

A close-up photograph of a man wearing a dark hat and sunglasses. He is holding his right index finger to his lips in a universal gesture for silence or secrecy. The background is slightly blurred, showing green foliage. The top right corner of the image has an orange overlay containing the text 'Factbook'.

Laser *Factbook*

The whole
Truth

The global market

by David A. Belforte

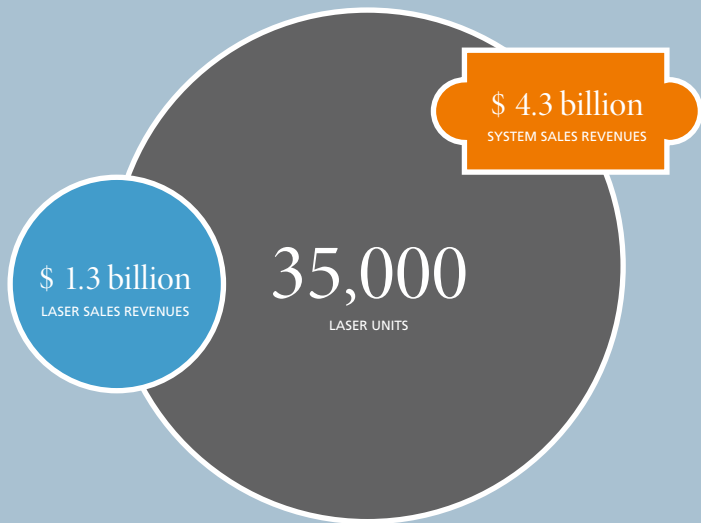
for industrial lasers

A comprehensive view by market insider David Belforte, Publisher and Editor-In-Chief of the monthly US-magazine Industrial Laser Solutions. A brief look at the history and today's overall figures is followed by discussions of the major applications and laser types as well as geographical markets.

Although lasers had been invented and commercialized earlier, the first industrial markets developed in 1970 with laser sales revenues of US-dollar 2 million. The laser industry considers this as the beginning of its business. Since then, this sector has grown at a compound annual growth rate of 20.17 percent and, most significantly, during this period this global market experienced only one period, 1991 – 1992, of zero growth. The early years showed the effects of education of the market as the laser suppliers worked to match product to applications. The years of substantive annual growth started in the late 1980s as sheet metal cutting evolved into a major revenue-producing application, and the first penetration into the automotive body welding sector began in the mid-1990s. Today this vibrant technology is used, around the world, by a wide range of companies, in a variety of industries, many with the same material processing requirements. Statistically, the world market for industrial lasers in 2005 was 35,000 units valued at US-dollar 1.3 billion, integrated into systems with sales revenues of US-dollar 4.3 billion.

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World Market for Industrial Lasers and Lasersystems 2005



Marking and Engraving

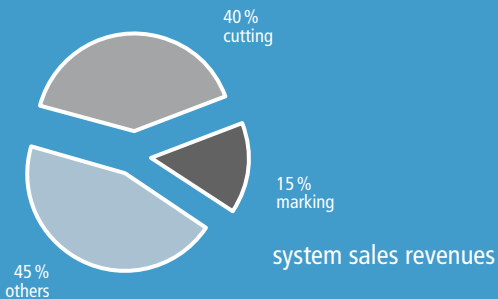
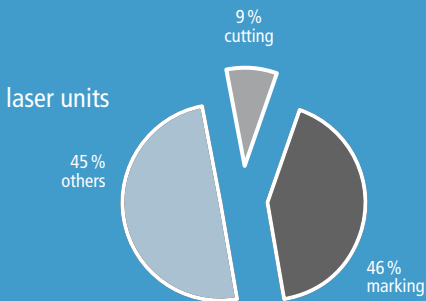
An excellent example of current worldwide acceptance of industrial lasers is marking/engraving, which accounts for almost half of all units produced and about 15 percent of all system revenues generated. This year more than 16,000 solid-state and CO₂ lasers will be installed for these applications.

Laser marking/engraving has reached the long-desired status of a commodity, a market situation that implies top value for modest investment, thanks to suppliers' careful attention to end-user requirements for reliable and easy to program and maintain products that are versatile and flexible to operate.

The world market for laser marking/engraving seems to be boundless as further cost reductions, on even more-productive units, powered by new technology appear in the marketplace. Laser marking/engraving suppliers have risen to the challenge of manufacturers' needs for security, warranty, and traceability on the products they make and sell.

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World Markets by Applications 2006



Cutting

Sheet metal cutting is another global example. If you were to walk into a sheet metal fabricator's shop in Thailand where there are laser cutting systems installed, they would likely be processing the same metals, at the same cutting speeds, producing small quantities of parts for customers that require rapid delivery as would a similar shop in Germany, Sweden, Canada, or Mexico. This is because laser cutting of sheet metal has become as ubiquitous as flame cutting but producing at a higher quality level and at a faster turn-around time, with less scrap, while generating profits for the shop owners. Is it no wonder that almost 30,000 laser cutters will have been installed in the world's industrialized countries by the end of this year?

It was laser cutting that first intrigued German companies in the early 1970s when 500-watt CO₂ lasers were mounted on the cantilevered arm of a plasma cutter system, controlled by an optical follower tracing system. As laser cutting power ramped up to today's 6kW level and control systems morphed into today's powerful PC-based units, the market responded by buying annual quantities that now exceed 3,000 units a year.

In 2006 the world market for laser metal cutting systems is expected to be about 25 percent of the total number of laser systems sold, but more than 40 percent of the revenues. And as demand is met for higher cutting speeds, the ability to cut thin and thick metals, and user's needs to process both steel and aluminum on the same equipment is expected to drive the market to new sales heights for several years to come. A generation of installed equipment powered at less than 2.5 kW is ready for replacement by the new breed of high beam quality systems that can be operated automatically with load/unload and part retrieval.

6,000 Watt



500 Watt

Laser Cutting Power

Welding

About 11 percent of industrial solid-state and CO₂ lasers are integrated into welding systems that are used in industries ranging from the manufacture of dental/surgical instruments on a micro scale to the macro scale, on-line assembly of automotive body-in-white. In between are a wide variety of industries, all with unique joining requirements, that make up the general field of laser welding. And this diverse market, heavily product and metallurgy oriented, is one reason that laser welding has historically made up only 10-15 percent of the total laser market.

All welding is very much product-driven application, and laser welding follows the same trend, except that it is usually considered for new products. On a one-for-one basis lasers are not usually chosen as direct replacements for installed conventional welding equipment; so the market is focused on new designs or the redesign of existing parts. This can limit the opportunities for substantial growth in market share.

Equipment suppliers within the industrial laser market have long been looking for what is known as a “killer” application; one in which large quantities of similar systems can be sold to a broad market that would represent yearly demand of thousands of units. There are few industries that match up to this, the most notable being the world’s auto industries who all have the same metal joining requirements. Thus the suppliers of high-power lasers have focused their attention on opportunities for multi-unit installations in body-in-white applications such as roof-to-side-frame welding and brazing.

The auto industry, while not a major market in terms of unit sales is certainly a major revenue producer, albeit one that is tied to the introduction of new models. For example, large numbers of high-power solid-state lasers sold to one German car maker can easily be adapted to new model changes, even to new platform introductions with minor allowance for replacement lasers. Currently the market for high-power solid-state lasers is on hold but

expected to increase as new models are introduced in Asia and North America in 2007 and in Europe thereafter.

Meanwhile both solid-state and CO₂ lasers continue to be sold to other world auto, truck, and agricultural equipment makers where they are used to weld powertrain components and other structural and sheet metal features on these vehicles. A typical example is the use of solid-state lasers for non-linear tailored blank welding of various body and chassis components, which is not a large market on a unit basis but is a major revenue producer as the cost of these systems is in the millions of dollars.

One potential market that might develop into a “killer” welding application is the use of lasers to weld fabricated metal parts in job shops. Welding is becoming a process that might allow job shops to offer more value added services to their customer base and by so doing also place them at an advantage to their competitors. However most fabricating shops do not have welding expertise and consequently some user education will be necessary before the value of laser welding sheet metal becomes apparent to users and fabrication welding becomes a market of size. But the raw numbers have the supplier industry thinking that this application might be the next major move in the welding market. Estimates of the number of shops that could make an investment in laser welding range up to 10,000 worldwide.

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Microprocessing

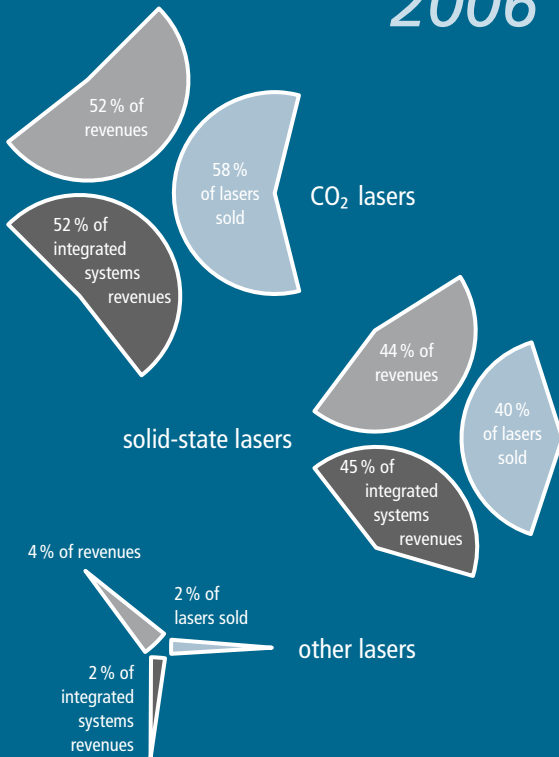
A broad range of applications fall into the market category called microprocessing, which is defined as those manufacturing operations that can be grouped as micron-scale operations. This sector represented about 12 percent of the world market for industrial lasers in 2005, down slightly from previous highs at the 15 percent level, caused primarily by continuing slow recovery in the semiconductor segment. This market sector has been identified as the area of major growth opportunities for industrial lasers in this decade. Halfway through it looks like these projections may have been optimistic because the driver for growth, the semiconductor industry, has experienced a prolonged period of low growth. Chief among the products sold into this market are circuit adjustment and mask repair systems, both of which are enjoying a market surge early this year.

Two applications that continue to represent a major share of microprocessing lasers sold are micro-via drilling and stent cutting. The former has its growth potential tied to the semiconductor and microelectronic industries and the latter benefits from major investments being made in health care in the industrialized nations. Via drilling is an application served by high beam quality CO₂ and solid-state lasers. Lamp- and diode-pumped solid-state lasers have been the power source of choice for stent cutting, but recent introductions of fiber lasers have begun to cut into their market shares. All of these products have seen market share increase as significant selling price decreases have resulted from technology advances and market competition.

Drilling applications, divided into drilling of metals and perforation of non-metals, remain as a small percentage (3 percent) of industrial laser application, with most of the growth rate increases occurring in the perforating sector. And the remaining share (5 percent) includes such diverse applications as rapid prototyping and manufacturing, surface treatment, and nanomanufacturing.

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World Markets by Lasersources 2006



Lasers

The most important factor behind the continuing acceptance of industrial laser technology has been the technical stability of products sold into the marketplace. Since the inception of the industrial market, CO₂ and solid-state laser technology has remained relatively free of competition. Today's high-power CO₂ lasers are several generations removed from the introductory products but are still operating at the same wavelengths as the original products. The same holds true for lasers that use rods as the laser source, except for a growing number of products that are frequency shifted into the ultraviolet wavelengths. Only the recent rapid growth of fiber lasers has changed market shares in the solid-state sector. Other laser technologies, such as excimer and diodes, well ensconced in niche market sectors, such as photolithography and microbrazing, have not had the broad market impact of the two basic lasers, CO₂ and solid state.

In 2006, CO₂ lasers will make up about 58 percent of lasers sold; representing 52 percent of the revenues. When integrated into systems they will produce about 52 percent of the revenues. Solid-state lasers (including fiber lasers) account for 40 percent of units sold and 44 percent of revenues. These lasers will account for 45 percent of integrated systems revenues. Other lasers will tally about 2 percent of units, 4 percent of revenues, and 2 percent of system revenues.

High-power CO₂ lasers have become more productive on a dollars/watt delivered basis

The world market for low-power CO₂ lasers is currently very competitive and as unit selling prices have decreased, unit sales have increased — a classic case of price / demand influence that has been a long-sought condition in this market sector. With projected unit sales for 2006 approaching 18,000 and growth rates expected to continue at a double-digit pace, one can only speculate on the applications and market regions that will support this. China and now India look to be the growth markets for these products, and the applications are in nonmetal processing, such as textiles and plastics.

High-power CO₂ lasers have become more productive on a dollars/watt delivered basis as suppliers of these products have improved beam quality, in units up to the 6kW level. As a result markets, such as sheet metal cutting, that might have stagnated are revitalized as customers seek more processed product in a shorter time, in other words higher productivity.

The recent introduction of industrialized disk and fiber and disc lasers represents a major technology shift in solid-state laser processing. Improved beam quality at lower selling prices has caused industries that can use this type of laser — those that may have been unable to justify lamp- and diode-pumped lasers — to now pursue these new products.

At the high-power end of the application scale are several applications that either are or were scheduled to be produced by rod type solid-state lasers. Examples are welding of automotive body-in-white and joining of tailored blanks. The trend seems to be to strong consideration, and in some cases, choice of high-power disc or fiber lasers as an alternative. Currently, the selling prices of high-power fiber lasers is still high, limiting their widespread penetration into the market, but this situation is expected to change as the technology and the markets mature. Fiberlasers compete with the disc laser for many of the same applications.

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Markets

The rise of Southeast Asia as a significant market has changed the character of the industrial laser market and has added a number of new product suppliers that compete domestically and eventually will export to world markets. Last year 16 percent of industrial laser system installations occurred in Southeast Asia and 18 percent were installed in Japan; making Asia the largest market for industrial lasers. Europe at 33 percent and North America at 25 percent and the remainder at 6 percent compose the rest of the world's unit installations. The picture changes dramatically when looking at 2005 system revenues with Asia slipping to third place at 22 percent due to the low dollar value of systems built and sold in China. Europe at 38 percent and North America at 32 percent are thus more important from a revenue standpoint.

A review of current applications being served by industrial lasers suggests that few approaching the market saturation mode and those close to maturity have sufficient replacement business to continue substantial sales for the near term. More importantly, it is not apparent that many serious threats exist as substitution or replacement of lasers in manufacturing operations. Lasers are well established, accepted, and proven as profitable, reliable, easy-to-operate, low maintenance equipment. By these measures the industrial laser market looks solid for the next few years.

Main Markets for Lasersystems



The Author

David A. Belforte has a long association with industrial lasers and materials processing as a researcher, process developer, marketer, business strategist, journalist and educator. He is the Publisher/Editor-In-Chief of *Industrial Laser Solutions*, the preeminent international publication focusing on industrial laser processing. His annual forecasts of the laser market are highly regarded by industry.

For his contributions to the world-wide advancement of industrial laser processing he was awarded the prestigious Arthur L. Schawlow medal.



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