew, Managing Director, Worldbizz Engineering

EAC Emerging Applications Centre
 Seeding and Growing Emerging Industries



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Transmission electron microscope (TEM) images of gold nanoparticles with chemical additives before (left) and after heating at 90°C for 15 minutes (right)

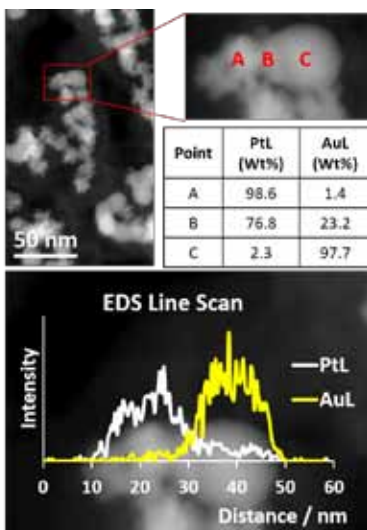
JOINING AT NANOSCALE MADE POSSIBLE BY FUSING NANOPARTICLES

This possibility enhances conductive inks quality for printed electronics on polymeric substrates

Metallic filler particles generally used in conductive inks for printed electronics on polymeric substrates require high drying temperature to achieve optimal electrical conductivity. As the temperature to fuse these fillers is much higher than the temperature to transform the polymeric substrates to molten state, these metallic filler particles usually do not coalesce after drying on the substrates.

Currently, SIMTech researchers are developing new materials and ink formulations suitable for printing on polymeric substrates with lower processing temperatures. Nanostructures are used in this development as they have high surface-to-volume ratio which makes them easier to fuse with each other.

A methodology was developed for the coalescence of metallic nanostructures from either similar or different metals at lower temperatures with the assistance of chemical additives. Without the addition of the chemical additives, the nanostructures typically do not fuse upon heating even if they are in close contact.



STEM image of gold - platinum bimetallic nanoparticles sample with EDS point scan showing percentage of different metal content (top) and EDS line scan showing the mixing of elements at the junction between gold and platinum (bottom)

SIMTech collaborated with Associate Professor Chen Hongyu of Nanyang Technological University to explore the use of metallic nanostructures as conductive fillers in ink formulations. By leveraging the understandings of the movement of atoms on the surface of nanostructures, the researchers have successfully joined metallic nanostructures at temperatures less than 90°C.

Studies of the coalesced nanostructures of different materials were performed with scanning transmission electron microscopy (STEM) and energy dispersive X-ray spectroscopy (EDS) to understand the movement of the atoms after coalescence.

The researchers are exploring methods to incorporate the chemical additives into ink formulations without affecting the shelf life of the formulations

For more information, please contact **Dr Wei Jun**, Programme Manager of Large Area Processing at jwei@SIMTech.a-star.edu.sg

Note: This work has been published in *Nanoscale*, 8 (16 February 2016) 3447-3453
 R L S Tan, X Song, B Chen, W H Chong,
 Y Fang, H Zhang, J Wei H Chen

A number of events were organised in 2017 to engage the industry and forge partnerships

MPTC Annual Conference 2017 and Launch of Model Factory@SIMTech, 5 October

The Manufacturing Productivity Technology Centre (MPTC) Annual Conference 2017 attracted a record 469 representatives from government agencies, trade associations and industry. The event theme was **Industry Transformation through i4.0** for industry to understand and participate in the 4th industrial revolution journey, i4.0.

Mr Soh Chee Siong, CEO of JEP Precision Engineering Pte Ltd, shared on his company's experience in Moving Towards Digital Manufacturing.

To assess member companies' current system capabilities in order to guide them in developing a roadmap for digitalisation, a Memorandum of Understanding (MOU) was signed by the Print and Media Association, Singapore (PMAS) and Singapore Precision Engineering and Technology Association (SPETA) with SIMTech. The other MOU between SIMTech and Technische Universitat (TU) Braunschweig covers research collaboration to develop model factory related technologies, utilising both factories' facilities as learning materials for industry classes.

Senior Minister of State for Trade & Industry and National Development Dr Koh Poh Koon, who is the Guest-of-Honour, launched the Model Factory@SIMTech in Fusionopolis Two. This was followed by a guided tour. Several tours were also organised for other attendees showcasing the Manufacturing Control Tower™ technologies developed to manage production efficiently and the various technologies demonstrate how shop-floor execution can quickly responds to changes in production orders.

21 companies were presented the Manufacturing Productivity Partners Recognition Award for successfully adopting technologies or innovations through MPTC and continuing their productivity journeys. MPTC Annual Conference 2017 was organised by SIMTech in partnership with Employment & Employability Institute, supported by the Economic Development Board, SkillsFuture Singapore, SPRING Singapore, Workforce Singapore, PMAS, Singapore Manufacturing Federation, SPETA and TU Braunschweig.



SMC Annual Conference and Technology Exhibition 2017, 2 November



To help local companies use fewer resources and optimise their use, SIMTech's Sustainable Manufacturing Centre (SMC) Annual Conference 2017, with the theme **Waste Revival in Manufacturing • Technology • Practice • Impact**, was attended by 178 industry and government agency professionals.

Dr Sami Karra, Professor & Director, Postgraduate Research at the Faculty of Engineering, University of New South Wales, shared on Waste with a Life Cycle View focusing on waste and waste generation with a life cycle view to facilitate future waste management. Mr Johnpaul Dimech, Region Chair-Asia Pacific & Country President of SODEXO Singapore, explored the state of food waste from an economic, environmental and social impact standpoint from a global and a local perspective.



The event was organised by SIMTech in partnership with the Employment and Employability Institute (e2i) and supported by the National Environment Agency, Public Utilities Board, Global Compact Network Singapore, Standards Development Organisation, Singapore Food Manufacturers' Association, Singapore Green Building Council, The Institution of Engineers Singapore and Waste Management and Recycling Association of Singapore.

Collaborative Industry Projects (CIPs) are cost-effective platforms, where companies facing similar issues work jointly with SIMTech, to develop capabilities and technology

Last Mile Logistics – On-the-go Planning and Monitoring Solution (OPMS)

To provide a planning and tracking solution to improve the last mile logistics of drivers/vehicles to effectively meet customer-imposed pickup and delivery requirements amidst resource constraints.

For enquiries, please contact **Ms Connie Ng** at yyng@SIMTech.a-star.edu.sg

Project Resource Management System (PRMS)

To provide a RFID system to manage the projects by offering accurate and timely identification and tracking of actual resources used and/or to track the calibration and inspection of safety equipment.

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

Smart Manufacturing Operations Management

To provide a manufacturing operations management (MOM) solution from planning, scheduling and tracking of the manufacturing operations in a smart and efficient way. It will streamline production operations to ensure realistic delivery commitments.

For enquiries, please contact **Mr Seow Yit Yuee** at yyseow@SIMTech.a-star.edu.sg

IIOT-enabled Equipment Condition Monitoring and Alert

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

For enquiries, please contact **Ms Connie Ng** at yyng@SIMTech.a-star.edu.sg

Engineering Design for Manufacturing (DFM)

This programme aims to help companies develop capabilities in engineering product design for manufacturing.

For enquiries, please contact **Ms Wan Siew Ping** at spwan@SIMTech.a-star.edu.sg



Energy Efficiency Monitoring and Analysis System (E²MAS)

To help companies implement Energy Efficiency Monitoring and Analysis System (E²MAS) to assess the equipment's energy usage in real-time and identify hotspots of excessive energy usage. These hotspots can then be analysed to derive quantifiable energy improvement.

For enquiries, please contact **Ms Connie Ng** at yyng@SIMTech.a-star.edu.sg

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

This programme aims to demonstrate 3D AM process capability from design & process optimisation, material preparation & handling, product processing to secondary operations, and 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

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 **Dr Thoe Teck Beng Alex** at tbthoe@SIMTech.a-star.edu.sg

SIMTech Scalable Mobile Platform (SMP) Programme

This programme aims to enable the development of customised mobile platform to suit different needs, and can realise high mobility critical for easy maneuvering in cramped spaces and for effective docking.

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

SIMTech 25th Anniversary

Several events are organised to celebrate SIMTech 25 years of partnership with industry. **SIMTech Partnership Night 2018** (details below) is one of the exciting events. Others in the pipeline are:

- PE COI Annual Conference 2018 in April
- SIMTech Annual Manufacturing Forum 2018 in July

Look out for details in this page or our website at <https://www.a-star.edu.sg/SIMTech/Events.aspx>

SIMTech Partnership Night 2018

27 February 2018 | 6.30pm - 10.00pm | Grand Copthorne Waterfront, Grand Ballroom, Level 4

This annual Lunar New Year celebration dinner brings together SIMTech's partners from industry, trade associations and government agencies for networking as well as kicking off SIMTech's 25th Anniversary Celebrations. At the event, SIMTech will share its upcoming activities and latest technologies.

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



Scan for more events

PE WSQ OMNI Programme

Module 2: Improve Operations Using OmniMethodology™

20 February 2018 | 1.30pm - 5.30pm, Company Premise

PE WSQ Graduate Diploma in Metal Manufacturing Processes

Module: Review Heat Treatment Processes for Metals

20 February 2018 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Graduate Diploma in Advanced Welding Technologies

Module 5: Evaluate Advanced Brazing

27 February 2018 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Graduate Diploma in Precision Measurements and Characterisation (PMC)

Module 5: Materials Characterisation

1 March 2018 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Graduate Diploma in Mechatronics

Module 2: Enhance Control Performance of Precision Machines

5 March 2018 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Graduate Diploma in Manufacturing Operation Management (MOM)

Module 1: Enterprise Resource Planning

5 March 2018 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ Graduate Diploma in Precision Measurements and Characterisation (PMC)

Module 4: Image Processing and Industrial Vision Inspection

6 March 2018 | 6.30pm - 9.30pm, SIMTech, Fusionopolis 2

PE WSQ OMNI Programme

Module 3: Develop Action Plan Using OmniMethodology™

27 March 2018 | 1.30pm - 5.30pm, Company Premise

Master Class in Emerging Manufacturing Technologies : Design of Biomedical Devices

2 - 4 May 2018 | 8.30am - 5.30pm, SIMTech, Valley Block@NTU

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

For general enquiries, please contact
Tel: 6590 3193 or email: KTO-enquiry@SIMTech.a-star.edu.sg



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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 400 researchers, we are committed to serving the manufacturing industry to develop the human, intellectual, and industrial capital in Singapore.

