



SIMTech

for Industry

SPRING
 singapore
 Enabling Enterprise

Dear Friends from Industry,

PE COI has launched eight initiatives as part of our continuous effort to help the precision engineering companies in Singapore venture into high growth industries. A short writeup of the initiatives is provided. We look forward to your company participating in the initiatives and the upcoming events.

Dr John Yong

Director, PE COI

Meet-the-Consultants Sessions

- 17 January 2011 [0900 – 1200 hrs]
- 15 February 2011 [0900 – 1200 hrs]
- 15 March 2011 [0900 – 1200 hrs]
- 15 April 2011 [0900 – 1200 hrs]
- 16 May 2011 [0900 – 1200 hrs]
- 15 June 2011 [0900 – 1200 hrs]

Upcoming



Precision Engineering Business Forum 2011

24-25 March 2011, Singapore Expo

To be held alongside MTA2011, the Precision Engineering Business Forum is an excellent platform for the sharing of expert knowledge and business strategies, as well as an exchange of ideas, to equip businesses for the upward ride ahead as the economy, and the manufacturing industry, are growing rapidly.

In this Issue:

1 - 3

Upcoming

- Precision Engineering Business Forum 2011
- Industry Initiatives

4

PE Expert Consultant Profiles

- Dr Danno Atsushi
- Mr Kanno Shigeyuki
- Dr Lim Beng Siong

5 - 8

Past Events

- Strong Industry Attendance at First PE COI Annual Conference
- REC Dialogue with Local Complex Equipment Industry
- Queen bee-led Gun Drilling Collaborative Capabilities & Industry Development
- Gun Drilling Seminar, Tutorial and Exhibition

9

Equipment News

- Plasma Enhanced Physical Vapour Deposition System
- Infinite Focus 3D Metrology System
- Vision-based 3D Digitiser (GOM system)

10 - 11

PE Consultants Highlight

12

Course/ Seminar

- WDA course
- Peening and Surface Conditioning for Aerospace Applications Seminar

Expanding its scope from 2009, the Forum in 2011 addresses technology developments, business challenges, and market opportunities in these industry sectors:

- Medical Equipment and Device Manufacturing
- Aerospace Manufacturing
- Oil & Gas
- Surface Finishing

Leverage on this unique platform to exchange knowledge with thought leaders, network with your precision engineering industry peers, and form fruitful partnerships with business associates! To attend this Forum, please email to Jenesta at jl@sesallworld.com.

Industry Initiatives

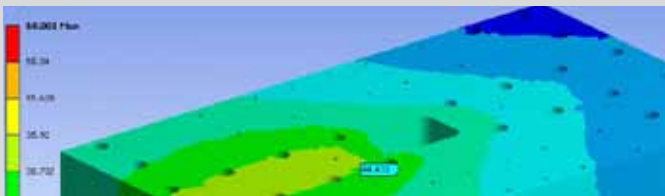


Oil & Gas Initiative

This initiative aims to develop indigenous deep-hole gun drilling, boring, trepanning and Fibre-laser cladding capabilities on exotic materials to attract a new range of high performance and corrosion resistant oilfield equipment to Singapore. An Oil & Gas team will promote, develop and transfer know-how and capabilities relating to laser cladding of Inconel 625; gun drilling, boring and trepanning of Inconel 718; drill heads designs through a series of workshops, seminars, consultancies, collaborative industry projects and consortia.

Contact: Dr Lim Beng Siong

Tel: 6973 8370 | Email: bslim@SIMTech.a-star.edu.sg



Engineering Design and Simulation Initiative

The Engineering Design and Simulation Initiative is a cross-functional initiative set up to exploit the use of simulation to enhance design in various engineering fields so as to improve productivity across design, engineering and manufacturing activities.

Contact: Dr Lin Wen Jong

Tel: 6973 8988 | Email: wjlin@SIMTech.a-star.edu.sg



MedTech Initiative

The MedTech Initiative intends to help local companies venture into the MedTech industry through a mix of value chain, technology and capability development consortia. Manufacturing consortia-based projects will be implemented to enhance the technical capabilities of the medtech companies. Workshops and seminars will be organised to promote and impart the advanced technologies. The initiative will also address the needs and challenges faced by the Singapore industry as it diversifies and migrates to medtech products manufacturing.*

***Business Opportunities**

A large US medical device manufacturer, with a plant in Singapore, is looking for local suppliers with machining capabilities to manufacture some of its metal components. Interested companies need to fill up a machining survey form. The information requested includes types of machining processes, machines available, achievable tolerances, measuring systems, assembly capability and certifications etc.

Contact: Mr Robert Lee

Tel: 6793 8436 | Email: cmlee@SIMTech.a-star.edu.sg



Aerospace Initiative

Based on industry needs, a consortium model involves a queen bee approach with an MNC and the local supply chain in Singapore creates niche capabilities in engine safety and component life span. These areas are of value to the aerospace industry. Critical to this is process reproducibility and part quality consistency. The objective of the consortium is to develop automated surface finishing and to transfer this to an existing company or to deploy it in a joint venture or spin-off. In this manner, a unique technological competitive edge and jobs will be created for Singapore.

Contact: Dr Anders Jarfors

Tel: 6973 8576 | Email: andersj@SIMTech.a-star.edu.sg



Operations Innovation Initiative

The objectives are to upgrade the local SME's capability and productivity in High Value Manufacturing through the Operations Innovation Programmes including: High-Mix Low-Volume (HMLV) consortium for Intergrated Production Planning and Shopfloor Tracking; Lean Manufacturing Initiative for Leadtime and Productivity Improvement; Manufacturing Operations Management Graduate Diploma Course for Workforce Skills Upgrading; Productivity Development Programme for Companies and Trainers; Cellular Manufacturing System Development for HMLV Production.

Contact: Mr Seow Yit Yuee,

Tel: 6793 3712 | Email: yyseow@SIMTech.a-star.edu.sg



Complex Equipment Initiative

The objective of the complex equipment initiative is to help enhance the business competitiveness and opportunities of the local SMEs in the manufacture of high value complex components, complex electromechanical modules and complex equipment through technological capability development. This initiative meets this objective through industry collaborative projects and technological capability upgrading programmes through the precision engineering industry value chain.

Contact: Ms Wan Siew Ping

Tel: 6793 8298 | Mobile: 9624 6282

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



Heat Treatment Initiative

This initiative develops the process routes and transfers technology to improve the competitiveness of the local heat treatment companies. This is achieved through Company upgrading and investment analysis; and Gas quenching, stepped quenching and advanced heat treatment targeting low pressure carburising and case depth control. The goal of the Heat Treatment Initiative is to develop the core capabilities through consortium activities and direct industry projects.

Contact: Dr Anders Jarfors

Tel: 6973 8576 | Email: andersj@SIMTech.a-star.edu.sg



Surface Finishing Initiative

The Surface Finishing Initiative aims to launch various consortia over the 3 years. Those are the application of fluoropolymer coatings for friction control on bearing surfaces for oil and gas tooling and equipment; biocompatible coatings for medtech devices; and metals recovery and waste water treatment using novel electrochemical processing techniques.

Contact: Mr Peter Collier

Tel: 6793 8531 | Email: peterc@SIMTech.a-star.edu.sg

PE Expert Consultant Profiles

Biography of Dr Danno Atsushi

Dr Danno has over 46 years of research and development experience in high precision bulk-metal forming technology for manufacturing metal components such as rotary forming/ spin forming, forging/ stamping, bending of shapes, forming process of special alloys etc. He joined Singapore Institute of Manufacturing Technology (SIMTech) in August 2003, and has been engaged in R&D on forming technology (spin forming, micro metal forming, stamping/ cold forging etc.) as a Visiting Senior Scientist and Expert Consultant of PE COI (Precision Engineering Center of Innovation).

Prior to joining SIMTech, Danno spent 39 years in Toyota since 1964, where he was the director and board member of Toyota Central R&D Labs (Toyota CRDL, Japan) from 1995 to 2001.



Biography of Mr Kanno Shigeyuki



Mr Kanno has been engaged in precision engineering R&D with over 50 years of industry experience. He has filed an impressive 136 patents in the field of cutting tools, fixtures and automatic tooling system. In his 34 years with Toshiba Tungaloy Co. in Japan, his research focus was on cutting tool design & development of related application system, precision machining and development of super-high pressure die & device for polycrystalline diamond (PCD) manufacturing. He was the president-director to Toshiba Tungaloy France.

He joined SIMTech in October 1997 as a visiting Research Scientist and Expert Consultant of PE COI, and has been working with industry partners from the electronics, medical devices, precision engineering, automotive, to aerospace sectors. Many projects for the local industry are machined surface quality improvement & diagnostics device design, technical support for localisation of precision machining parts on semiconductors, and technical advice to SMEs for new and/or hard-machining material machining such as Titanium Alloy, Super alloy and Polymer.

Biography of Dr Lim Beng Siong

Dr Lim leads the PE COI Oil & Gas Initiative. He joined SIMTech in 1987 following the development of an aerospace flight simulator configuration system at Brighton University for Rediffusion Simulation at Crawley. He pursued his PhD with a scholarship from the University of Nottingham in the applications of computational intelligence for component design and tool engineering. Prior to his academic pursuit, he served an apprenticeship for 5 years with TIMEX in tool making, process planning, cost estimation and fixture design.



At SIMTech, Beng Siong led several research teams to develop cutters for the machining of Inconel 718 and Ti6Al4V, EDM electrode verification system, computer integrated and flexible manufacturing systems; conduct research into prosthetic knee joint implants, daily production scheduling systems, process planning, modular fixture design and automated guided vehicles systems.

His main interest includes the development of evolutionary computation for performance degradation, characterisation & reference modelling. These methodologies are applied towards a large segment of industry for estimating the remaining useful life, predicting failures and monitoring the degradation pattern of critical machinery, utilities, processes and tools for the precision machining, oil and gas equipment manufacturing sectors.

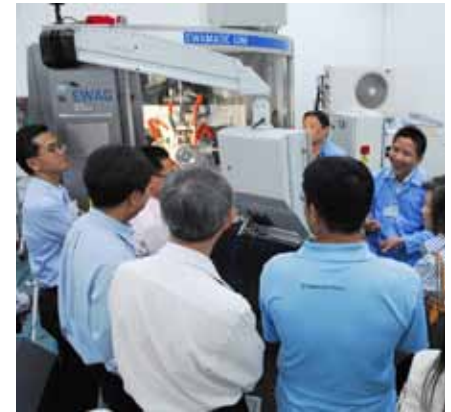
Past Events

Strong Industry Attendance at First PE COI Annual Conference



The inaugural PE COI Annual Conference at SIMTech was attended by 125 representatives from 61 companies and government agencies. The conference provided an invaluable opportunity for SMEs in Singapore to explore business partnerships with leading manufacturers in the oil and gas, aerospace, medtech and complex equipment sectors - particularly

with the rapid localisation of the manufacturing activities in this high growth region. Local companies have gained a deeper insight on the trends, gaps and strategies involved so that capabilities development consortia can be cost-effectively formed with the support from A*STAR, SIMTech, SPRING Singapore, EDB and PE COI. At the conference, MNCs such as Halliburton (Oil & Gas), Applied



Materials and AMEC (Semiconductor equipment), and Medtronic (MedTech) shared some of their localisation requirements and provided case studies.

The Leads of the eight PE COI initiatives also shared some of the key capabilities required to enable local companies to confidently undertake higher precision and higher value manufacturing activities to meet stringent performance requirements. After the conference, specific company-led “by invitation roundtable” discussions were arranged and technological capability development consortia were formed to retain Singapore’s position in these key areas.

REC Dialogue with Local Complex Equipment Industry

REC, the MNC in photovoltaic (PV) solar – Singapore, shared important operational information with our equipment industry partners particularly in complex equipment development that is important to PV solar industry, and the current and future needs of this industry which is relatively new in Singapore.

Through this session, our local equipment industry partners understand the way to support REC. With close to 140 representatives from industry and government agencies attending the dialogue which has been rated excellent, more of such events for specific topics will be held.

Queen bee-led Gun Drilling Collaborative Capabilities & Industry Development

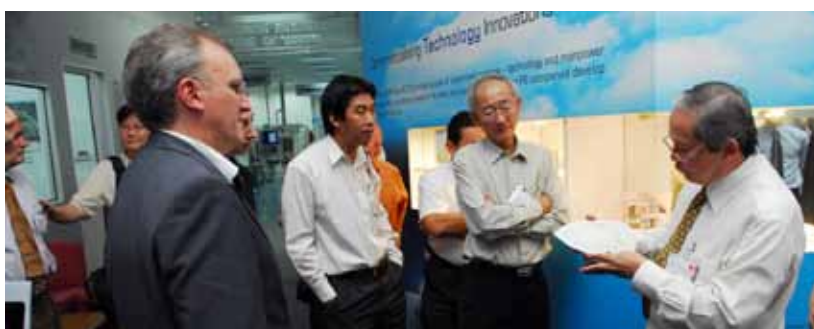
Launch of Gun Drilling Collaborative Industry Project (6 December 2010)



22 signatories participating in the GDI



Some of signatories together with witnesses for GDI



GDI generated strong industry interest

The Gun Drilling Collaborative Industry Project (GDI) was launched by a group of 22 closely inter-related companies on 6 December 2010 with the support of PE COI, SIMTech, SPRING Singapore, A*STAR and EDB. Mr Dax Middlebrooks, Manager, International Sourcing, Halliburton led this initiative with a team of four international sourcing, quality and supplier development experts from Halliburton USA. These experts help lead the workshops and roundtable discussions elaborating on both the short- and long-term perspectives of the business, technological and quality challenges.



Presentation of Gun Drilling Roundtable Findings

Gun Drilling Roundtable – Key Challenges and Issues; Partnership Formation (8 December 2010)

The key objective of the Gun Drill Roundtable was to identify the main drivers, challenges, issues, constraints and potential partners in the gun drilling of Inconel 718, a hard-to-machine nickel-based alloy. The roundtable collectively defined a number of pilot projects to be executed between January and September 2011, using the combined resources and expertise of the members and taking into consideration the background, experience, strength and leadership of each member. The results drawn from these pilots will provide the stimulus to drive further collaborative R&D and to develop critical capabilities to meet the harsh operating environment of the Oil & Gas sector.



Halliburton International Sourcing and Supplier Development Panel

One-to-one Supplier Meeting – Mainly SMEs and some MNCs

In the development of indigenous capacity and capability, a series of closed door one-to-one dialogue was held between Halliburton and the GDI's members. Each company demonstrated their machine tool, gun drills, samples of the oilfield components and experience with down-hole tools together with their expertise in large format machining, boring, gun-drilling, welding and cladding equipment. These dialogues helped uncover new hidden collaborative opportunities and provide the local supplier's management team with the thrust to set up their investment plan in addressing the business gaps. These pro-active closed door meetings not only reveal new business opportunities but also provide a basis for inter-linking companies for joint capability and partnership development.

Gun Drilling Seminar, Tutorial and Exhibition (3-9 December 2010)

Gun Drilling Seminar - Trends, Applications, Material and Tooling for Deep-Hole Drilling of High Aspect Ratio on Exotic Material: Oil & Gas, Aerospace, Photo Voltaic and Mould Bases



Industry expert shared useful knowledge

As part of cross-industrial knowledge exchange, a series of gun drilling seminars, tutorial and exhibitions was held for industry. These 3 events attracted 170 participants from the manufacturers of gun-drilled base high value products required by the Oil & Gas, Mould-bases and the Photo Voltaic equipment industry.

In the Oil & Gas sector, deep gun drilled holes are created on extremely hard and corrosion resistant, nickel- and chrome-

based alloys to serve as safety, control, wire-lines and flow-line holes to allow effective command, control and communication between the down-hole tools with the surface control crew. In the Mould-Base and Photo Voltaic equipment manufacturing sectors, gun drilled holes are predominantly created to serve as cooling channels to uniformly distribute the heat generated from the multi-cavity moulding and the PVD/CVD processes. The diameters of the holes range between 6-8mm

and depths range between 4-5m deep, making traditional gun drilling techniques highly inadequate for these high aspect ratio holes that has to be applied in the current harsh drilling environment.



Invited Speakers at the Gun Drilling Seminar

Ten prominent international speakers from Germany, UK, USA, Japan and Singapore - from machine tool builders; gun drill and tool manufacturers; specialty material and lubricant manufacturers together with SIMTech research scientists, shared their attempts in addressing these challenging issues. Collectively, these experts recognised that it is crucial to combine their expertise to control the hole's straightness, improve yield, productivity and eliminate costly rejects..

Tutorial on Gun Drilling - Dortmund University of Technology (9 December 2010)

As part of the PE COI's expert consultant programme, Professor Dirk Biermann and Ms Nadine Kessler, Research Assistant presented a comprehensive description of the various gun drills, optimisation of the boring and repanning tool geometry for different deep-hole drilling processes; clamping sleeves; cutting fluid pressure and flow rate.



Miss Nadine Kessler and Prof D Biermann – Technical University of Dortmund, Germany

Gun Drilling Exhibition (3-7 December 2010)

In conjunction with the seminars and workshop, a 3-day exhibition was held to provide companies a rare glimpse of the new machine tools, gun drills, materials and lubricant required to make Singapore a sustainable place for the manufacture of oilfield and down-hole equipment; photo voltaic chambers and high value multi-cavity step moulds.



Gun Drill Samples Exhibited

Contact us for your potential roles and contributions in growing these sectors:

Dr Lim Beng Siong, Senior Scientist, PE COI Oil and Gas Initiative Lead, SIMTech

Email: bslim@SIMTech.a-star.edu.sg or Tel: 9664 3967

Equipment News

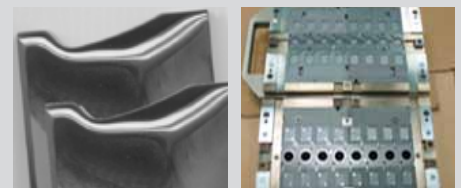
Some of the recent available equipment for R&D and resource sharing are:

Plasma Enhanced Physical Vapour Deposition (PEPVD) System

The PEPVD system combines magnetron sputtering and cathodic arc processes in one chamber with additional plasma source for sample cleaning and enhanced deposition of metallic or ceramic hard coatings. The system is designed to deposit hard or super hard coatings for wear or surface protection of precision engineering parts and components or decorative coatings for various parts and components.

The system has a deposition chamber of 900 mm x H 1000 mm in dimension, and is capable of pilot run. The coating types include Binary ceramic hard coatings: TiN, CrN; Ternary ceramic hard coatings: AlTiN, TiAlN, CrAlN, CrTiN; Nanocomposite super hard coatings: nc-TiAlN/a-SiNx, nc-CrAlN/a-SiNx; Dedicated multi-layer coatings; Decorative coatings.

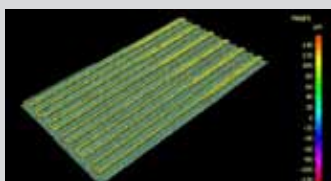
The typical applications are cutting, stamping, and forming tools; moulds and dies; gears; wear parts and components; and components for decoration.



Infinite Focus 3D Metrology System

This Infinite Focus Optical 3D Surface Metrology System is capable of measuring surface profile, surface roughness, waviness, and dimensions.

It is equipped with objectives of 2.5x, 5x, 10x, 20x, 50x and 100x. The best resolutions are vertical: 10nm, and lateral: 0.4µm. The max slope angle is up to 80°, lateral travel range (XY): 100mm x 100mm, and max weight of object: 20 Kg.



The typical applications include 2D/3D dimensional measurements of surface features; measurements of surface form, roughness & waviness; measurement of area and volume of solid sample; inspection of wear on cutting tools and burr of machined parts.

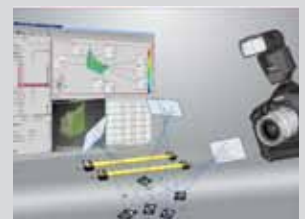
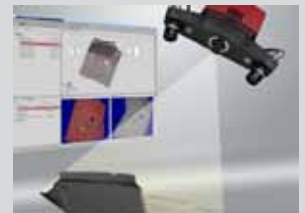
3D Digitiser (GOM System)

This flexible optical measurement system is based on the principle of triangulation. Projected fringe patterns are observed with two cameras, 3D coordinates for each camera pixel are calculated with high precision, and a polygon mesh of the object's surface is generated to achieve high accuracy digitising with the help of a photogrammetric system for large or complex objects.

Its specifications include:

- measured points: 4,000,000
- measurement time (sec): 2
- measuring area (mm²): 100X100 - 500X500
- point spacing (mm): 0.05 - 0.24.

The typical applications are non-contact and material-independent 3D digitisation of arbitrary objects such as workpieces, models and moulds; generation of STL or CAD data; transfer of model modifications to CAD; comparison of nominal/actual values between measured object and computer data (CAD model, point clouds or STL data).



For equipment enquiry, please contact Mr Peter Shi at 6793 8515 or zfshi@SIMTech.a-star.edu.sg.

PE Consultants Highlight

Metal Forming & Casting



Dr Atsushi Danno

- Former Board Member and Director in TOYOTA CRL.
- High Precision Bulk-Metal Forming Technology

danno@SIMTech.a-star.edu.sg



Dr Anders Jarfors

- Casting of Advanced Materials
- Superplasticity Forming

anders@SIMTech.a-star.edu.sg



Dr Nishiyama Sabrou

- Former GM, Hitachi Zosen
- Modelling for Metal Forming
- Tool & Die

nishiyama@SIMTech.a-star.edu.sg

Plastic, Metal & Ceramic Moulding



Dr Li Qingfa

- Powder Injection Moulding and Powder Metallurgy

qfli@SIMTech.a-star.edu.sg



Mr Chen Ge

- Plastic Injection Mould Design
- Mouldflow

gchen@SIMTech.a-star.edu.sg

Welding & Joining



Dr Sun Zheng

- Welding Processes and Welding Metallurgy

zsun@SIMTech.a-star.edu.sg



Dr Wei Jun

- Diffusion Bonding and Micro/Nanojoining

jwei@SIMTech.a-star.edu.sg

Machining



Mr Kanno Shigeyuki

- Precision Machining Technology, Micro-Machining and Micro-ecm

kanno@SIMTech.a-star.edu.sg



Dr Lim Gnian Cher

- Laser Machining and Processing

gclim@SIMTech.a-star.edu.sg



Mr Liu Peiling

- CAD/CAM/CNC toolkit and simulation system developer of InventorMould, Virtual CNC Training Lab & QuickCNC

pliu@SIMTech.a-star.edu.sg



Dr Khong Heng Poh

- Former Head of Process Engineering & Technology, Rolls-Royce Fuel Cell Systems, Singapore
- Machine Tool
- Automation

hpkhong@SIMTech.a-star.edu.sg

Plating & Coating



Dr Andrew Soutar

- Surface Finishing

soutar@SIMTech.a-star.edu.sg



Dr Sandor Nemeth

- High Temperature Resistant and Scratch Resistant Coatings

sandorn@SIMTech.a-star.edu.sg



Dr Ding Xing Zhao

- Tribological Hard Coatings

xzding@SIMTech.a-star.edu.sg



Mr Chang Jen Heng

- Former R&D Director and co-founder of Technochem
- Decorative Plating, Chemical Etching, Metal Stripping and Recovery

jhchang@SIMTech.a-star.edu.sg

Operational & Supply Chain Management



Dr Lim Yan Guan, Roland

- Lean Manufacturing, ERP system and Supply Chain Management

ygliim@SIMTech.a-star.edu.sg



Dr Zhang Nengsheng, Allan

- Information Technology in Manufacturing Operations Management

nzhang@SIMTech.a-star.edu.sg

**Mr Chua Tay Jin**

- Production Planning and Scheduling
- tjchua@SIMTech.a-star.edu.sg

Manufacturing Execution & Control**Dr Goh Kiah Mok**

- Manufacturing System Design
 - Embedded System, Equipment and Device Interface
- gkmgoh@SIMTech.a-star.edu.sg

**Mr Wong Ming Mao**

- System & Supervisory Control
 - Automated Warehouse Control System
- mmwong@SIMTech.a-star.edu.sg

Green Manufacturing**Dr Song Bin**

- Green Manufacturing
 - Re-manufacturing
- bsong@SIMTech.a-star.edu.sg

MedTech**Mr Kiyoshi Chikashige**

- Medical devices
 - Design
- chikashige@SIMTech.a-star.edu.sg

Equipment Development**Ms Wan Siew Ping**

- Equipment and System Conceptualisation
 - Automation and System Integration
 - Modular Design and Documentation
- span@SIMTech.a-star.edu.sg

Process & Tool Condition Monitoring**Dr Lim Beng Siong**

- High Integrity and Performance Monitoring
 - Electrode, Tools and Work Piece Tracking
- bslim@SIMTech.a-star.edu.sg

Factory Automation**Dr Lin Wei**

- Precision Mechanism and Machine Design
 - Manufacturing Automation
- wlin@SIMTech.a-star.edu.sg

**Dr Lin Wen Jong**

- CAE for Precision Machines
 - Vibration Analysis and Control
- wjlin@SIMTech.a-star.edu.sg

**Mr Budiman Sastra**

- Mechatronics
 - Storage Systems & Displays
- budiman.sastra@SIMTech.a-star.edu.sg

Reliability**Assoc Prof Tan Cher Ming**

- Electronic & Electrical Reliability
 - Failure Analysis
 - Quality Engineering
- ECMTAN@ntu.edu.sg

Precision Measurements**Dr Fang Zhongping**

- Optics
 - Metrology
- zpfang@SIMTech.a-star.edu.sg

**Dr Xu Jian**

- Image Processing
 - Vision Inspection
- jxu@SIMTech.a-star.edu.sg

Material Characterisation**Dr Tung Siew Kong**

- Material Characterisation
 - Metrology
- sktung@SIMTech.a-star.edu.sg

**Ms Liu Yuchan**

- Dimension Metrology
- yliu@SIMTech.a-star.edu.sg

Course/ Seminar

The Precision Engineering Workforce Skills Qualifications (PE WSQ) Specialist Diploma in Precision Engineering

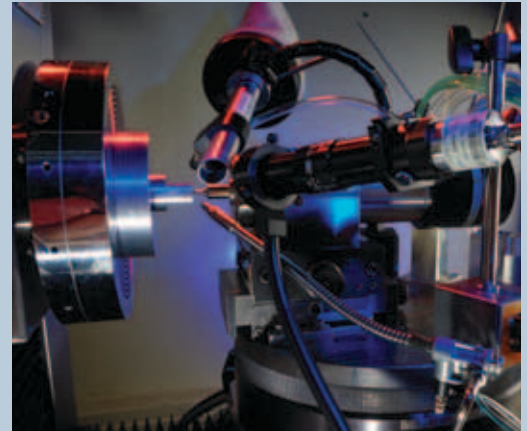
This course covers the following modules:

- Module 1: Laser Machining Technology
- Module 2: Apply Injection Moulding Tool Design
- Module 3: High Speed Machining and Cutting Tools
- Module 4: Employ Advanced Metal Forming and Casting Technologies
- Module 5: Apply Surface and Coating Technologies
- Module 6: Apply Advanced Joining Technologies

Course starting schedule: 24 February 2011

Every Tuesday & Thursday, 6.30pm – 9.30pm

Venue: SIMTech Training Room



NEW

We will be launching **PE WSQ Graduate Diploma in Manufacturing Processes Technology** in the near future. Please look out for more details.

Contact person: **Ms Connie Ng**

Tel: 6793 8986 | Email: yyng@SIMTech.a-star.edu.sg

Peening and Surface Conditioning for Aerospace Applications Seminar

28 February 2011

For details, please contact: **Dr Anders Jarfors**

Tel: 6973 8576 | Email: andersj@SIMTech.a-star.edu.sg

About the Precision Engineering Centre of Innovation (PE COI)

The PE COI serves as a national resource and aims to proactively assist the upgrading of SMEs within the PE sector. It provides technology and IT related services and know-how to industry through the following means:

- Consultative role: companies requiring short term advice in resolving imminent technical and productivity improvements issues can effectively use the PE COI to serve as their in-house consultants.
- Technology development: companies needing help in the development of new technology that require more than consultative advice will be channelled to the appropriate institutions such as the research institutes within A*STAR and other institutions of higher learning. The PE COI will act as a one-stop centre to facilitate faster response to industry's needs.
- The laboratory facilities at the PE COI will be made available to the consultants and companies as well as researchers from institutions.

For enquiries, please contact: PE COI Technical Hotline

Ms Verlin at 6793 8360

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

Website: www.pe-coi.sg

Partners

