OPEN INNOVATION HUB

Screen Printing Forever

ASADA MESH CO., LTD.
5th Advanced Screen Printing Workshop
at
WCPC – Swansea University, UK
September 10th-11th, 2018

ASADA MESH CO.,LTD.

Welsh Centre for Printing and Coating
WCPC
Canolfan Argraffu a Chaenu Cymru

Swansea University
Prifysgol Abertawe

icmPrint

Dear Invitees,

Asada Mesh Co., Ltd. will host the **5th Advanced Screen Printing Workshop** at the **ESRI Auditorium, Swansea University Bay Campus in Swansea, UK.**

The latest news and developments in **Conductive Inks, PE Sensors, Solar Cells, Squeegee Technology, Emulsions and Asada´s latest Stainless Steel Meshes** will be shared. Our **Open Innovation Lab** has been busy this year with materials that will be presented during our event.

We are happy to welcome our **Speakers:**

1. **Tomas Syrovy - UNIVERSITY OF PARDUBICE, CZECH REPUBLIC.**
2. **Gregoire Staelens - GENE´S INK, FRANCE.**
3. **Julie Ferrigno / John Hannafin - GGI SOLUTIONS, CANADA and SUN CHEMICAL, USA.**
4. **J. Patrick Frantz / Hung Ming Chang - HAYDALE TECHNOLOGIES, THAILAND.**
5. **Professor Gunter Hübner - MEDIA UNIVERSITY STUTTGART, GERMANY.**
6. **Professor Tim Claypole – WCPC SWANSEA, UK.**
7. **Owen Price - WATTS POLYURETHANE PRODUCTS LTD., GLOUCESTERSHIRE, UK.**
8. **Toru Matsumoto - ASADA MESH, KAGOSHIMA, JAPAN.**
9. **Kirsty Denning / Mr. Richard Stewart – ASM, UK.**
10. **Yi Zhang – HERAEUS, PENNSYLVANIA, USA.**

Agenda for Day 1 (September 10th)

8:30	**Registration / Refreshments**
9:00	**Welcome remarks from Professor Claypole + Mr. Hideaki Asada Jr. (President of Asada Mesh Co.)**
9:30-10:00	**Speaker 1: TOMAS SYROVY – UNIVERSITY OF PARDUBICE, CZECH REPUBLIC.**
10:00-10:30	**Speaker 2: GREGOIRE STAELENS – GENE´S INK, ROUSSET, FRANCE.**
10:30-11:00	**Speaker 3: JULIE FERRIGNO and JOHN HANNFIN GGI SOLUTIONS QUEBEC, CANADA - SUN CHEMICAL, USA.**
11:00-12:00	**BREAK + EXHIBITOR AREA**
12:00-12:30	**Speaker 4: PATRICK FRANTZ and HUNG MING CHANG - HAYDALE TECHNOLOGIES, THAILAND.**
12:30-13:00	**Speaker 5: GUNTER HUEBNER – HOCHSCHULE DER MEDIEN (HdM) STUTTGART, GERMANY.**
13:15	**LUNCHEON**
14:15	**Visit to WCPC Labs.**
15:15	**End of 1st Day**

Agenda for Day 2 (September 11th)

8:30	**Registration / Refreshments**
9:00-9:30	**Speaker 6: TIM CLAYPOLE – WCPC, SWANSEA, UK.**
9:30-10:00	**Speaker 7: OWEN PRICE – WATTS POLYURETHANE PRODUCTS LTD., GLOUCESTERSHIRE, UK.**
10:00-10:30	**Speaker 8: TORU MATSUMOTO – ASADA MESH, KAGOSHIMA, JAPAN.**
10:30-11:30	**BREAK + EXHIBITOR AREA**
11:30-12:00	**Speaker 9: KIRSTY DENNING and RICHARD STEWART – ASM, WEYMOUTH, UK.**
12:00-12:30	**Speaker 10: YI ZHANG – HERAEUS, PENNSYLVANIA, USA.**
12:30-13:00	**FERNANDO ZICARELLI + PEDRO PENA – UPDATE 2019 WORKSHOP.**
13:15	**LUNCHEON**
14:15	**Visit to WCPC Labs.**
15:15	**End of 2nd Day and Symposium**

September 10th - Featured Speakers:

Final Abstract: "The Screen Printed Batteries for Intelligent Packaging Applications" by Tomas Syrovy from the University of Pardubice, Chez Republic.

Within the presentation it will be described the fabrication of Screen Printed Batteries for Smart Labels applications.

It will be discussed influence of various battery parameters (layer thickness, printing paste) to battery performance.

The lateral and sandwich structure of batteries will be compared towards to its performance and towards to industrial fabrication process ability.

Final Abstract: "New applications opened by Genes' Ink Nano inks" by Gregoire Staelens from Genes´ Ink France.

The presentation will describe Genes´ Ink R&D Roadmap for screen printing inks.

Genes´ Ink team build its roadmap on a solid customer intimacy and knowledge developed by working with different type of users of printed electronics: OEMs, Mesh Manufacturers, Institutes, Universities and Experts all around the World which are part of a dedicated Scientific Committee.

You will see the strong links between Genes' Ink and the printed electronic market through several development examples and collaborative works run at Genes' Ink.

JOHN HANNAFIN´S PICTURE HERE!

Final Abstract: "Micron Size features with Silver Molecular Inks" by Julie Ferrigno, GGI Solutions, Canada and John Hannafin, Global Product Manager, Sun Chemical, USA.

GGI Solutions has been operating in the field of human machine interface technologies for more than 30 years while continually diversifying its product and service offerings. The company is a trusted value-added partner in leading-edge technological solutions for its global aerospace, medical, industrial, transport and defence clients. In collaboration with the National Research Council of Canada and Sun Chemical, GGI developed a silver Molecular Ink (M-Ink). The M-Ink formulation is based on silver salt, meaning there's no particle. Consequently, the M-Ink allows to achieve the smallest resolution possible without compromising the conductivity. With the current screen printing technology, 75µm/75µm (width/space) is the best resolution achieved on standard substrate.

Sun Chemical and its parent company, the DIC Corporation, deliver a vast portfolio of advanced products and technologies to broad markets, including automotive, inkjet, electrical/electronics, architectural and industrial coatings, aerospace, printed electronics, ink, printed circuit boards, textiles, photovoltaics, plastic cards, water degassing, metalworking and plastics.

The goal of the current study is to achieve 20µm/20µm (width/space) with the combination of the new very fine line mesh developed by Asada Mesh, the M-Ink and a different set of substrates. The results obtained will be compared to the traditional silver PTF fine line ink, AST-6025, from Sun Chemical.

Final Abstract: "High Temperature Silver Paste for Fine Line Printing" by J. Patrick Frantz & Mr. Hung-Ming Chang from Haydale Technologies - Taiwan.

Haydale Technologies (Taiwan) has developed a novel silver paste for high temperature sintering (>500C) for substrates such as ceramics.

This new ink is screen-printable and can achieve fine line printing resolutions down to 25u lines with 25u spacing, and it can be easily integrated into an environmentally friendly manufacturing process without the need for laser or chemical etching.

This results in no loss of material, and the cost of the ink is comparable to existing silver pastes on the market.

Final Abstract: "Screen Printing of Sensors/Actuators for Man/Machine Interface" by Prof. Dr.-Ing. Gunter Huebner, Thomas Fischer M.Sc. and Ricardo Martinez from HdM University of Stuttgart, Germany.

Very commonly sensors for man/machine interfaces are based on capacitive effects. When arranged in an x-y-matrix, those sensor arrays are called touchpads. Two main principles can be used to detect a touch: self-capacitance and the mutual capacitance. The principle of the mutual capacitance type is that the presence of a human finger (with the large capacity of the human body behind) changes the capacity of a sensor node locally. A microcontroller sequentially measures the capacity in the x-y-matrix, looking for changes in the base capacity due to the impact of the human finger (and body).

With the aid of a microcontroller that uses appropriate algorithms the x-y position of the capacity change can be detected and even multi-touch is measurable. Such touchpads are commonly manufactured on glass substrates by structuring ITO conductive layers. In this case, however, flexible plastic films (PET or similar) are used because the final aim of the project work is to print actors on the backside of the substrate that are able to generate a haptic feedback signal to the user (e.g. vibrations). On the touchpad-side of the film the layout and print quality must be optimized in order to reach comparable low capacities that enable quick detection and responses.

For the mutual capacitance principle, a crossing of the x and y lines is necessary. Therefore, at the crossing points a dielectric layer is printed in order to avoid shorts between the x and y lines, which mostly comprise of silver conductive inks. The geometry of the lines and especially the crossing points rules the performance of the sensors. In this investigation, several different designs for the layout between those crossing points have been tested and since only small idle capacities are necessary the lines may be very small, thus fine line printing (<<80µm) of the silver tracks is needed. The dependencies of the touchpad performance from design and print parameters (track width and height of conductive lines and dielectric) will be shown. A secondary goal is the printing of transparent touchpads. The finer the lines the better is the transparency due to the human eyes resolution limitations.

Since the project is currently being worked on intensively, more interesting results can be expected until the day of the presentation, especially on the actor side.

September 11th - Featured Speakers:

Final Abstract: "Effect of Nano carbon geometry on printability" from Professor Tim Claypole – WCPC, Swansea, UK.

Nano carbons are widely used in functional inks for flexible electronics, wearable technology, smart packaging, energy storage and sensors. These applications require features ranging from fine lines to solid areas to be printed, the latter with the additional complication of controlling the surface roughness. The geometry of the carbon varies from nano spheres (carbon black and buckyballs) to high aspect ratio particles (CNT, graphene, GNP and graphite). The blend of nano carbons determines the flow through the screen and hence the printability of the ink.

This paper looks at the influence of nano carbon geometry and loading on the printing of fine lines and solid areas. The relationship with classical powder bridging theory is evaluated by studying model inks comprising of mono particles and this is extended to practical application with the hybrid inks containing a nano carbon blend. This is complimented by the application of advanced rheology to the inks, including CSPS (controlled stress parallel superposition) and SAOS (Small amplitude oscillatory shear) that has previously been shown to be an indicator of aspects of printability.

OWEN´S PICTURE HERE!

Final Abstract: "Technological Advancements in Electronic Printing PU Squeegees" from Owen Price – Watts Polyurethane Products Ltd., UK.

It is our aim to give an insight in to the latest technological advancements developed by Watts Urethane Products to improve and stay ahead with the continuous changes in contemporary electronic printing.

We will demonstrate our capabilities as an experienced manufacture to develop and offer squeegee products to improve the efficiency of their printing to reduce costs, whilst improving print quality to maximize profits.

Several types of squeegees will be passed around to show the different specifications of material hardness, profiles and types.

Final Abstract: "Advanced Emulsion Technology from OIH" by the OIH Group - Kagoshima, Japan.

The Open Innovation Hub of Asada Mesh will present the results of the latest Emulsions tested; Kiwo, Chromaline and Kurita will be showcased.

A very big effort has gone into resolving Line Widths of 20 microns or less.

Mr. Matsumoto will share with the audience the differences between the 3 chosen materials; best practices for handling, mixing, filtering, application, drying, best EOMs and exposure times will also be shared.

Asada Mesh will also share with our audience the latest meshes coming out of our R&D Facility this year and what is under development.

Finally, we will share some of the best Screen Printed results based on some of these emulsions.

KIRSTY DENNING´S PICTURE HERE!

Final Abstract: "20/20 Project; in the pursuit of 20 micron features and 20 micron spaces" by Richard Stewart and Kirsty Denning from ASM Assembly Systems - Weymouth, UK.

ASM in Weymouth, UK will present the results of a collaborative project with Asada Mesh to develop the optimum Screen Production and Testing Methodologies for Fine Line Screens.

The presentation will also include an overview of ASM´s Advanced Screens Production processes used to ensure that the High Mesh Count Technology from Asada Mesh can be used at the lowest possible total cost.

Updates on the latest Fine Mesh Panel Technology with some Industrial Size Partners already using the technology in Mass Production.

The project is focused on Fine Line Screens theoretically capable of printing 20µ track with 20µ gap.

Final Abstract: "Double Printing Ag Metallization Paste for Si-Solar Cell – Features and Current Status" by Mr. Yi Zhang - Heraeus, USA.

- Updates on their Ag Pastes for Si-Solar Cell.
- Latest updates on Screen Technology.
- Latest updates on Printing modes.
- Ultra-fine line printing trends.
- Lower paste laydown.
- High mesh screen with narrower opening.
- Various wafer surface textures.
- Double Printing Ag Metallization Paste Features.
- Other update from cooperation projects.

SPEAKER BIOS

Assoc. Prof. Ing. Tomáš Syrový, (Ph.D.):

Just a few months ago; Tomas became an Associate Professor. Congrats!!!

Since 2006, Dr. Syrový has been a Senior Researcher at the Department of Graphic Arts and Photo physics at the University of Pardubice, Czech Republic.

From 2009 is leader of a research group working on material Printing/Coating Technologies.

Since 2010, he has been the Deputy Manager of the Department of Graphics Arts and Photo physics. His research is focused on of various topics of printed/coated electronics (Sensors, RFID, Displays – (ECD, LEC), Accumulators, Smart labels, etc.), functional layers/structures (antistatic, antibacterial, luminescent, photochromic, etc.).

The core of his activities in projects is the development of ink formulations, and the technology of preparing functional layers/structures, including upscaling and transfer to industry.

Mr. Gregoire Staelens:

Gregoire is working as a Scientist in the R&D department of Genes' Ink.

The company is offering innovative solution for Printed electronic market, including OPV, OLED displays and IoT (sensors, RFID).

4 years at Genes' Ink working in ink formulation, printing process development (Screen printing, Ink Jet and Flexo, Spray) and curing process.

One of his key achievement is the development of the first curing free silver nano ink for screen printing.

Julie Ferrigno, PhD, Eng.

She is an R&D engineer at GGI Solutions, Montreal, Canada, where she is specialized in the design, conception and manufacturing of emerging printed electronics products.

Over the past few years, she has focused her activities in advanced manufacturing for the very fine line screen printing process and has worked in collaboration with the NRCC (National Research Council of Canada) to aid in developing a new conductive ink dedicated to micron and submicron printing technology.

She has a PhD in Electronics (Failure Analysis of Digital Integrated Circuits, 2008) from CNES, Toulouse, France and an Engineering Degree in Physics (2005) from INSA Toulouse, France.

John Hannafin:

JOHN HANNAFIN´S PICTURE HERE!

John Hannafin is currently Global Product Manager at Sun Chemical.

Formerly CEO of NanoMas Technology, a high performance nanosilver particle and ink producer, he joined Sun upon his sale of NanoMas to Sun in 2013.

John has over 25 years of experience in materials and solutions for the printed electronics, electronic assembly and semiconductor packaging industries.

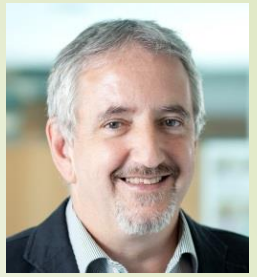
He has a BS in Electronic Engineering from the Wentworth Institute of Technology and an MBA from the Olin Graduate School of Business at Babson College.

Mr. J. Patrick Frantz:

J. Patrick Frantz received BA (1995) and MEE (1997) degrees from Rice University and returned to Rice in 1999 to serve as the Executive & Technical Director for the Center for Multimedia Communications.

In 2006 he was awarded the Outstanding Young Engineering Alumnus award for his efforts in international engineering education. Shortly thereafter, Patrick moved to Japan, working in the semiconductor and display industries (Xilinx, Barco and UniPixel Displays) and receiving an MBA from Temple University Japan in 2011.

He founded planarTECH in 2012 and has since been active in the field of graphene and other emerging 2D materials, including serving as Haydale Limited's Asia Representative since May 2014.



Prof. Dr.-Ing. Gunter Hübner:

Since 1999 Prof. Hübner teaches at the University of Applied Science, Stuttgart Media University “Hochschule der Medien” (HdM) in Stuttgart, Germany.

From 2004 until 2014 he was the leader of the HdM study program “Print and Media Technology”. Besides the entire printing technologies and printing processes his specialties in teaching are digital, screen and functional printing.

In 2006 the Institute for Applied Research (Institut für angewandte Forschung – IAF) was founded at the HdM. He took over the leadership of the IAF, which is an umbrella organization over meanwhile, about 30 research groups within the HdM. His own research group is called “Institute for Innovative Applications of the Printing Technologies” (IAD) and mainly deals with functional and specialty printing. Recent successful developments are printed antennae for automotive applications, screen-printing of rechargeable batteries and resistive or capacitive sensors.

Before joining the HdM he worked for about 11 years with the companies AGFA Gevaert AG and DuPont de Nemours as a research and process engineer.

Prof. Tim Claypole:

Prof. Tim C. Claypole, MBE, Phd, BSc (Hons), C. Eng, F.I.Mech.E., M.I.E.T.

Tim Claypole is a founder and director of the WCPC (Welsh Centre for Printing and Coating, Swansea University). He is a faculty member of the College of Engineering, Swansea University. His areas of research include colour control, manufacturing systems, quality, maintenance, reliability experimental design, fluid mechanics and process thermodynamics. He is a British Expert on ISO TC130 on standards for the graphic arts. As well as graphics and packaging, he has internationally leading research on the use of volume printing processes for advanced manufacture of a diverse range of products including electronics, sensors and point of care health.

Tim led the ERDF funded DIPLE project won the 2009 Regiostars award for "Research, Technology Development and Innovation", reflecting the successful transfer of the research into industry. He was awarded an MBE for his services to graphic arts and industry in the 2010 Queens New Years Honours.

His contribution to the printing industry has been recognised by the industry with the TAGA Michael Bruno award in 2008 and in 2009 an EFTA special award for outstanding contribution to flexographic printing. The EPSRC, Government and Industry have funded his research that has led to over 170 publications on printing and related topics. He recently finished a prestigious EPSRC Portfolio Grant in "Complex Fluids for Complex flows", these are only awarded to World leading research groups. He is a co-investigator on the EPSRC Centre for Innovative Manufacture of Large Area Electronics. This major UK award for research is held by the WCPC jointly with the other 3 UK Centres of excellence in Printable Electronics - Cambridge University, Imperial College London and Manchester University.

Mr. Owen Price:

OWEN´S BIO HERE!

Mr. Richard Stewart:

Richard (Rich) Stewart was born in Dundee, Scotland but grew up and was schooled in the London area. After attending University in London he started his career as a buyer with a construction company in the mid 1980's.

Following a number of years in purchasing and supply chain roles in the Construction and Engineering industries he joined ASM (then DEK Printing Machines) in 1999. After a number of roles in purchasing and commercial roles he moved to DEK's Engineered Products (EP) business in 2009 as Operations Manager for the Screens business in Weymouth, UK.

Since 2009 his role has grown to incorporate Management of the Stencils and Tooling businesses with sites across Europe, Asia and the USA. He is still involved in the Screens business on a daily basis. Rich firmly believes that emerging technologies mean Screen Printing is key to the core ASM vision of "enabling the digital world".

Ms. Kirsty Denning:

KIRSTY DENNING´S BIO HERE!

Mr. Toru Matsumoto:

Mr. Matsumoto joined Asada Mesh in 2007.

One of the first members of the R&D Department who also lead the establishment of Open Innovation Hub (OIH).

He has been working on re-evaluating the basic data of Screen Printing from Screen Making to Screen Printing. This year, he has conducted multiple experiments in the Emulsion Technology which has resulted in the discovery of several materials being able to open 20 micron features.

He is the main person who guides visitors through the OIH, Lab.

Supports also the Sales Team with technical inquiries.

Ph.D. - Mr. Yi Zhang:

Yi Zhang received the B.Sc. degree from the University of Science and Technology of China and the Ph.D. degree in Chemistry from the Nanyang Technological University, Singapore.

He is Research Scientist and Project Leader at Heraeus Photovoltaics, West Conshohocken, US, where he works on metallization paste development, screen printing and paste rheological properties.

Currently, he is doing research on the different posible methods of Double Printing for conventional Solar Cells.