

## Views

Arnold Mayer\*

# Laser materials processing market reaches record high

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**For the first time in history, the market for industrial laser systems crossed the \$10 billion line in 2011. Within this market, the machines for cutting and for welding comprise the biggest market share. Besides, the systems for laser marking and ‘micro’ applications substantially contribute to the market.**

**All these markets have not only recovered from the downturn in 2009 but saw an all-time high in 2011. There are a number of remarkable trends in these markets. One is the ongoing adoption of high-power solid state lasers, which replace CO<sub>2</sub> lasers. Still, the market for CO<sub>2</sub> laser sources grew in 2011. Another trend is the increasing maturity of the laser systems market.**

The global market for the laser systems for materials processing has reached a new record volume of € 7.2 billion (or US-\$ 10.1 billion) in 2011, according to the annual survey performed by Optech Consulting. The market is 22% (28% in US-\$) above its 2010 volume and 90% ahead of its size in the crisis year 2009, when the market was down to € 3.8 billion (US-\$ 5.3 billion). The demand for laser materials processing systems also surpassed its previous peak volume of € 6.4 billion (US-\$ 9.4 billion) reached in 2008, thus, returning to its long-term growth trend (Figure 1).

Geographically, the market growth in recent years was especially strong in East Asia, with a steeply growing demand for the laser systems in China, Korea, and Taiwan. The laser system demand also accelerates in other countries, with high growth rates of industrial production, such as India, the ASEAN countries, and Brazil.

## 1 Laser system market outperforms machine tool market

With revenues of € 7.2 billion, the global laser system market now has a volume corresponding to about 12% of the global machine tool market. Over the last 25 years, since Optech Consulting tracks the market, the global laser system sales have increased by more than a factor of 10, corresponding to an average annual growth rate (CAGR) of nearly 10%. Over the same period, the global machine tool market only grew by about 100%, corresponding to a CAGR of about 3%. These figures refer to the market measured in Euro, markets measured in US-\$ have increased more due to the long-term decrease of the US-\$ vs. the Euro.

The demand for the lasers and laser systems for materials processing is subject to considerable fluctuation with the economic cycles. While the average annual growth rate of the laser systems market was about 10% over the last 25 years, that period included the years with growth of more than 25% as well as the years with negative growth. In 2009, the laser system market suffered a 41% decrease due to the macroeconomic downturn in the wake of the financial crisis. One of the aspects of the downturn was that the drop of the laser systems market in 2009 was more pronounced than the downturn of the machine tool market (Figure 2). This is due to the fact that the backlog of the laser systems industry is smaller than in the machine tool sector, which results in an especially steep decrease and increase of production volumes in the laser sector during a sharp downturn and upturn.

After the steep increase in 2010 and 2011, the growth of the laser systems market is expected to be moderate in 2012, also dampened by the less favorable global macroeconomic environment. This expectation is confirmed by the revenue trend of the leading market participants.

## 2 Laser sources market

The market for the high-power laser sources comprises a volume of €2.2 billion (2011). Gas lasers, including CO<sub>2</sub> lasers and excimer lasers, still dominate the market. The solid state lasers, including fiber, disk, rod, and diode lasers, presently enjoy a larger growth than gas lasers and are expected to surpass the gas lasers by market volume in the near future. It is worth to note, however, that in 2011 also, the market for CO<sub>2</sub> lasers grew because the overall growth rate of the market more than compensated for the market share losses of CO<sub>2</sub> lasers in the high-power segment.

With an average annual market growth rate of 29% over the last 6 years, the fiber lasers have been highly successful (Figure 3). In 2011, the fiber lasers accounted for a global market volume of about €400 million, up from €85 million in 2005. The most important application sector of the fiber lasers is materials processing,

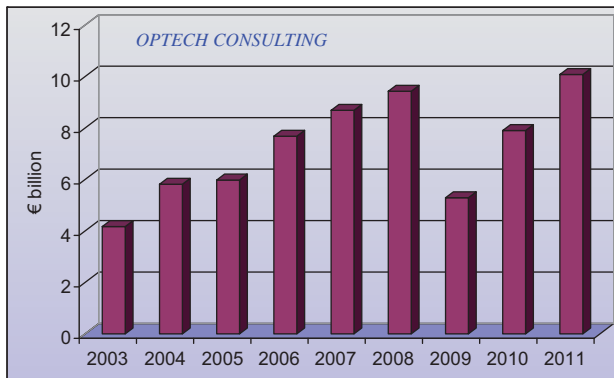


Figure 1 The global market for laser systems for materials processing.

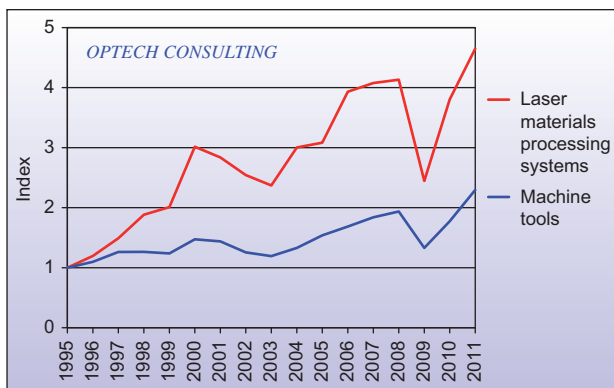


Figure 2 The global market laser material systems vs. machine tools (indexed to respective 1995 values).

which currently accounts for about 80% of the fiber laser market. The balance of 20% is accounted for by applications in medical therapy, analysis and instrumentation, and measurement and sensing.

## 3 Growing share of fiber and disk lasers in sheet metal cutting

Laser materials processing systems are used in a wide range of industries (Figure 4). The market comprises the laser systems for macro processing, mainly for cutting, welding, and marking, worth about €5 billion, and laser systems for micro processing, for the production of semi-conductors, flat panel displays, printed circuit boards, and solar cells, worth about €2 billion. Both segments contributed to the booming market growth in 2011.

In macro processing, high-power solid state lasers including fiber and disk lasers presently set the major trend with their surging market share in cutting, the largest application segment in laser materials processing. While not yet suited for all cutting applications, the solid

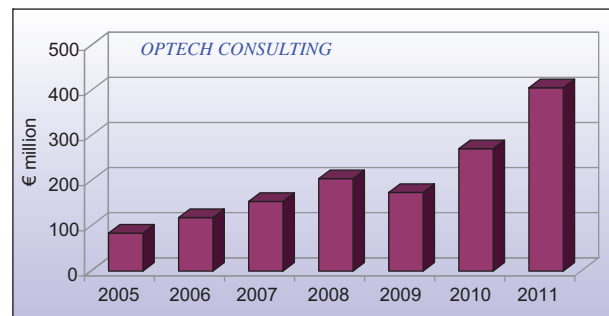


Figure 3 The global market for fiber lasers.

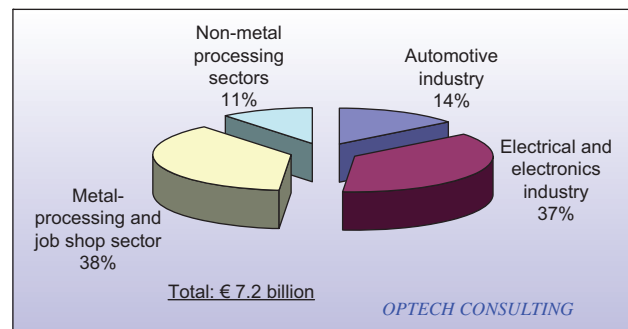


Figure 4 The global laser systems market by the end-user sector (2011).

state lasers lead to advantages mainly for the cutting of thin metal sheets, they are welcome in the market. One major reason for this is the low-power consumption of these lasers. While high-power CO<sub>2</sub> lasers, the established work horses of laser cutting, have an electrical efficiency of <10% and consume up to 100 kW of electrical power, the power consumption of fiber and disk lasers is about five times lower. The Trumpf Group, one of the market leaders, already equips more than 10% of its sheet metal cutting machines with disk lasers. A similar percentage is estimated for the average of the other manufacturers of sheet metal cutting systems, which mainly use fiber lasers. The breakthrough of the new lasers in high-power cutting comes many years after their success in welding where fiber, disk, and diode lasers already dominate the market.

#### 4 Laser micro processing driven by consumer electronics

Laser micro processing contributed to the market growth in 2011 as well, spurred by an increased application in the major segments. In the semiconductor and printed circuit board industry, the lasers take a crucial role for the continued decrease of the feature sizes, by direct ablative structuring and by the exposure of photoresist. The lasers are also increasingly used for the production of flat panel displays, including high-resolution displays and touchscreens for smartphones and tablet computers, as well as large LCD and OLED displays for television sets. Another growing application field for laser micro processing is the production of solar cells where laser structuring helps to increase cell efficiency.

Various laser types are used in micro processing, including solid state, excimer, and CO<sub>2</sub> lasers. These lasers cover a wide range of wavelengths, pulse parameters, and power. Also, ultrashort pulse lasers are increasingly used, while still accounting for a small share of the total market. Picosecond and femtosecond pulses enable the ablation of the material with reduced thermal load, as well as new cutting processes. For example, the ultrashort pulses are employed for the efficient cutting of glass and other dielectric materials.

#### 5 Stuttgart Laser Marketplace'12

The issues discussed in this article have also been topics at the Stuttgart Laser Marketplace'12 held on May 13th in conjunction with the Lasys trade show. This year's speakers included the leading laser market experts as well as experts from the laser equipment manufacturers and users. Dr. Arnold Mayer (Optech Consulting) presented the global laser market update. Dr. Kunihiko Washio (Paradigm Laser) analyzed the market and technology trends in Japan. David Clark (Coherent) and Dr. Jens König (Robert Bosch) discussed the current developments in laser micro processing. Klaus Löffler (Trumpf), Wolfram Rath (Rofin Sinar), and Theodor Fleitmann (Nutech) presented their views on laser macro processing, including cutting and welding applications and competing laser types.

The Laser Marketplace is a market review conference focused on the market and application trends in laser materials processing. The Laser Marketplace conferences are organized by Optech Consulting in cooperation and along with the LASYS trade show in Stuttgart and the LASER World of Photonics trade show in Munich. For further information and registration, please visit [www.optech-consulting.com](http://www.optech-consulting.com).



Arnold Mayer is the General Manager of Optech Consulting. His work is focused on product-to-market and business development concepts in the laser and photonics industry. Prior to founding Optech Consulting, he held positions in marketing, management consulting, and industrial R&D. Dr. Mayer holds a degree in physics from the University of Stuttgart and received his PhD at the Max Planck Institute for Solid State Research, Stuttgart.

Founded in 1992, Switzerland-based Optech Consulting provides consulting for the laser and photonics industry and assists companies and institutions in technology marketing and strategy development. Its publications include the Industrial Laser Quarterly Report and various laser market reports. The Laser Marketplace, a seminar organized periodically by Optech Consulting, provides a discussion platform on the industrial laser markets.