PRESS RELEASE

Aachen, 3rd May 2018

Dr. Axel Luft, Laserline GmbH: Prize Winner of the Innovation Award Laser Technology 2018

The Innovation Award Laser Technology 2018, initiated by the associations Arbeitskreis Lasertechnik e.V. and the European Laser Institute ELI and provided with 10 000 € prize money, has been conferred to Dr. Axel Luft, Sales Manager Global Automotive at Laserline GmbH on 2nd May 2018 in Aachen´s town hall. Dr. Axel Luft and his team have got the first place in the open prize competition with the innovation *Multi Spot Modules to Improve Joining Processes due to Tailored Spot Geometries*. The jury composed by eight international experts has selected 3 outstanding finalists among the various submitted applications. In the historical ambience of the "Coronation Hall" around 370 guests attended the awarding ceremony.

Dr. Paul Hilton, speaker of the international jury, pointed out the outstanding innovations of the 3 finalist project teams in the field of laser technology. The jury conferred the **1st prize of the Innovation Award Laser Technology 2018** provided with 10 000 € prize money to Dr. Axel Luft, Sales Manager Global Automotive der Laserline GmbH and his team for the innovation *Multi Spot Modules to Improve Joining Processes due to Tailored Spot Geometries*.
The innovative work of the team consists in the development of a multi-spot module offering the advantage of continuously adjustable and robot-controlled power distribution allowing higher quality and more cost-efficient material processing such as joining with diode lasers in industrial mass production.

The prize winner Dr. Axel Luft has been awarded the title of "AKL Fellow" and "ELI Fellow". The certificates for the first, second and third placed finalist teams were handed over during the award ceremony in Aachen by Ulrich Berners, president of the Arbeitskreis Lasertechnik AKL e.V. and Dr. Alexander Olowinsky, president of the European Laser Institute ELI.

The **Innovation Award Laser Technology** is a European prize for applied research awarded at 2-yearly intervals by the associations Arbeitskreis Lasertechnik e.V. and the European Laser Institute ELI. The award can be conferred on an individual researcher or on an entire project group, whose exceptional skills and dedicated work have led to an outstanding innovation in the field of laser technology. The scientific and technological projects in question must center on the use of laser light in materials processing or the methods of producing such light, and must furthermore be of demonstrable commercial value to industry.

Mitglieder des Vorstandes:
Dipl.-Ing. Ulrich Berners (Vorsitz)
Prof. Dr. rer. nat. Reinhart. Poprawe
Dr. Hartmut Frerichs (Geschäftsführer)
Dr.-Ing. Dipl.-Wirt.-Ing. Bernd Schmidt

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The **international jury composed by 8 members** selected on the basis of merit and the published criteria 3 outstanding finalists among the 9 applications for the Innovation Award Laser Technology 2018 (see detailed descriptions of the three innovations including photos on www.innovation-award-laser.org).

The 3 finalists and their teams listed in final ranking:

1st Place

Multi Spot Modules to Improve Joining Processes due to Tailored Spot Geometries

Team:

Dr. Axel Luft, Laserline GmbH, Mülheim-Kärlich, Germany
(Team representative)

Dipl.-Ing. Thorge Hammer, Volkswagen AG, Wolfsburg, Germany
Dr. Markus Baumann, Laserline GmbH, Mülheim-Kärlich, Germany
Dr. Florian Albert, Scansonic MI GmbH, Berlin, Germany
Dipl.-Ing. Andreas van Hove, Scansonic IPT GmbH, Berlin, Germany

Diode lasers are used in automotive production for more than 18 years and are still gaining importance. Today, one of the well-established methods for joining galvanized steel sheets in the series production of automotive bodies is laser brazing.
A key success factor of laser brazing technology is mainly the high aesthetic quality of the joints. However, recently automotive OEMs have increasingly moved towards using hot-dip galvanized sheets (HDC sheets) in the body because of being more corrosion-resistant and the coating being more cost-efficient. However, the quality of the joint itself decreases; it is rougher, often shows so-called “wavelets” at which the lot exceeds the provided joint and in areas close to the joints, spatters increasingly occur, in other words: laser brazing technology for HDC sheets could not meet all the expectations placed in it.
To address these challenges, a team of experts from Laserline, Scansonic and Volkswagen developed a multi-spot module including an optical camera tool for a suited spot-in-spot design and with an integrated robot control and qualified a triple-spot-module as the preferred solution for hot-dip galvanized (HDG) material at Volkswagen series production in 2016.
To get an optimal brazing process, two things are crucial: First, an exact arrangement of the spots to one another and second, an exactly adjusted distribution of the laser power, i.e. depending on the application such as roof or tailgate, or depending on different joint geometries, different power distributions towards the three spots are necessary.
The developed triple-spot-module offers the advantage of continuously adjustable power distribution between the main spot and the front spots on the one hand, and between the leading front spots on the other hand. Even new features such as robot-controlled power distribution on the move is included. Therefore, it is now also possible to switch off front spots, e.g. in flexible lines for cars with EG (electro-galvanized) coating or to adjust the space between the front spots.
Besides brazing, the team applied the multi-spot-module successfully to welding of aluminum, the second most common industrial application for diode lasers.
By using the multi-spot-module it was possible to combine keyhole and heat conduction welding and therefore adding advantages of both processes by combining a bigger with a smaller spot within the “spot-in-spot” module. As a result, smooth surfaces, straight edges, high penetration depths and speeds and also reduced spatters were achieved even for aluminum welding in industrial series production of car bodies.
The technology is bound to penetrate a large number of manufacturing processes and thereby adds a new and cost-effective member to the family of beam forming optical systems for material processing with diode lasers in industrial mass production.

2nd Place

Multi Parallel Ultrafast Laser Ablation for Large Scale Ultraprecision Manufacturing

Team:
Dr. Gerald Jenke, Saueressig GmbH + Co. KG, Vreden, Germany (Team representative)
Dr. Arnold Gillner, Fraunhofer ILT, Aachen, Germany
Dr. Stephan Brüning, Schepers GmbH, Vreden, Germany
Dr. Manfred Jarczynski, LIMO GmbH, Dortmund, Germany
Dr. Daijun Li, Edgewave GmbH, Würselen, Germany

Ultrashort pulsed lasers in the fs- and ps-pulse duration range provide outstanding laser machining quality for replication tools, functional parts from electronics and automotive industry, medical technology and other applications. However due to the underlying physical process (cold ablation) this is a slow process because only limited laser power and limited laser fluences – typically smaller than three times the ablation threshold fluence – can be used to process part or components without any damage to the functionality.
With these limits, processing of large parts, such as large scale injection molding tools, large scale embossing and printing rollers as well as large scale functional surfaces is out of any economic value with the current single spot ablations technology due to the enormous processing time of days and weeks.
Within the consortium, the companies Saueressig, Schepers and LIMO as well as the Fraunhofer-Institute for Laser Technology developed a new programmable multi beam processing head and the related processing technology, which allows large scale ultrafast laser processing with 100 times higher processing speed.
The system is based on a multi spot diffractive optical element (DOE) with high efficiency (> 90 %), a multi-channel acousto optical modulation system which allows multiple ultrashort laser beam machining with the individual beam switching and modulation with a data rate of 6 MHz of each beam together with a 500 W ps-laser. Integrated in an ultra-high precision cylinder engraving system, 16 spots were generated and synchronized with a precision of < 2 µm. The beam delivery with the multi spot comb is positioned with a precision of +/- 200 nm. This system has been realized and industrially integrated in a commercial roller engraving system for the manufacturing of high precision embossing rolls.
With the developed technology, high precision engraving of embossing rollers and other components with required surface functionalities could be in increased by a factor of up to 100 compared to conventional processing speed. By this way new product functionalities on consumer products, e.g. reduction in friction, increased lifetime, improved soft touch or antibacterial effect, light diffraction etc., can be realized even on large parts in an economic way.

3rd Place

RAIO DSS: A High Flexibility Dynamic Beam Control System for Laser Heat Treatment and Related High Power Laser Applications

Team:
M.Sc. Eng. Alejandro Bárcena, Talens Systems S.L. Etxe-Tar Group, Elgoibar, Spain (Team representative)
M.Sc. Eng. Jesús Dominguez, Talens Systems S.L. Etxe-Tar Group, Elgoibar, Spain
M.Sc. Eng. Javier Diaz, Ikergune S.L. Etxe-Tar Group, Elgoibar, Spain
M.Sc. Eng. Paula Sancho, Talens Systems S.L. Etxe-Tar Group, Elgoibar, Spain
M.Sc. Eng. Eder Ujia, Talens Systems S.L. Etxe-Tar Group, Elgoibar, Spain

The developed innovative approach proposes an original method for a high flexibility customization of the laser beam delivery able to provide energy density patterns compatible with a fully prescribed beam energy deposition distribution, thus allowing the homogeneous laser treatment of critical areas such as corners or smaller mass zones with full control of material evolution and a fully precise laser energy tailoring suitable for every workpiece geometrical detail.
On the basis of reference knowledge supplied through an incorporated monitoring and control system, RAIO DSS generate, by means of a fast oscillation 2-axes scanner, a fast and accurate 2D motion of the independently adjustable laser spot on the workpiece, allowing the generation of extremely precise and fully controllable dynamic laser energy distribution patterns meeting the most exigent specifications referred to local heating cycle.
Although apparently based on similar principles, the system is not to be considered as a conventional laser spot shaper, especially in what concerns the RAIO DSS ability to adjust in a fully customized way the required irradiation pattern for every local zone of every individual component and to control in real time the laser energy deposition according to previous reference knowledge.
For this purpose, a completely original controlling software has been developed overcoming the high oscillating frequency problems found in commercial software typically limited to prefixed scanning patterns with simple geometrical shapes and low oscillation speed ratios.
The RAIO DSS solution has been initially developed and commercialized on the basis of customized laser hardening workstations for different car engine components with convoluted geometry such as crankshafts, new-technology camshafts and different types of powertrain gears, but is rapidly developing to provide innovative solutions for other laser processing applications.

The 8 members of the international jury of the Innovation Award Laser Technology 2018 have been recruited from industry and the research community:

- Dr. Paul Hilton, TWI, Cambridge, United Kingdom
- Prof. Dr. Veli Kujanpää, VTT Technical Research Centre of Finland Ltd., Lappeenranta, Finland
- Prof. Dr. José Luis Ocaña, Centro Láser U.P.M., Madrid, Spain
- Prof. Dr. Andreas Ostendorf, Ruhr-Universität Bochum, Germany
- Dr. Markus Kogel-Hollacher, Precitec GmbH & Co. KG, Gaggenau, Germany
- Dr. Ir. Armand Pruijmboom, Philips GmbH Photonics, Aachen, Germany
- Bertold Hopf, Eberdingen, Germany
- Dr. Pablo Romero, AIMEN – Asociation de investigacion metalurgica del noroeste, Pontevedra, Spain

Further information:

- **Regarding the award and the finalists:** www.innovation-award-laser.org
  Descriptions of the realized innovations of the 3 finalists and photos of the awarding ceremony on 2nd May 2018 in Aachen´s town hall can be downloaded here.

- **Regarding Arbeitskreis Lasertechnik AKL e.V.:** www.akl-ev.de
  Contact person: Dr. Hartmut Frerichs, General Manager of Arbeitskreis Lasertechnik AKL e.V.
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- **Regarding European Laser Institute ELI:** www.europeanlaserinstitute.org
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- **Regarding International Laser Technology Congress AKL´18 (May 2-4, 2018):** www.lasercongress.org
  Contact persons: Silke Boehr, Axel Bauer, Marketing and Communications, Fraunhofer Institute for Laser Technology ILT, www.ilt.fraunhofer.de
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Picture 1:
The winner team of the Innovation Award Laser Technology 2018 (l.t.r):
Dr. Markus Baumann, Laserline GmbH, Mülheim-Kärlich, Deutschland; Dipl.-Ing. Thorge Hammer, Volkswagen AG, Wolfsburg, Deutschland; Dr. Axel Luft, Laserline GmbH, Mülheim-Kärlich, Deutschland (Team-Repräsentant); Meinulf Hinz, Volkswagen AG, Wolfsburg, Deutschland; Dipl.-Ing. Andreas van Hove, Scansonic IPT GmbH, Berlin, Deutschland.
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Picture 2:
2nd place of the Innovation Award Laser Technology 2018 (l.t.r):
Presenter Annett Möller; Dr. Alexander Olowinsky, Chairman of The European Laser Institute ELI e. V.; Dr. Arnold Gillner, Fraunhofer ILT, Aachen, Germany; Dr. Stephan Brüning, Schepers GmbH, Vreden, Germany; Dr. Manfred Jarczynski, LIMO GmbH, Dortmund, Germany; Dr. Gerald Jenke, Saueressig GmbH + Co. KG, Vreden, Germany (Team Representative); Dr. Daijun Li, Edgewave GmbH, Würselen, Germany; Dr. Ulrich Berners, Chairman of the Arbeitskreis Lasertechnik e. V.
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Picture 3:
3rd place of the Innovation Award Laser Technology 2018 (l.t.r):
Presenter Annett Möller; Dr. Alexander Olowinsky, Chairman of The European Laser Institute ELI e. V.; M. Sc. Eng. Alejandro Bárcena, Talens Systems S.L. Etxe-Tar Group, Elgoibar, Spain (Team Representative); Juan Isaza, Talens Systems S.L. Etxe-Tar Group, Elgoibar, Spain; Dr. Ulrich Berners, Chairman of the Arbeitskreis Lasertechnik e. V.
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Picture 4:
The finalists of the Innovation Award Laser Technology 2018, Prof. Reinhart Poprawe, Director of the Fraunhofer Institute for Laser Technology ILT (front row left), Dr. Alexander Olowinsky (back row, 4. f.l.) and Dr. Ulrich Berners (front row right).
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