the business of photonics

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SPIE ups value of global photonics trade to $182 billion

Revisions to market analysis boost overall annual sales figures, with increased business observed in China.

The value of annual sales in the global photonics market has been revised upwards to $182bn, according to new analysis by SPIE, the international society for optics and photonics (and owner of optics.org). The new results were presented by SPIE's Industry and Market Strategist Steve Anderson at the Optics+Photonics expo exhibitors' meeting in San Diego.

Photo: Matthew Peach.

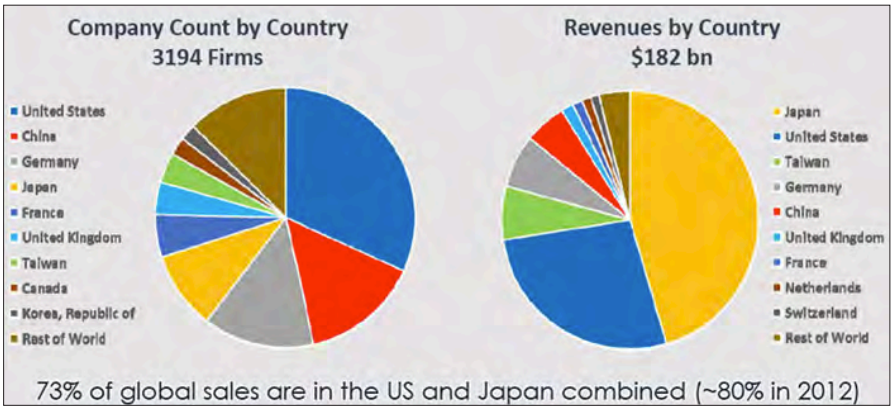
Steve Anderson, SPIE's Industry and Market Strategist.

On the basis of research performed to 2012, Anderson had previously assessed the annual value of the photonics market to be $160bn but SPIE has been working over the past two years to refine its list of key industry players and their sales.

He said, "In 2012 there were 2700 photonics companies worldwide, employing 686,000 people. By 2014, we saw an 18% increase in the number of active companies, now totaling 3194, sales were up by 15%, so the global business is worth $182 billion per year, and we now believe it employs 863,000 individuals, which would represent an increase of 26% over 2012."

He described the updated analysis as "valuable information for industry leaders and academic researchers seeking to communicate the impact of the field." These data have become more important in recent years, not just for forecasting and supporting investment, but increasingly at the political level with developments such as the US National Photonics Initiative and the EC's Horizon 2020 programs, into which serious state money and policies are being directed.

Anderson explained how the list had been refined and how the significant changes identified: "In updating the 2012 dataset of 2713 companies, we took 193 out and 674 were added so we ended up with a net change of 481. Of these, 305 Asian companies were added, 91 European, and 81 from the US. The reason that there was a lot more activity added in Asia was that, since 2012, a lot of Chinese companies have been coming out of their shells, wanting to export more. At the same time, SPIE's assessment procedure has been improved."



Graphic: S. Anderson / SPIE.

Geography of global components production, according to SPIE's 2014 analysis.

Big players own 70% of business

Investigating the data reveals much about recent business trends with photonics companies: "Since 2012, most companies added were in the under-$10m and $10m-to-$50m turnover categories. About three-quarters of firms are still SMEs, with under $10m annual business. The majority of the revenues are still generated from the minority of companies: just 63 companies from the 3194 total 2014 sample account for 70% of the total business while the remaining 2384 companies account for only 4% of total sales."

What SPIE's latest survey found to be different from just two years ago is that the industry's job distribution is more even across the companies than is the distribution of revenues. Anderson commented, "We still clearly have the bias towards larger companies in terms of employment but in 2014 the picture is a little more spread out."

One measure of companies' operating efficiency and performance is the sales ratio, measurable in dollars per employee. In the 2014 analysis, the average yield per head was down from $230,000 (2012) to $211,000. "This is accounted for by the addition of many new Asian companies to the database," he explained. "Although, in the US the 2014 performance figure is around $260,000 per employee."

Revenues by country

Anderson highlighted an interesting element from the latest analysis. "If you look at the company count by country, the top five host countries are ranked: US, China, Japan, Germany and France, as we expected. But if you look at the where the revenues are coming from, you will see a very different picture. Almost half of the total revenues come from Japan and if you look at Japan and US together then you are looking at 73% of total global revenues, which is actually down from their 80% joint total in 2012."

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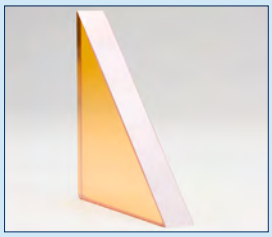

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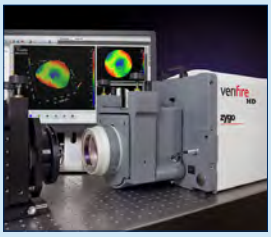

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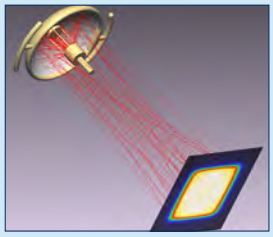

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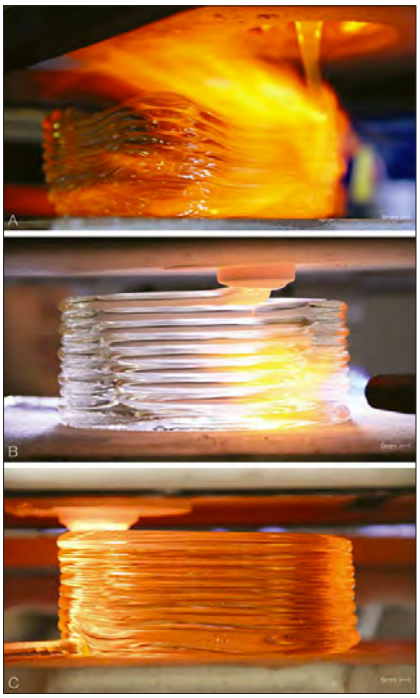
US group develops 3D-printing technique for optical glass

MIT labs and Harvard institute collaborate to enable "creative freedom and bespoke production" of optical glass pieces.

A new system that can 3D print optically transparent glass, known as G3DP, has been developed by a collaboration between the Mediated Matter group at MIT's Media Lab, the institute's Mechanical Engineering Department, the MIT Glass Lab and Harvard University's Wyss Institute. The work of the team led by Professor Neri Oxman is described in 3D Printing and Additive Manufacturing.



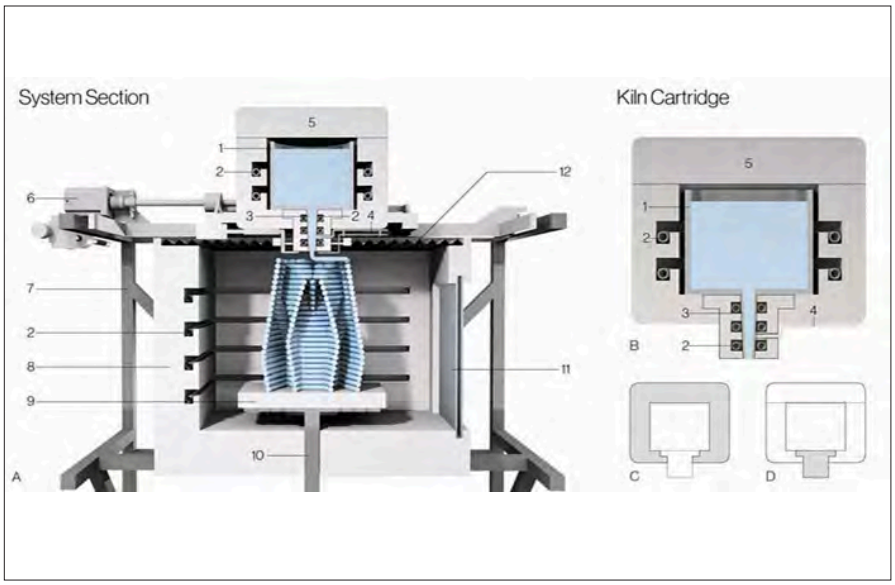
Evolution of the printing process: from its early stages (A), through the introduction of a nozzle (B), to the current setup with an annealing chamber (C).

The new platform is based on a dual heated chamber concept. The upper chamber acts as a so-called Kiln Cartridge while the lower chamber serves to anneal the developed structures. The Kiln Cartridge operates at approximately 1900°F (1000°C) and can contain sufficient material to build a single glass architectural component. The molten material gets funneled through an alumina-zircon-silica nozzle. The project synthesizes modern technologies, with "age-old" established glass tools and technologies, but it can produce novel glass structures with numerous potential applications, the researchers say.

The 3D Printing and Additive Manufacturing article describes the material extrusion printer for optically transparent glass thus: "The printer comprises scalable modular elements, able to operate at the high temperatures required to process glass from a molten state to an annealed product. Processing parameters such as temperature, which control glass viscosity, and flow rate, layer height and feed rate, can be adjusted to tailor printing to the desired component, its shape and its properties, as described by CAD models.

"We explored, defined and hard-coded geometric constraints and coiling patterns as well as the integration of various colors into the controllable process, contributing to a new design and manufacturing space. Printed [glass] parts demonstrate strong adhesion between layers and satisfying optical clarity."

Production of glass parts is said to be highly repeatable, while the glass constructs resemble those that are conventionally obtained: "the 3D printed glass objects can thus be extended to implementations across scales and functional domains including product and architectural design." The MIT and Harvard group says its research lies at the intersection of design, engineering, science and art, and represents a highly interdisciplinary approach.



Cross-section of the system showing (A) the printer during fabrication, (B) the Kiln Cartridge (C) the Crucible Kiln and (D) the Nozzle Kiln. Detail elements are as follows: (1) the crucible, (2) heating elements, (3) the nozzle and (4) the thermocouple, (5) removable feed access lid (6) stepper motors (7) printer frame (8) Print Annealer (9) ceramic print plate (10) z-drive train (11) ceramic viewing window (12) insulating skirt.

Substantial strength

Professor Oxman's team concludes, "Preliminary printed material characterization was performed in terms of morphological, mechanical and optical properties. Results indicated strong adhesion between layers and substantial strength increase when the process was performed in a heated build chamber with roughly 60% of material strength across layers.

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US group develops 3D-printing technique for optical glass

From an optical point of view, high transparency is observed and complex caustic patterns have been created with LED light sources, depending on the samples' geometry.

Commenting on the opportunity presented by their development, the system developers noted, "Two trends in additive manufacturing highlight the value we expect from additive manufacturing of molten glass. First, the freedom that this process provides in terms of the forms that can be created in glass. This enables the creation of structures characterized by higher structural and environmental performance delivered through geometric complexity. Currently we are observing how geometrical complexity can be leveraged for engineering gain, particularly in the aerospace industry in some cases improving performance by 40% or more.

"Second, bespoke creation of glass objects provides the opportunity for complex scaffolds, fluidics and labware custom made for individual applications. Moving forward, the simultaneous development of the printer and the design of the printed glass objects will yield both a higher performance system and increasingly complex novel objects."

About G3DP

The G3DP project was created in collaboration between the Mediated Matter group at the MIT Media Lab, the Mechanical Engineering Department, the MIT Glass Lab and the Wyss Institute. Researchers include : John Klein, Michael Stern, Markus Kayser, Chikara Inamura, Giorgia Franchin, Shreya Dave, James Weaver, Peter Houk and Prof. Neri Oxman.

Image Credit: Andy Ryan, MIT.

Example of 3D printed lass form, showing caustic patterns created by illumination from a suspended overhead LED.

A selection of 3D printed glass pieces produced by this method will be presented in an exhibition at Cooper Hewitt, Smithsonian Design Museum, in New York, NY, US, in 2016. The patent Additive Manufacturing of Optically Transparent Glass was filed in April, 2014.

http://optics.org/news/6/9/3

New CEO slashes GTAT workforce by 40%

Provider of furnaces for manufacturing sapphire expects to emerge from bankruptcy proceedings in the first quarter of 2016.

GT Advanced Technologies (GTAT), the US-headquartered provider of furnaces used to produce large sapphire crystals for optical and other applications, is to shed nearly half of its workforce as it emerges from Chapter 11 bankruptcy proceedings.

The Merrimack, New Hampshire, company is recovering from an ill-fated encounter with Apple that initially saw hundreds of millions of dollars invested in furnace development and production in the US.

Credit: GT Advanced Technologies.

Through its Crystal Systems subsidiary, GT Advanced Technologies is one of the world's leading providers of core sapphire material that is subsequently turned into wafers upon which LED chips are produced. The agreement with Soitec should see a new and much more cost-effective way to deposit light-emitting semiconductors on those wafers become widely available.

Apple had been planning to use GTAT as a captive supplier of sapphire material in unprecedented volumes for scratch-proof screens in various consumer electronics applications, but the deal turned sour last year and left GTAT burning through cash at a rate of $1 million every day. The company filed for Chapter 11 bankruptcy protection in the US courts last October - a move that caught both equity analysts and Apple by surprise.

However the two companies did then agree a settlement, and in July GTAT revealed that it had secured a $95 million "debtor-in-possession" loan on its path to recovery. Having just parted company with Tom Gutierrez, the CEO who oversaw the Apple disaster, GTAT says it is now taking the necessary steps to align its cost structure with a revised business plan and a route out of bankruptcy.

New CEO

Under new CEO David Keck, an executive who was previously in charge of GTAT's worldwide sales operation, the company is returning to focus on its core technologies: the equipment needed to make sapphire and polysilicon materials.

On top of that, it is aiming to commercialize its newly developed "Merlin" cell interconnect technology for PV applications, and will retain an effort focused on specialty sapphire materials. "The company is taking steps to ensure that its solar PV product offerings are ready to capitalize on new demand from customers as the solar capital equipment business returns to growth over the next two years," announced the firm.

However, the new plan inevitably involves some difficult decisions, and although GTAT is still evaluating the "strategic importance" of its other businesses, a headcount reduction of approximately 40 per cent is expected.

Exactly how many jobs that means at this stage is unclear. At one time, GTAT had planned to hire more than 1000 workers when building out the Arizona factory where it had been expecting to produce sapphire for Apple – although many of those were laid off nearly a year ago.

The latest round of layoffs should also reduce the company's operating expenses by around 40 per cent as GTAT seeks to return to profitable operation.

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