

# The Active Fiber

Summer 2018 Newsletter

The Active Fiber is an IPG Photonics' quarterly newsletter featuring company news, product updates and notable applications. To subscribe to the Active Fiber or for more information on products and processes discussed in this issue, please contact [sales.us@ipgphotonics.com](mailto:sales.us@ipgphotonics.com).



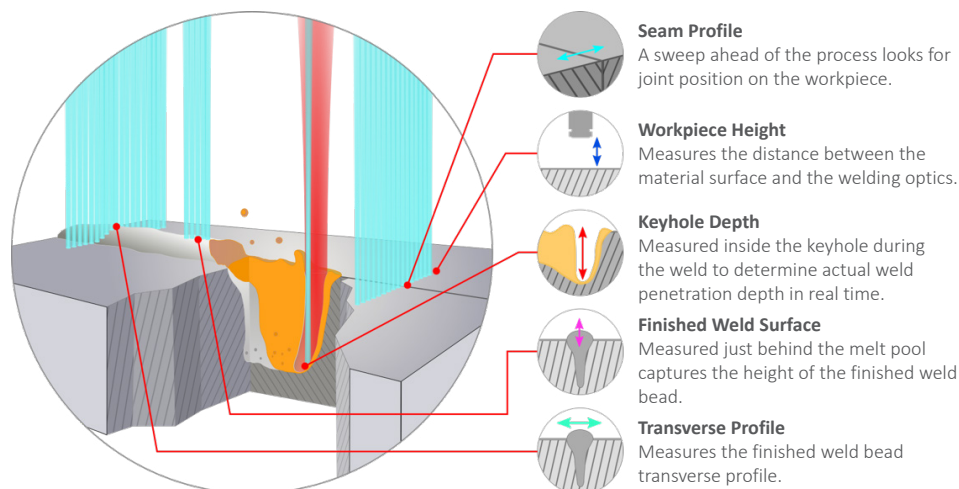
## Laser Welding: Do ALL of Your Welds Measure Up? by Chris Galbraith



How do you get more certainty out of your laser welding process? This question is becoming increasingly common among our customer base as greater numbers of industrial welders who already enjoy the benefits of laser technology begin to look for the next steps to further enhance their lead over competition. The benefits of fiber lasers for welding (speed, efficiency, robustness and design flexibility) are well understood throughout industry today. While the capability and accessibility of fiber lasers continue to improve, it is critical that industry leaders also focus on the intelligence of the manufacturing systems that utilize these sources. As the “eyes and ears” of intelligent manufacturing equipment, next-generation sensor technologies are an integral part of automotive, aerospace and medical device industries.

With the acquisition of **Laser Depth Dynamics** in 2017, IPG Photonics provides in-process quality monitoring and control solutions for laser-based welding applications. Since 2012, LDD has developed **Inline Coherent Imaging (ICI) technology**, the first industrial imaging technique capable of directly measuring the penetration depth of laser welds.

ICI uses an active, low-power infrared beam, delivered through the same focus optics as the welding laser, to take highly accurate distance measurements. This measurement beam can view the bottom of the vapor channel in laser keyhole welding and, crucially, is not blinded by other types of light present in the process region. By rapidly scanning this beam around the surface of the workpiece, an ICI system can take 3D images of the material, melt pool, and keyhole, or focus on specific regions of the material to perform multiple process monitoring tasks simultaneously. In addition to the unique ability to directly monitor weld



depth, this patented technology has the ability to replace multiple measurement instruments on and around the laser head, reducing bulk and centralizing the equivalent of an entire suite of monitors into a single, powerful and upgradable software interface. The LDD product capabilities are also driving deep integration into complete processing systems, allowing integrators to construct their own unique systems on top of the LDD platform.

IPG's **LDD-700 Inline Weld Monitor** is compatible with IPG's **beam delivery products** and fixed-optic camera ports. Paired with our **OmniWELD** software, the LDD-700 offers five monitoring modes: keyhole depth, seam profile, workpiece height, weld surface height and bead profile.

*Chris Galbraith, Applications Specialist at IPG Photonics Canada, can be reached at [cgalbraith@ipgphotonics.com](mailto:cgalbraith@ipgphotonics.com).*

**The Power to Transform®**





## IPG Marlborough FiberForum by John Bickley

On June 5<sup>th</sup>, IPG hosted the company's first FiberForum at the new applications facility located in Marlborough, Massachusetts. The facility is home to the east coast applications team and is the regional center for demonstration of IPG lasers, beam delivery components and fully-integrated systems representing IPG's extensive product range.



"FiberForum" is the name given to the combined educational and open house event that comprises a technical seminar and hands-on demonstrations of new laser processing techniques. This FiberForum was focused on laser welding and provided an understanding of the reasons for the explosive growth in the use of lasers in manufacturing, a review of laser technologies and overview of best-practice laser welding techniques. Two customer presentations provided case studies in practical implementations of replacing legacy technologies with advanced fiber laser processing alternatives. Featured



The Power to Transform®



demonstrations allowed visitors to delve deeper into the following application processes:

- ▶ **Micro-welding** for medical parts
- ▶ **Wobble-welding** of dissimilar metals
- ▶ **Titanium alloy I-beam fabrication**
- ▶ **Cladding and laser additive manufacturing**

The educational theme continued over lunch with visitors able to join tables hosting discussions on the different laser technology themes embodied in the



## Applications

IPG Photonics offers complimentary sample processing and evaluation as well as laser product recommendations. Whether the processing method is cutting, welding, marking or surface modification, IPG has comprehensive application expertise in materials, process development, system set-ups

demonstrations. IPG laser processing specialists provided both high-level insights and answered customers' specific applications processing questions.

*John Bickley, IPG's Sales & Marketing Director, can be reached at [jbickley@ipgphotonics.com](mailto:jbickley@ipgphotonics.com).*



for clean environment requirements, and metallurgical and surface analyses. Each evaluation includes an applications report and follow-up. **Contact IPG** to arrange your initial evaluation.

Visit [www.ipgphotonics.com](http://www.ipgphotonics.com) for more information on IPG lasers and systems.



## Rapid Growth of IPG Lasers for Cleaning and Ablation by Mike Klos



Over the last 12 months there has been a dramatic adoption of IPG pulsed lasers for **ablation and cleaning** in the automotive world and other manufacturing segments. Within a half-decade, research in laser cleaning and ablation redefined many surface preparation, paint removal and oxidation control processes. Lasers are rapidly replacing legacy removal tools based on mechanical edge scrapers, brushes, bead blasters and even water jet systems. The laser eliminates consumables, lessens maintenance (e.g. sharpening blades), while dramatically reducing the amount of leftover waste.

IPG is known for providing robust laser

solutions at compelling price points which enable lasers to evolve from experimental tools to being embraced as manufacturing solutions. Laser processing has moved from the laboratory stage into the commodity realm. There are now a wide variety of IPG lasers for complex material removal featuring extremely high performance quality.



*Laser Cleaning with 1 kW Pulsed Fiber Laser*

Interesting growth areas include removing coating materials like zinc from galvanized steel, aluminum silicon from high strength steel and now oxide layers from aluminum. These materials are increasingly used in automotive manufacturing as carmakers strive for greater fuel efficiency. Ablation lasers are often a prerequisite for a secondary laser process like welding or brazing in auto body and structural

components. Laser processing is migrating beyond the underbody and body panels into cleaning powertrain gears, engine blocks, transmission case overhauls and the removal of paint.

Current cleaning technologies such as chemical, mechanical, plasma and thermal-ovens can have negative impacts on the surface or metal composition of the part. Most consume considerable energy and generate waste products making their total cost of ownership higher than lasers. IPG laser processes benefit from the extremely high efficiency of the laser and the ability to selectively clean areas critical to downstream process integrity.

IPG lasers provide a small footprint and can be fully automated into existing process flows. The high uptime of a maintenance-free fiber laser is a huge advantage over traditional methods. Lasers are consistent and repeatable, exceeding the necessary controls for modern cleaning operations. IPG lasers come in a wide range of power levels in order to match the line rate at an optimal cost.

At IPG Midwest Operations in Novi, MI, we have worked with industry to qualify new products for many OEMs and tier-one suppliers needs. Our lab is open for customers to validate a process and we work with all of our 15 IPG labs worldwide to provide a solution.

*Mike Klos is the General Manager of IPG Midwest Operations. He can be reached at [mklos@ipgphotonics.com](mailto:mklos@ipgphotonics.com).*



## Benefits to Fiber Laser Cleaning/Ablation

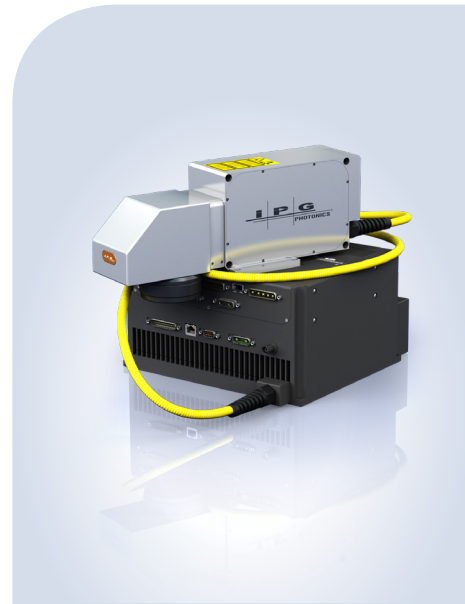
- ▶ **Lower Manufacturing Costs**
- ▶ **High Speed**
- ▶ **Low Thermal Distortion**
- ▶ **Non-contact Process**
- ▶ **Reliable – Consistent – High Yield**
- ▶ **Material Removal of Complex Shapes**
- ▶ **Process Feedback Capability for Quality Control**

***We have detailed welding capability calculators that can help you to evaluate the introduction of a new welding process, contact us to speak to a representative.***





## UV Fiber Laser Marking of Polymers for Medical Devices by Brian Baird



“Advancements in fiber laser technology and improvements in non-linear optic crystals, including lithium triborate (LBO) for harmonic generation, has led to the recent introduction of reliable, compact pulsed UV fiber lasers emitting at 355 nm.

What technology and capabilities does IPG offer that adds value to this arena?”

Conventional polymer marking long relied upon infrared lasers in the near-IR (1.0 μm) or longwave-IR (10 μm) regions. While relatively low-cost and reliable, these lasers generally produce dark or gray marks on polymer materials through a thermochemical laser process referred to as carbonization. On harder plastics, raised marks are formed through a technique called laser foaming. Thermal marking processes produce laser soot and waste byproducts which must be removed by fume extraction or other debris mitigation, such as post-process solvent cleaning.

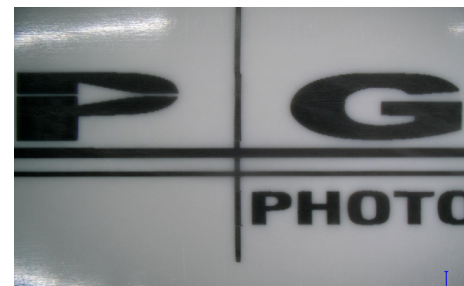
In contrast to conventional IR polymer marking processes, UV fiber laser marking is a photochemical process due to the much higher UV photon energy. Incident UV light is absorbed at the surface and produces high-contrast marks via an efficient “cold marking” process. This process is enhanced by the short 1 ns

pulse duration of the IPG UV fiber laser. “Cold marking” offers a visually crisp mark with minimal discoloration or heat-affected zone. UV marks are generally located sub-surface and are produced without marring component finish and/or cosmetic appearance.



UV Marking of ABS

IPG’s UV pulsed fiber laser is ideal for integration with a 2-axis galvo scanner, constituting the UV Integrated Marking Module. Combined with control electronics, scanning optics and a versatile marking software, the UV Integrated Marker provides high pulse energy with fast, accurate positioning. Medical device



UV Marking of Polycarbonate

makers, in particular, value compact and efficient lasers since many manufacture in clean room environments where floor space is expensive. UV pulsed fiber lasers capably mark a wide range of medical device polymers including: polycarbonate, acrylonitrile-butadiene-styrene, silicone and high density polyethylene.

IPG’s introduction of a compact, cost-effective UV Integrated Marker, coupled with superior marking results is leading to a rapid adoption of UV fiber laser marking technology in the medical device industry.

*Brian Baird, Senior Applications Manager at IPG Silicon Valley Technology Center (SVTC), can be reached at [bbaird@ipgphotonics.com](mailto:bbaird@ipgphotonics.com).*



## Employee Spotlight

**Leonid C. Lev** is IPG’s Senior Director of Materials Processing Applications. Prior to joining IPG, he worked for General Motors, Apple and Great Wall Motors. Dr. Lev’s interests include new technology development and implementation, venture development, and product development. His scientific expertise includes laser material processing, laser beam interaction with solid surfaces, and laser process monitoring. Dr. Lev received his B.S. and M.S. from Leningrad University (St. Petersburg) and Kiev Polytechnic University and his Ph.D. from MIT. He may be reached at [llev@ipgphotonics.com](mailto:llev@ipgphotonics.com).



**Vijay Kancharla** is the Director of Applications on the east coast for IPG. In this role, he manages customer projects and acts as a liaison between sales and technical teams to advance laser based solutions. He has over 15 years of laser materials processing experience, developing and implementing a wide range of laser applications from UV to IR spectrum, including ultra-short pulsed to multiKW CW lasers. Vijay has authored and presented several papers in technical conferences and has also filed for provisional

patents for processes developed at IPG. He obtained his Master’s degree in Industrial and Manufacturing Systems Engineering from Iowa State University. Vijay can be contacted at 508-341-6829 and [vkancharla@ipgphotonics.com](mailto:vkancharla@ipgphotonics.com).

**Paul Denney** joined IPG Photonics in January 2018 as Director of Advanced Process Development. Prior to IPG, Mr. Denney has over 37 years in laser materials processing research, holding research positions at Lincoln Electric, C.F.&I. Steel Corporation, U.S. Naval Research Laboratory (NRL), Westinghouse R&D Center, Applied Research Laboratory at Penn State, EWI and Connecticut Center of Applied Technology. His areas of process interest include welding, cladding (powder and wire), cutting and drilling. Mr. Denney is currently



a member of the American Society for Metals (ASM), Fellow and Past President of the Laser Institute of America (LIA) and the American Welding Society (AWS). He holds 36 U.S. patents, received two ARL Penn State Technical Contribution Awards and was bestowed an R&D Top 100 Award in 1997. Mr. Denney earned his B.S. and M.S. in Metallurgy from the Massachusetts Institute of Technology. Paul can be contacted at [pdenney@ipgphotonics.com](mailto:pdenney@ipgphotonics.com).



## Did You Know...?



...that IPG’s Integrated Marker was used to engrave David Ortiz’s gold-plated bat to commemorate his retirement from baseball? Thanks for the years, Big Papi!



...IPG’s new 10 watt femtosecond laser with its ultra-compact form factor, high repetition rate, and the industry’s lowest cost of ownership enables a wide range of precise micromachining and ophthalmic applications?

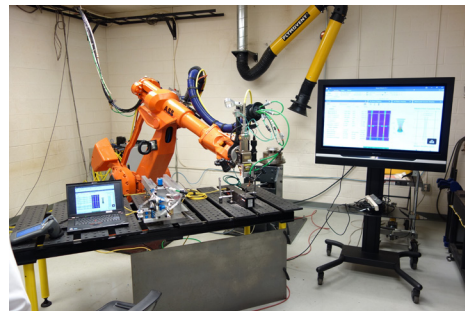




## IPG Novi Invests in Customer Education at Open House Demonstrations by Mike Klos



The first half of 2018 was full of customer outreach at IPG Photonics. In March, IPG Midwest Operations hosted the Technical Meeting for the American Welding Society (Detroit Section) at their Novi, MI facility. Dr. Paul Webster of IPG Canada presented an overview and live demonstration of multifactor weld monitoring capabilities and available tools.



In May, IPG Novi hosted an Open House as sponsorship to the Advanced Laser Applications Conference (ALAC) and demonstrated its newest products

including the 3D High Power Scanner and the Trifocal Fiber Laser System.

In June, IPG Novi held their well-attended Open House event as a sponsor to the 25<sup>th</sup> annual Advanced Laser Applications Workshop (ALAW). Over 150 people attended throughout the evening to view process capabilities in their six application labs. Featured demonstrations included the Laser Seam Stepper welding system and high average power and short pulse scanners. Attendees also had the opportunity to preview the new lab expansion geared to the next level of customer-driven research for electric vehicles, next generation battery development, advanced process controls and expanded material testing.

*Mike Klos is the General Manager of IPG Midwest Operations. He can be reached at [mklos@ipgphotonics.com](mailto:mklos@ipgphotonics.com).*



## Upcoming Events

- Sept 10 - 15** **IMTS**  
Chicago, IL
- Sept 11 - 13** **The Battery Show**  
Novi, MI
- Oct 5 - 9** **OSA Laser Congress**  
Boston, MA
- Oct 14 - 18** **ICALEO**  
Orlando, FL
- Fall 2018** **FiberForum**  
Marlborough, MA
- Fall 2018** **Open House**  
Santa Clara, CA
- Oct 31 - Nov 1** **MDM Minneapolis**  
Minneapolis, MI
- Nov 6 - 8** **FABTECH**  
Atlanta, GA
- Dec 6 - 8** **PRI Show 2018**  
Indianapolis, IN

In addition to these upcoming events, IPG also offers regional seminars and in-house events. Please contact [sales.us@ipgphotonics.com](mailto:sales.us@ipgphotonics.com) to find out more.



## IPG Expands Applications Space in the Southeast by Mike Mirov

IPG recently completed construction of a new 40,000 sq. ft. applications facility in Birmingham, Alabama. The Southeast Technology Center (SETC) houses IPG's Mid-IR laser product development and applications lab to better address the needs of its customers in the southeast region. The application lab features systems and laser sources for welding, cutting, surface cleaning, and cladding applications as well as polymer and reinforced composite processing using novel Mid-IR laser sources. A full service metrology lab also provides timely analysis of processed parts. To arrange



complimentary sample processing and evaluation as well as an in-depth introduction to IPG laser and system products, please contact [sales.us@ipgphotonics.com](mailto:sales.us@ipgphotonics.com).

*Mike Mirov, SETC's Applications Manager, can be reached at [mmirov@ipgphotonics.com](mailto:mmirov@ipgphotonics.com).*



## Small Parts Made Easy

- ▶ Optimized Speed & Accuracy for Cutting Small Parts
- ▶ Vision Registration for 100% Part Yield
- ▶ Minimized Footprint & Operating Costs for Maximum Profit



Designed, Built and Supported by the Leader in Fiber Technology

[www.ipgphotonics.com/LaserCube](http://www.ipgphotonics.com/LaserCube)



# Laser Welding Made Simple!

## SOLUTIONS TO COMPLEX WELDING PROBLEMS

- ▶ Complete Toolset for Integrators
- ▶ Enhanced Process Window
- ▶ Unmatched Reliability and Value



### Wobble Welding

*Breakthrough in Weld Quality*



### 2D/3D Remote Welding

*Fast Processing of Complex Welds*



### IPG Weld

*Flexible Software Package*



## The New Frontier in Weld Monitoring - LDD 700



*Integrated Solution for:*

- In-situ Weld Depth Measurement
- In-line Seam Tracking
- Post-weld Surface Measurement



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