Fotona: Producing the Highest Performance Laser Systems for Over Forty Years

Fotona began life in 1964 (the same year that the first Neodymium laser was created) as an optical research laboratory, and quickly became one of the fastest-growing high-tech companies in Slovenia, specializing initially in high-sensitivity optoelectronic laser equipment for the defense industry.

It entered the medical laser market in the early 1980's with the highly-demanding manufacture of ophthalmic laser equipment, and has been at the forefront of medical laser technology ever since.

Lasers have remained at the heart of Fotona's technology. Today, Fotona is involved in four areas – defense, communications, industry and medicine – with their major focus centering on medical laser equipment.

Introduction

Despite the popular conception of Lasers as being futuristic and the stuff of science fiction, lasers have been with us for over 40 years, with their range of applications growing steadily all the time. The word Laser itself is an acronym that stands for **Light Amplification by Stimulated Emission of Radiation. Laser light is characterized by the following properties:**

- The light it emits is **monochromatic** - in other words it contains one specific wavelength of light.
- All photons travel together in phase so that the light released is **coherent**.
- Finally the photons all travel in the same direction (**unidirectional** or **collimated**).

Since their creation lasers have spread into numerous industries. Today lasers are widely used, in a myriad of ways, in defense, communications, industry, scientific research and medicine. In the medical field, doctors use them to perform bloodless surgery, to correct sight defects and to treat many dermatological conditions. In everyday life, lasers are found in numerous household products while, via fiber optic cables, lasers have become the cornerstone of modern telecommunications.

Harold Maiman invented the first operable 'ruby' laser in 1960, closely followed by the first Carbon Dioxide and Neodymium lasers four years later. Fotona has therefore been involved with lasers since their very conception, giving the company unrivalled experience and expertise. In those first pioneering days Fotona was involved in the development of gas lasers for scientific applications and then in solid-state lasers. From here, work developed on laser-based distance-measuring instruments and laser rangefinders for defense applications. These, in turn, created the basis for the development of a wide range of laser-based technologies and applications in medicine, communications and manufacturing.

The laser industry has grown and matured since its birth in the 1960s and the technology and the range of applications that use lasers continues to evolve and develop at a remarkable pace. Consequently the market for laser-based technologies has grown enormously. Fotona has been at the forefront of this dramatic change since the beginning. Today the laser industry is becoming more and more specialized, with new applications continually being investigated and developed.

Fotona's headquarters in Ljubljana, Slovenia

Fotona's revolutionary S-11 Scanner

Slovenia entered the European Union in 2004 as the most prosperous of the 'accession states' and in 2007 will be the only one of them to join the European single currency - the Euro – further evidence of its financial strength and stability.

Slovenia enjoys a strategically advantageous location in south central Europe, located between Italy to the west, Austria to the north, Hungary to the east and Croatia to the South. The country boasts excellent transport links, including Ljubljana International Airport, a modern and extensive highway network and port and cargo facilities in Koper.

Increasingly popular with foreign investors and tourists, the country's stunning natural beauty, historic towns and castles and its charming and picturesque capital, Ljubljana, are rapidly putting the country on the international map.

Most would be surprised, however, to learn that Slovenia is also home to one of the world's leading manufacturers and producers of laser systems - Fotona d.d., located in Stegne Industrial Park, close to the center of Ljubljana.

Dr Matjaž Lukač, president of Fotona:

The secret to our success is each and every employee's identification with Fotona and its passion for perfection. While we pursue perfection in everything we do, we are particularly committed to provide the most advanced and capable, as well as the safest and most reliable laser systems in the world. We are proud of our worldwide reputation for making laser systems that last "forever". Hence our maxim: "the highest performance, best made laser systems in the world". There is no other company in the world that can be better in this regard than Fotona with its unique in-house R&D, manufacturing and testing capabilities.

Dr Matjaž Lukač, president of Fotona.

Fotona has been an innovative, technology-based company since its birth in 1964, and their laser systems are the result of that experience and of their know-how and expertise in the fields of medicine, communications, industry and defense. As a consequence, Fotona is recognized as a world leader in the innovation, development and manufacture of laser systems.

From very modest beginnings, Fotona has grown into one of the leading manufacturers of laser systems in the world. Since their inception over 40 years ago the company has installed over fifteen thousand specialized laser systems all over the globe.

Quality Control on Precision Handpieces

High-Precision Machining Centers

Commitment to Quality

Dedication to strict compliance with the most stringent military standards is one of Fotona's principal attributes. Unlike many others within their field, Fotona itself produces most of the components that are used in their laser systems 'in house'.

This means that the company can ensure the quality and reliability of its systems. All of the products the company manufactures are stringently tested to guarantee that their laser systems are of the highest quality, reliability and durability and in compliance with all applicable international standards.

This dedication to quality has resulted in certification to a whole series of international standards including ISO 9001:2000, ISO 13485:1996, ISO 13485:2003, EN 46001, MDD 93/42 Annex II.3 standards, and the United States GMP standards. All Fotona's medical products comply with the requirements of the EU Medical Devices Directive, while their industrial products comply with the requirements of the EU Low Voltage Directive. Individual specific products are also certified and/or approved in the countries where they are used (for example, the FDA in the USA). Additionally, regardless of their application, all of Fotona's systems are submitted to strict temperature and vibration tests in line with military standards.

Technical Expertise

Since Fotona produce the overwhelming majority of their technology in-house, they are not simply an assembly company, but are involved in every stage of the production and manufacture of laser systems, from research and development through to the finished product - literally 'from the drawing board'.

Their facilities include modern CAD-linked CNC machines which ensure the precision and speed of production of complex mechanical subassemblies.

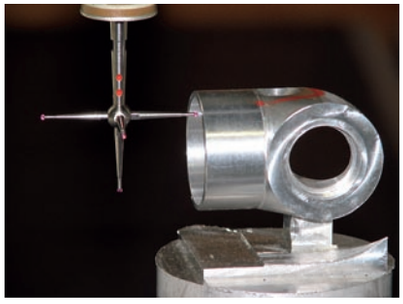
These machines are able to process cast stainless steel, aluminum alloys, bronze or synthetic substances. Fotona also boasts an optical manufacturing facility where precise optical parts can

be cut, milled, ground and polished to produce flat mirrors and optics as well as curved, shaped lenses. The facility is also able to perform thin-film coating, a technically complex procedure where evaporated metals are deposited to provide different coatings for mirrors and lenses, giving them different optical qualities.

As well as their unique 'in house' manufacturing and testing capabilities Fotona has long-standing technical partnerships with the University of Ljubljana's research laboratories.

Indeed the company played a pivotal role in helping to establish their undergraduate and postgraduate programs in Laser Physics. Fotona also collaborates with a number of universities and research institutes worldwide.

These relationships enable the company to introduce new technologies and processes which continue to ensure that Fotona's laser systems are among the most modern, efficient and technologically-sophisticated available.



Precise Component Control

Skilled Personnel

All of Fotona's key technical staff each have over ten years experience in their respective disciplines. Many hold advanced degrees or doctorates from leading American or European universities (approximately 27% of technical staff have Masters equivalent qualifications, or higher, in science and engineering), while others have had research experience in such institutions.

Such expertise provides the company with unique advantages, ensuring, among other things, a highly innovative and diligent research and development department that is constantly exploring how new technological advances can be incorporated into both new and existing systems to ensure that Fotona remains a by-word for innovation in laser technologies.

Dedicated Laser Assembly Line

From Defense to Medicine

As laser technology developed so did the range of practical applications for the technology - from the defense and military sectors into communications technology and also into medical laser systems.

Fotona first began producing lasers for use in defense and communications and subsequently moved into industry and medicine. While these industries may appear quite diverse, what connects them are shared technologies: lasers, electronics, optics and mechanics.

The first practical applications for laser technologies were in the precise measurement of distances. These found their practical application in rangefinder technologies in the defense industry. Fotona consequently began its commercial operations by producing rangefinders for tanks and artillery. Today Fotona maintains its defense arm,

Sophisticated Defense Observation System.

Laser Rangefinder Binoculars.

Optical Communications Traffic Control Systems.

producing equipment that services the entire spectrum of products for a modern army. These include observation instruments, fire control systems, control systems, laser irradiation detector systems, thermal imaging systems for night vision and anti-tank missile guidance.

Fotona has been involved in optical network technologies for telecommunications for over 20 years, producing hundreds of optical communications devices and systems, in addition to thousands of kilometers of optical fibers and cables. Fotona has also built and commissioned over 200 microwave and SDH optical links, not only in Slovenia, but also in foreign markets - especially in Southeast Europe and Russia. Their experience, know-how and expertise allow the company to be quick, flexible and able to satisfy customer requirements.

Medical lasers – transforming aesthetics, dermatology and dentistry

Advances in laser technology resulted in the technology quickly finding uses in medicine, including surgery, aesthetics and dentistry. Fotona's pedigree, experience and know-how meant that, as these new markets emerged, the company was uniquely placed to move into these sectors. Since the 1980s these markets have shown enormous growth. For example, by 2005 the US aesthetics market alone was valued at more than $400 million. Total commercial revenues for lasers worldwide are estimated to be in excess of $2 billion.

Fotona was one of the first companies to move into the medical laser market. The technology and know-how inherited from its pioneering early work, combined with its unique advantages, have seen the medical laser market become the leading commercial market for Fotona's products. The company produces the largest range of laser systems available to meet the demands of medical professionals, dental practitioners, and increasingly spa and other non-traditional customers. The product range serves all the aesthetic market segments from entry-level systems to versatile combination lasers that are able to treat an enormous range of applications.

The largest segments of the growing market for lasers in aesthetics and dermatology are laser hair removal and skin rejuvenation. Other markets include acne treatments, tattoo removal, vascular and pigmented lesion removal and endovascular laser treatment. Fotona produces systems specifically designed for each of these applications, as well as combination systems that are able to fulfill multiple applications.

A Fotona dental laser system in operation.

In both dentistry and aesthetics Fotona continues to innovate. Its latest dental laser system, the Fidelis Plus III, is the only laser that can achieve ablation speeds faster than conventional dental drills. In addition, the combination of Er:YAG and Nd:YAG laser sources means that the system can perform both hard tissue procedures, such as cavity preparation, as well as soft tissue procedures, such as frenectomy, gingivectomy, gingioplasty etc. Further-

Fidelis Plus III – Fotona's latest Dental Laser System,

more, the Fidelis Plus III also has a unique dermatology upgrade option, which will allow dental practitioners to offer facial aesthetic procedures.

In the aesthetics market the latest system available from Fotona is the Fotona XP MAX. This system comes with a unique scanner that not only has the fastest scanning speeds and the largest scan area available on the market, but also is the only scanner available that has three spot sizes – 3, 6 and 9mm. In addition Fotona's scanners use a unique sequence of optimal laser spots to ensure the highest levels of patient comfort. Drawing on the success of the Fotona Dualis^{XP} range, the XP MAX is a clear example of Fotona's commitment to produce the highest performance, best-made laser systems in the world.

Fotona XP MAX – Fotona's leading Medical Laser System

Conclusion

Fotona's corporate slogan is 'Choose Perfection', a slogan that is reflected in strong investment in outstanding research and development facilities to ensure that the company delivers innovative solutions to this ever-changing and developing market. This, in turn, ensures that the company's philosophy of producing the highest performance, best-made laser systems in the World is delivered. Furthermore, the company has an established network of over 40 partners throughout more than 60 countries worldwide, ensuring comprehensive support and cooperation wherever our customers are.

"We have used the Fotona Dualis^{XP} Plus and Fidelis^{XS} for almost a year. The results for our clients have been excellent. The learning curve was short, and they are so versatile; we are finding new uses for them each month. Clients who have had procedures done with other systems have commented on how much less discomfort they have had with Fotona's lasers. Fotona's number of years in business, the safety features, the square pulse technology, and the support, were all some of the reasons we chose Fotona. We have not regretted this choice. We would not hesitate to recommend either of these lasers to someone starting a similar practice in hair removal, vein treatments, and skin care." - Mary M. Huff, MD

"I have been working with Fotona Nd:YAG lasers for 6 years now. I started with the Fidelis^{XP}; as my practice grew, to keep up with growing demand, I decided I needed a Dualis^{XP}, then a Dualis^{XP} Plus and finally a DualisVP. I have now performed over 1,800,000 shots without having any problems, and I can say that Fotona laser systems are easy to use and safe. Fotona was my first choice because of their long history in the laser business and their ability to continuously update their range to provide the system performance that I need to be able to give my patients what they expect. I am very satisfied with the Fidelis^{XP} as an introductory system. It allowed me to perform all popular aesthetic laser treatments and the final results were excellent. Once I understood the basic principles of laser/tissue interaction, it was very easy to perform all applications. I am now confident enough to let my nursing staff perform certain treatments under my supervision, allowing us to expand the practice even more. I'd recommend the Fidelis^{XP} to anyone who is looking for new challenges and is eager to expand their practice." - Jasna Blaha MD

"I have been running my laser dental clinic for over 10 years. In the practice we continuously strive to improve our service, knowledge and to offer our patients the latest in dental technologies. With a base of over 3.000 patients, even from neighboring countries, we feel we have achieved something unique. Laser dentistry has played an important role in our success. Lasers are especially effective in improving our patients' comfort levels during procedures, especially when treating sensitive patients. Fotona's laser systems have been instrumental to our success, through their efficiency, versatility and wide range of applications, while meeting the standards a successful and busy laser dentistry practice requires. We recommend the Fidelis Plus II to any colleagues who are seeking to expand their dental practice and embrace the advantages of laser dentistry." - Dr Med Dent, Želimir Božič MSc.