

Hub of Application Laboratories for Equipment Assessment  
In Laser Based Manufacturing

## Editorial

*Dear APPOLO newsletter readers,*



Around one year ago the APPOLO project has been started and many steps have already been taken. All partners are actively involved in the assessment of new equipment and laser technologies.

Large progress has for example been made by the HUB members Bern University of Applied Sciences (BUAS), Next Scan Technology, Time-Bandwidth Products AG and Daetwyler Graphics AG in the validation of fast and precise surface texturing technologies, using polygon scanners and high-repetition rate ultra-short pulse lasers.

Excellent results were achieved in the scribing of thin film solar cells in a collaboration of BUAS, the Swiss Federal Laboratories for Materials Testing and Research for Industry, Construction and Commerce (EMPA) and the OneFive GmbH with a modified fiber laser producing the record-narrow interconnection. In addition the Leibniz Institute of Surface Modification has developed an on-line monitoring tool for reliable laser scribing process validation.

Lightmotif and the Material Supplier Centro Ricerche Fiat S.C.P.A. (CRF) are on a good way to optimize the laser texturing technologies of 3D molds for functional polymer surfaces. Consequently APPOLO is a good extension of the FP7 Nanoclean project for new applications.

Furthermore the Center for Physical Sciences and Technology, CRF and Bioage SA achieved promising preliminary results in laser writing for electro-less metal plating, utilizing new laser sources.

Besides the research and development efforts, the APPOLO members show strong international presence. A list of all fairs and exhibitions, where HUB members represented APPOLO in the first half of the year 2014, can be seen on page 3 and indicates our presence in important markets.

In the Focus Topic of this issue we want to take a closer look on the latest achievements in CIGS scribing of our HUB members BUAS and EMPA.

We hope you enjoy this edition of the APPOLO newsletter,  
Gediminas Račiukaitis, Project Coordinator

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[www.appolo-fp7.eu](http://www.appolo-fp7.eu)

# Focus Topic

## *Enhancing high performance CIGS by laser patterning*

### **Maturing market – new challenges**

The photovoltaic market did grow fast in the last years. As production technologies got more advanced and diverse, the prices for solar cells and modules did decrease and as the market is mainly divided into crystalline and thin-film photovoltaic modules, those two technologies were competing. The prices for crystalline cells were falling faster and due to the increasing price pressure, the thin-film solar cell market has seen a period of consolidation during the last years and many involved companies were forced to stop production. Today, thin-film solar industry is gaining momentum again and the problems of low efficiency and high loss of productive area seem to decrease due to new laser patterning. Especially the CIGS thin-film solar module technology evolves at high pace fired by recently achieved record efficiencies of 20.4 percent on flexible polyimide substrate and 20.8 percent on glass substrate. Fresh companies are preparing market entry with matured products and manufacturing technology suitable for high-volume and high-throughput production. Among the thin-film absorber materials  $\text{Cu(In,Ga)Se}_2$  (CIGS) systems boast highest-in-class efficiency and stable performance.

### **APPOLO members conducting joint experiments**

A key enabling technology for the industrialization of CIGS solar modules is laser patterning which allows the cell-to-cell interconnection to be realized with minimal loss of productive area and without the addition of foreign materials such as solder or metal conductors. Researchers at the Institute ALPS at Bern University of Applied Sciences (BUAS) and the Laboratory for Thin Films and Photovoltaics at EMPA, both located in Switzerland, did study this key technology in collaboration. As the laser source for their experimental work in this study they used the Katana HP, manufactured by Ofive GmbH, Switzerland. This is an all-in-fiber picosecond pulse laser system which delivers <50 ps pulses at the two wavelengths 532 nm and 1064 nm. All above

mentioned institutions and companies are members of APPOLO.

### **Investigating all three ablation processes**

In their experiments the researchers investigated all three selective ablation processes necessary for building monolithic interconnects. EMPA and BUAS have optimized laser process parameters for the picosecond laser with respect to electrical quality and heat affection of the scribe border and could show that a complete set of optimized parameters for the three scribing processes P1, P2 and P3 can be found at the two wavelengths 532 nm and 1064 nm for pulse durations <50 ps. The goal of the study was to decrease the non-productive dead-zone width while maintaining the good electrical properties of interconnects and the high module efficiency. The work has been done on 50x50 mm<sup>2</sup> float glass substrates and produced functional 8 cell mini modules. Subsequently these modules have been analyzed at EMPA by means of illuminated current voltage characteristics.

### **Lower dead-zones and higher efficiency**

As a result of the experiments a reduced size of interconnects and excellent electrical quality has been achieved, which directly translates into better module performance. A certified module efficiency of 16.6% with a low-dead-zone module was thereby accomplished. Thus the results prove that an increase in active cell area directly increases overall electrical yield and that the modules with the lowest dead zone width were also the ones with the best module performance. Recent results were achieved in a project by the Swiss Commission for Technology and Innovation and now that reliable laser scribing processes and laser sources are available, these results need to be transferred into industrial production. Here the APPOLO project and its network of institutes and laser companies gets involved and will help to connect researchers, laser equipment suppliers and end-users. The focus will shift from the understanding of the process mechanics to more practical aspects of laser processing such as long-term performance and stability of the laser system, beam delivery and machine integration of the laser device and of course total cost of ownership. Research institutes are accompanying this transfer process from lab to production line and work together with the early adopters of all-laser-scribing among the solar module producers.

# APPOLO Project Activities Raise International Echo

In the first half of 2014 the FP7 project “Hub of Application Laboratories for Equipment Assessment in Laser Based Manufacturing” (APPOLO) and its 21 project members demonstrated high user relevance and networking activities within the laser-based industries. In just 6 months they showed presence in over 16 international conferences and exhibitions promoting the upcoming APPOLO assessment activities all over the world connecting researchers, suppliers, manufacturers and end-users of laser.

Gediminas Račiukaitis, Project Coordinator of APPOLO can already see internalized benefits of the exchange of APPOLO partners with external potential customers along the value chain in different industries: “It is amazing to see, how HUB members act in a fruitful crowd not only representing their own company, but also promoting the APPOLO project and discussing the recent efforts in the APPOLO project. By that, we can add distinct industry needs to the diverse and complex structure of the APPOLO assessment chains.”

In not even one year, APPOLO and its project members were present at the following exhibitions and conferences:

- SPIE Photonics West 2014, San Francisco, USA
- Innovation Forum Mikrolas, Rostock, Germany
- Laser World of Photonics China 2014, Shanghai, China
- SPIE Photonics Europe, Brussels, Belgium
- Photonix 2014, Tokyo, Japan
- High Power Laser Ablation, Santa Fe, USA
- Smart Laser Processing Conference, Yokohama, Japan
- AKL - International Laser Technology Congress, Aachen, Germany
- 5<sup>th</sup> International Conference on Radiation Interaction with Materials, Kaunas, Lithuania
- E-MRS Spring meeting, Lille, France
- CLEO 2014: Laser Science to Photonic Applications, San Chose, USA
- 15<sup>th</sup> International Symposium on Laser Precision Microfabrication, Vilnius, Lithuania
- Environment Professional Microtechnologies, Genève, Switzerland
- Plastics Design & Moulding, Telford, United Kingdom
- Stuttgart Laser Technology Forum, Stuttgart, Germany
- Laser Optics, Berlin, Germany

We are looking forward to meeting you soon on the upcoming events. For detailed list of upcoming events see page 12 of this newsletter.

Find the full press release at

[http://www.appolo-fp7.eu/uploaded\\_files/file/APPOLO%20Project%20Activities%20Raises%20International%20Echo.pdf](http://www.appolo-fp7.eu/uploaded_files/file/APPOLO%20Project%20Activities%20Raises%20International%20Echo.pdf)

# Meet the Consortium

**Lappeenranta University of Technology**



Open your mind. LUT.  
Lappeenranta University of Technology  
©LUT

Lappeenranta University of Technology (LUT) is an agile, international science university. The Finnish university is a pioneer in combining technology and business since 1969. The strategic focus areas are green energy and technology, sustainable value creation and a role as an international hub of Russian relations. LUT's operation is solution-focused and characterized by an "open your mind" thinking: crossing boundaries open-mindedly, together.

Its international community comprises 6,500 students and experts engaged in scientific research and academic education.

## <News<<<News<

### NST at Stuttgart Laser Technology Forum

NST was invited to speak at the Stuttgart Laser Technology Forum (SLT'14, June 24-25<sup>th</sup>). During this event the design rules in polygon scanning were discussed and a referral to the APPOLO results was made.

Additionally the results were published in an article in the Laser Technik Journal Volume 11, Issue 3, June 2014.

Source:  
<http://onlinelibrary.wiley.com/doi/10.1002/latj.201400033/abstract>

## Interview...

*...with Mr. Matti Manninen, Research Scientist, Laser Processing Research Group at LUT*

*What is your core competency in the laser business?*

At first the focus of research was on laser welding, surface treatment, and laser cutting, and the core competencies of LUT Laser still revolve around laser material processing. However, since then the research has evolved to include wider aspects of laser material processing, such as how to design for industry utilizing the strengths of laser processing and what kind of business concepts should be adapted to best utilize modern manufacturing equipment, laser quality control systems and occupational safety.

*What is your contribution to the APPOLO project?*

LUT Laser will use its process monitoring know-how to test their sensors in laser fine processing and develop a new monitoring and control setup for APPOLO process assessment purposes. Prior to APPOLO these sensors have been used in monitoring laser additive manufacturing and laser welding. LUT is also responsible for workshops that are organized throughout the project and part of the virtual hub of application laboratories in APPOLO.

*What is your aim in the APPOLO project?*

As LUT Laser's core competencies revolve mostly around higher power laser processing, this project is an amazing opportunity to find new partners, connections, and knowledge in ultra-fast-pulse area of laser processing. It is similarly a good opportunity to spread the knowledge and experience developed in our laboratory over the years to a new audience. In terms of technology, we hope that the new monitoring setup that is being developed enables us to better understand the laser beam and material interaction and do advanced scientific research and cooperation with the platform.



The university has produced over 10,000 graduates holding the degree of Master of Science in Technology or Master of Science in Economics and Business Administration. In addition, over 450 LUT students have the postgraduate degree of Doctor of Science in Technology, Doctor of Science in Economics and Business Administration, or Doctor of Philosophy.

The research group at LUT's Laboratory of Laser Processing – LUT Laser – is part of the Lappeenranta Laser Processing Centre (LPC) which is a joint institute between LUT and the Technical Research Centre of Finland. The research facilities are located in the city of Lappeenranta in south-eastern Finland, a hundred meters from the main University facilities. LUT Laser has had a significant influence in the early years of laser processing in Finland, and most of the laser related businesses in Finland today have some sort of history with them.

Another research unit of LUT Laser is in Turku, which is located on the south-western coast of Finland. Today, LUT Laser is one of the most well-known laser processing research centres in the Baltic Sea region and the best known research areas are laser and hybrid welding processes for the heavy industry.



LUT Campus at lake Saimaa

©LUT

The research group LUT Laser was founded in 1985 and the first high power laser was acquired the following year. At first the focus of research was on laser welding, surface treatment, and laser cutting, and the core competencies of LUT Laser still revolve around laser material processing. Laser fine machining and laser additive

## <News<<<News<

### *Abengoa to develop new solar-thermal storage technology*

In collaboration with the US National Renewable Energy Laboratory (NREL) and the Colorado School of Mines the APPOLO member Abengoa has been selected by the US Department of Energy to develop a new storage technology for solar thermal plants. The program will last for two years and will require an investment of €1.3 million by the US Department of Energy.

Abengoa will be responsible for leading the systems integration work and the technical-financial analysis, focusing on the commercial potential of this technology in future solar plant projects.

This new research program will consolidate Abengoa's leadership position in developing innovative technology solutions for sustainability, specifically in the field of solar R&D in which the company has carried out major research programs. As a result of this investment, Abengoa currently has 1,223 MW of installed capacity in commercial operation and 430 MW under construction, including both solar-thermal and photovoltaic technology.

Abengoa has worked with the US Department of Energy on various occasions, most recently in December to develop new technologies for manufacturing and assembling parabolic trough collectors.

Source:  
[http://www.abengoasolar.com/web/en/acerca\\_de\\_nosotros/sala\\_de\\_prensa/noticias/2014/abg\\_20140610\\_1.html](http://www.abengoasolar.com/web/en/acerca_de_nosotros/sala_de_prensa/noticias/2014/abg_20140610_1.html)

manufacturing are relatively new processes that have been studied more intensively since 2009.

In the APPOLO project LUT Laser will use its process monitoring know-how to test several different monitoring methods that can be applied to laser fine processing. The most suitable method can then be used in process validation and assessment.

Activities and processes at LUT Laser include:

- Basic and adapted research of laser processing
- Prototype and 0-series production

- Product and process development
- Expert services
- M.Sc., D.Sc. and industrial education
- Process monitoring
- Laser cladding
  - Laser cladding of thin layers for improved wear and corrosion resistance
  - Base material surface is clad using powder based cladding material
- Laser additive manufacturing
  - LAM is 3D printing of strong and solid metal objects. Compared to conventional manufacturing, 3D printing gives great freedom of design.
  - Education started 2013 at LUT
- High power laser welding
- Other laser surface treatments
- Laser cutting, drilling, marking and fine machining



©LUT

**Laser welding preparations**

Visit <http://www.lut.fi/teknillinen-tiedekunta/lut-kone/laboratoriot/lasertyosto> to find out more.

## <<News<<<News<<<News<<<News<<<

### ***Abengoa builds Latin America's first solar-thermal plant***

In May 2014, Abengoa celebrated the start of the works on the first solar-thermal plant in Latin America, located in the commune of María Elena in the Atacama Desert, Chile. Abengoa was selected in an international tender by the Chilean Ministry of Energy and Corporación de Fomento de la Producción to develop a 110 MW solar plant using tower technology with 18 hours of thermal energy storage based on molten salts. The project is based in the Atacama Desert, the region with the highest concentrations of solar radiation in the world, and will be the first solar-thermal plant for direct electricity production in Latin America.

Solar-thermal tower technology uses a series of mirrors (heliostats) that track the sun on two axes, concentrating the solar radiation onto a receiver on the upper part of the tower, where the heat is transferred to the molten salts. The salts then transfer their heat to a water current in a heat exchanger that generates superheated and reheated steam, which feeds a turbine capable of generating around 110 MW of power.

The solar plant will also have a pioneering thermal storage system, designed and developed by Abengoa, which makes this technology highly manageable, enabling it to supply electricity in a stable way, 24 hours a day, responding to electricity demand at any time.

Abengoa's project in Chile will prevent the emission of approximately 643,000 tons of CO<sub>2</sub> into the atmosphere every year, equivalent to the annual emissions from 357,000 vehicles, and create up to 2,000 direct jobs and a large number of indirect jobs.

Learn more about the project at

[http://www.abengoasolar.com/web/en/acerca\\_de\\_nosotros/sala\\_de\\_prensa/noticias/2014/abg\\_20140513.html](http://www.abengoasolar.com/web/en/acerca_de_nosotros/sala_de_prensa/noticias/2014/abg_20140513.html)

## Sächsische Walzengravur GmbH (SWG)



©SWG

The SWG is one of the leading fully-levelled manufacturers of printing rollers, screens and sleeves, as well as embossing cylinders and sleeves. With a successful background of more than 120 years the company offers the full spectrum of printing rollers together with all-round support and the service of converting designs and patterns into industrial printing forms. All significant parameters that play a part in production are converted into high quality, durable embossing and printing rollers. From fine paper to high-tech synthetics, differing industrial applications are converted into state of the art embossing roller technology.

Founded in 1890 by August Dippmann as a roller engraving company, SWG today looks back on an eventful history that spans a period of three centuries of tradition and progress. The successful re-privatization in 1991 was carried out by the family of the founder, together with the Janoschka group. Since this time, the company is characterized by a continuous growth, which was also accompanied by massive investments in the latest production technology and buildings. Thus, the SWG profiled into a modern and versatile engraving company and positioned itself as one of the European leaders in pre-press.



SWG facilities in Frankenberg, Saxony

©SWG

## Interview...

*...with Toni Fiedler, Head of R&D Sächsische Walzengravur GmbH (SWG)*

**What is your core competency in the laser business?**

The work of SWG is based on many years of experience in laser technology for the structuring of printing forms. While this is true for the production of flexographic printing plates since the 1990s, the laser-based direct engraving of metallic layers is for more than 5 years a priority research focus in the company, which has already led to some successful established process, plant and material solutions. In this context SWG could contribute as the first partner of a leading engraving laser system manufacturer in developing the first direct laser system for high-resolution 2D and 3D engraving in metal layers. On this basis, the company is today one of the leading suppliers of high quality printing and embossing dies.

**What is your contribution to the APPOLO project?**

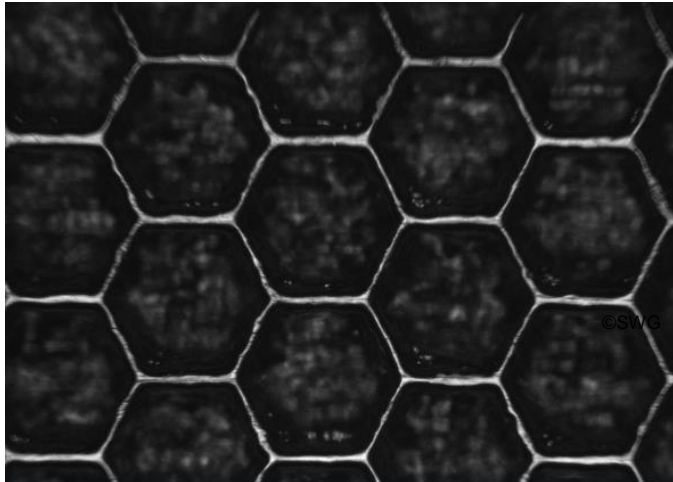
SWG's contribution in the project focuses on:

- Development of suitable test structures,
- Definition of target parameters for future laser patterning of engraving and printing cylinders etc.,
- Evaluation of the laser patterning regarding the technical compatibility to the current process flow of printing cylinder fabrication and quality of printings / embossing,
- Evaluating and improving new engraving processes for printing cylinders with ultra-short laser pulses for high resolution industrial printing and embossing applications (development and demonstration).

**What is your aim in the APPOLO project?**

SWG aims with this project at the future use of short-pulse laser technology for effective engraving of metal layers. The focus is on the realization of microstructures for gravure and embossing cylinders with new visual and tactile effects in decorative and packaging applications will be possible. Facing the increasing quality and functional requirements for decorative surfaces and packages, the new developments will help to win additional shares in the European market, which encloses over 100,000 forms p.a..

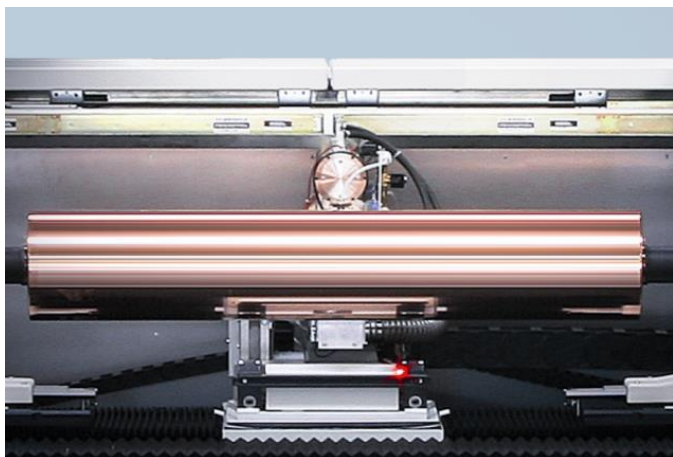




©SWG

#### Hexagonal cells as a result of intelligent combined and parameterized laser and electro-polishing processes

SWG has unique experience in the production of printing and embossing rollers, technical rollers, air cylinders for flexographic and gravure applications, spindles and accessories as well as the regeneration of waste rolling bodies. Since its inception, the company has established itself as an innovative manufacturer of printing forms for the various mass printing technologies and achieved an excellent position in international competition. One of the most traditional product lines is the production of gravure printing forms, supported by its own roller production, electroplating, laser engraving and advanced automatic electroplating line.



©SWG

#### Direct laser engraving by fibre laser technology

But even in flexo and screen printing SWG is one of the leading European manufacturers. The service portfolio ranges from etch gravures for textile or wallpaper printing up to digital helio and 3D direct laser gravures for decor and packaging. All gravure forms can be realized

as conventional printing cylinders or as sleeves. More than 30 years' experience in the engraving technique and nickel electroplating give the procedural basis. Most modern technical standards for the production of flexographic printing plates of all kinds, maximum customer proximity and a highly qualified team are the particular strengths of the flexo gravure.

In the APPOLO project the SWG is involved in the work package "high speed surface texturing by lasers" and will, as an end-user of printing rollers, take part in the validation of the equipment and processes.

Visit <http://www.swg-online.de/> to find out more.

## <News<<<News<

### *EMPA investigates for high efficiency of CIGS cells*

Small quantities of sodium in the CIGS absorber improve the efficiency of a CIGS cell. The use of sputtering targets made from molybdenum-sodium (MoNa) allows CIGS manufacturers to achieve a homogeneous distribution of sodium and precisely control of the sodium content.

The Laboratory for Thin Films and Photovoltaics at the Swiss Federal Laboratories for Materials Science and Technology (EMPA), which supplies material for the APPOLO project, investigated together with the Plansee SE the ideal sputtering parameters for achieving high efficiency. The outcomes of the investigation were efficiency levels of up to 15%. The results were published in Volume 124 of Solar Energy Materials & Solar Cells.

Source: [http://www.plansee.com/en/News-Archive-204\\_1587.htm](http://www.plansee.com/en/News-Archive-204_1587.htm)



# <<<News<<<News<<<News<<<News<<

## ***FTMC conducts the LPM 2014***

On June 17<sup>th</sup> – 20<sup>th</sup>, 2014, the 15<sup>th</sup> International Symposium on Laser Precision Microfabrication (LPM 2014) took place in Vilnius gathering more than 250 laser specialists from 23 countries. During the four-day event, 154 oral talks and 54 posters were presented by researcher from academia and industry on hot topics of laser technologies in micro-fabrication. New trend and success stories were reviewed in plenary and invited talk. The symposium provided a forum for discussion on fundamental laser-matter interaction aspects, the state-of-the-art of laser materials processing, and topics for the next generation of laser technologies with researchers, end-users and laser manufactures. It was a platform for the international exchange of knowledge and closer collaboration between specialists.

The symposium is held in different countries every year: Japan, US, Germany, Canada, Austria and was organized this year by the Center for Physical Sciences and Technology in Lithuania, coordinator of the FP7 project APPOLO. Partners of APPOLO project were also responsible on the special session on Lasers in photovoltaics and were authors on a good number of oral and poster presentation, reflecting achievement in project work packages.



Attendees of LPM 2014 during excursion to Trakai

©FTMC

## ***APPOLO partners conduct workshop at LPM 2014***

At the 15<sup>th</sup> International Symposium on Laser Precision Microfabrication (LPM) in Vilnius on June 16<sup>th</sup> 2014 members of the APPOLO project (FTMC, IOM, LUT, UAB) successfully organized in conjunction with the LPM a workshop on the topic 'New Processes and Opportunities in Use of Laser Technologies in Industry'. The workshop attracted representatives from 13 companies and had around 80 participants. Part of the day were an introduction on the APPOLO project, 3 presentations on laser technologies, 3 on laser systems and a final round table discussion.



APPOLO workshop for industrial laser users in Vilnius

©FTMC

Source: [http://www.appolo-fp7.eu/uploaded\\_files/Workshop%20APPOLO%20Vilnius%202015%2006%20program%20v5.pdf](http://www.appolo-fp7.eu/uploaded_files/Workshop%20APPOLO%20Vilnius%202015%2006%20program%20v5.pdf)

## Daetwyler Graphics AG



**Daetwyler**  
Graphics

©DG

Since 1965, Daetwyler in Switzerland creates innovative process solutions for the printing industry with a special focus on building of machines for the rotogravure engraving process. The machines developed at Daetwyler include the engraving as well as the pre- and post-processing of printing cylinders.

Daetwyler Graphics AG (DG) offers high-precision roller and surface processing methods with turning, milling and grinding machines. In addition, DG develops and produces laser engraving systems for the engraving of print rollers with superior quality for packaging, decorative and illustration printing which are used in rotogravure print presses all over the world.

The close cooperation with the companies of Heliograph Holding offers customers the competence for the highest-quality rotogravure cylinder manufacturing. The co-operation increases the solutions offered to the customers in the areas of galvanics, cylinder and surface processing, engraving and laser systems for rotogravure, automated by high-efficiency transport and storage technology.

Daetwyler has established a service network that has spread around the world with 9 subsidiaries and with representatives in almost every country.



©DG

**POLISHSTAR: for achieving of highest surface precision of copper or zinc rotogravure cylinders using a milling spindle unit and a manual side milling device**

## Interview...

*...with Dr. Guido Hennig, Head of R&D  
Technology Laser, Daetwyler Graphics AG*

*What is your core competency in the laser business?*

DG is a manufacturer of machines and systems used for mechanical surface treatment, electroplating and engraving of rotogravure cylinders including development, production and integration of complete fully-automated production lines for gravure cylinders. Staff of DG has over 20 years of experience in laser treatment of materials. This includes the development of appropriate laser resonators as well as the development of modulation and beam shaping methods for the precisely controlled micro-ablation of metals, polymers and ceramics on gravure cylinders.

*What is your contribution to the APPOLO project?*

DG contributes to the definition of target parameters for the ps – laser sources and to the development of the components for beam delivery, modulation and shaping. We will integrate the ultrafast laser and scanner equipment which will be developed in the APPOLO project into an existing industry oriented engraving device and will evaluate the performance of this system as well as develop and optimize the ultrafast ps ablation process for the surface structuring of large cylinder surfaces for printing and embossing tools. Together with end users DG will test the potential of the APPOLO results for specific applications to establish new engraving processes with ps - lasers for future value added industrial printing and embossing applications.

*What is your aim in the APPOLO project?*

DG aims to improve substantially the quality and speed of gravure, embossing and of digital printing processes by using the targeted APPOLO results for high power, high repetition rate, ultra-short pulse laser. The goal is to explore the ablation processes with USP laser in the region above 100W average power and to work at highest efficiency of the ablation process, in order to process large areas with highest accuracy in an industrially acceptable time with removal rates of up to 20mm<sup>3</sup>/min and to enhance the productivity of the ps structuring to an industrial acceptable range of >1m<sup>2</sup>/h per layer.

In 2009, Peter Daetwyler (MDC Max Daetwyler AG, Schepers) and Max Rid (HELL Gravure Systems, K. Walter, Bauer Logistik) joined together in the areas of development, manufacturing, sales and service and founded Heliograph Holding GmbH. This holding company includes Daetwyler Graphics and the companies HELL Gravure Systems, K. Walter, Bauer Logistik, Schepers, OHIO and all their worldwide subsidiaries. The companies combined in Heliograph Holding GmbH produce and market their products under their own names. The customers purchase electromechanical and laser-based engraving technologies from DG, Hell Gravure Systems and Schepers. These products can be combined seamlessly with galvanic systems and automation technology from K. Walter, with surface technology from DG and with storage and transport technology from Bauer Logistik to form complete production lines supported by high-efficiency transport and storage technology.



©DG

**GRAVOSTAR:** This machine is used for the engraving of gravure cylinders by means of an electro-mechanical process. The master image to be engraved is provided as an image file and is engraved on the copper gravure cylinder surface by suitable modulation of an engraving stylus

DG offers a wide selection of consumable materials that cover the requirements for print systems and for printing cylinder manufacturing for rotogravure; Moreover, experts will be at customer's side with advice and support if technical or other questions occur regarding the use or the performance capability of the products.

The galvano-technical products, DG offers, include various degreasing and cleaning chemicals, complete electrolytic coating processes with the associated anodes and additives that were designed especially for rotogravure. Burnishing stones and bands and washing solutions can be obtained for finishing cylinder surfaces. Other specialties include high-precision diamond tools for mechanical surface processing of the cylinders and electromechanical engraving and a wide spectrum of lubricants and oils.

Since more than 20 years DG collected experience in surface treatment and material processing with pulsed lasers for high throughput applications.

The APPOLO project will enable DG to extend this knowledge to the range of efficient material processing with ultra-short pulse lasers. This will be applied for process development in printing and embossing industry.

DG is involved in the work package "High speed surface texturing by lasers" and expects from the results of APPOLO to improve precision, flexibility and throughput of cylinder engraving with ultra-short pulse lasers at high repetition rates.

Visit <http://www.daetwyler.com/graphics/> to find out more.

## <News<<<News<

### *Lightmotif's developments do not go unnoticed*

The online magazine Mikroproduktion published an article about the progress of Lightmotif on the 3D surface texturing technology. The article describes how the Dutch company developed a technology to functionalize 3D-free-formed surfaces. It uses a new machine concept, in which a picosecond laser and a galvo scanner get integrated in a 5-axis manipulator. The corresponding software structures the surface into tiles and tells the laser to proceed in a step-and-scan-procedure. In the article it is also mentioned, how Lightmotif will further optimize and validate the technology within the APPOLO project.

Source: <http://www.mikroproduktion.com/fachartikel/artikel/3d-oberflaechenstrukturierung-von-freiformflaechen.html>

# Upcoming Events 2014

8.09. – 11. 09.	Fuerth, Germany	LANE, 8 <sup>th</sup> International Conference on Photonic Technologies
22.09. – 29.09.	Amsterdam, Netherlands	29 <sup>th</sup> European Photovoltaic Solar Energy Conference and Exhibition
23.09. – 24.09.	Schaumburg, IL, USA	LME, Lasers for Manufacturing Event
29.09. – 03.10.	Matsue, Japan	ICPEPA, International Conference on Photo-Excited Processes and Applications
19.10. – 23. 10.	San Diego, CA, USA	ICALEO, International Congress on Applications of Lasers & Electro-Optics 2014
12.11. - 13.11.	Veldhoven, Netherlands	14 <sup>th</sup> Edition Precision Fair



© Bayerisches Laserzentrum GmbH

The **8<sup>th</sup> International Conference on Photonic Technologies** will take place on September 8<sup>th</sup> to 11<sup>th</sup>, 2014 in Fuerth, Germany.

Modern research has to act on social, economical and environmental developments to provide solutions for the existing and upcoming global challenges. To meet this challenge, LANE 2014 offers a platform for an international exchange of ideas, opinions, perspectives, results and solutions concerning photonic technologies.

<http://www.lane-conference.org/>

## <News<<<News<

### *Daetwyler Graphics executes ambitious project in Lebanon*

Technicians of DG installed an entirely new cylinder manufacturing line at the group of Al-Moutahed Co sal & UCPP sarl headquarters close to Beirut in only three weeks.

The innovative cylinder manufacturing line uses machines from Daetwyler Graphics, a CFM and a Finishstar as well as K. Walter electroplating systems and an OHIO Spectrum engraver. The customer is very satisfied with his decision. Fadi Abdallah, Managing Director at Al-Moutahed Co sal & UCPP: "We chose Daetwyler Graphics for our in-house cylinder manufacturing line due to increasing demands from our customers on quality and flexibility coupled with constantly decreasing processing times."

Source: <http://www.helioscope.de/en/archive/issue-01-2014.html>



## ICALEO

The **International Congress on Applications of Lasers & Electro-Optics (ICALEO®)** has a 32 year history as the conference where researchers and end-users meet to review the state-of-the art in laser materials processing and predict where the future will lead. From its inception, ICALEO has been devoted to the field of laser materials processing and is viewed as the premier source of technical information in the field.

<http://www.lia.org/conferences/icaleo>



The **29<sup>th</sup> European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC)** will take place from September 22<sup>th</sup> to 26<sup>th</sup>, 2014 at RAI Convention and Exhibition Centre in Amsterdam, the Netherlands.

The five-day conference is complemented by the three-day exhibition, held from September 23<sup>th</sup> to 25<sup>th</sup>, 2014.

The EU PVSEC is held annually at changing European locations. This unique PV solar event constitutes the world's leading science-to-science, business-to-business and science-to-industry platform for the entire PV value chain.

While photovoltaic solar energy is becoming a major electricity source on a global level, the 29<sup>th</sup> European Photovoltaic Solar Energy Conference and Exhibition (EU PVSEC 2014) further extends its focus to application- and policy-oriented topics.

<http://www.photovoltaic-conference.com/>

## LME

The **Lasers for Manufacturing Event® (LME®)** is the place to see the latest in laser technology, network with the industry's elite and find solutions to current and future manufacturing needs.

Part of the program are a show floor theater for keynote presentations on trending topics in the laser industry and free educational sessions to help understand why laser technologies are the future of manufacturing and where and how it is applied.

<http://www.lia.org/conferences/laserevent>

## ICPEPA

The **9<sup>th</sup> International Conference on Photo-Excited Processes and Applications (ICPEPA)** will take place from September 29<sup>th</sup> to October 3<sup>rd</sup>, 2014 in Matsue, Japan. The topics range from fundamental laser-material interactions, theory and modeling to applications with nanoparticles and nanophotonics as well as new trends in photo excitations. The conference intends to create an atmosphere for scientific presentations at the forefront of the field and an informal exchange of ideas in a relaxing environment.

<http://icpepa9.com/>



The **14<sup>th</sup> edition of the Precision Fair** will take place on 12<sup>th</sup> and 13<sup>th</sup> November 2014 in NH Conference Centre Koningshof, Veldhoven/Eindhoven (the Netherlands).

The Precision Fair has grown into the main European event on precision technology and has acquired an international reputation.

<http://www.precisiebeurs.nl/>

# Consortium



## Coordinator

State research institute Center for Physical Sciences and Technology (FTMC)

Department of Laser Technologies  
Savanoriu Ave. 231, LT-02300 Vilnius, Lithuania

Tel.: +370 5 264 9211, 266 1640/1643,  
Fax: +370 5 260 2317

## Contact Person

**Dr. Gediminas Račiukaitis**

Head of Department of Laser Technologies, FTMC

Tel.: +370 5 264 4868

E-Mail: [graciukaitis@ar.fi.lt](mailto:graciukaitis@ar.fi.lt)

