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With a population of 2.7 million, there are 60 laser companies… The secret of a semiconductor technology powerhouse

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[Monthly Central] Special Report | Numbo, a semiconductor producing country, is Europe's "laser school"… Semiconductor technology powerhouse goes to Lithuania

More than 60 laser companies in 2.7 million small countries compete… The key to the success of a leading country in ultra-short pulsed lasers is industry-academia cooperation and fostering future researchers in a free start-up atmosphere

Martynas Barkauskas, President of LightConversion. / Photo: Kim Tae-wook

When I arrived in Vilnius, the capital of Lithuania, 12 hours away from Incheon International Airport, the first thing I saw was a small airport with a panoramic view. It was a tranquil city where the windmills described in Cervantes' novel Don Quixote would

Quixote rode on horseback. The bus running along the river didn't make a single sound, unlike other city buses in Seoul.

Lithuania, a small country with a population of 2.7 million, has the world's most advanced technology. Laser companies are the protagonists. The biggest advantage of lasers, also known as light beams, is their "exquisite processing." Lithuania has a particularly large share of half of the global market in the market for picosecond lasers. Lasers are an indispensable technology for semiconductor manufacturing. In fact, South Korean companies also use ultra-short pulse lasers from Lithuania. Laser processing equipment required for semiconductor manufacturing is broadly divided into 'nanosecond pulse laser' and 'ultrashort pulsed laser' according to the pulse width. Microwave pulsed lasers include picoseconds and femtoseconds (thousandths of a trillionth of a second). The advantage of ultra-short pulsed lasers is that they can be processed with ultra-precision compared to nanosecond pulsed lasers.

Teltonika, one of Lithuania's leading companies, also uses its own laser technology. Teltonica, a leader in the Internet of Things (IoT) market, drew attention from the industry last year by announcing that it would develop semiconductor technology together with the Taiwan Institute of Industrial Technology (ITRI). Teltonica made headlines when it announced that it could obtain a license for the semiconductor manufacturing technology and devices developed by ITRI. At that time, the foreign press predicted that Lithuania would soon become a semiconductor producer rather than just providing laser technology.

Semiconductor mediation brings closer to the Taiwanese government

What does Lithuania's leading Internet of Things (IoT) company look like? As I entered the entrance to Teltonica's headquarters, about a 10-minute drive from the center of Vilnius, I saw a magnificent building. On the other side, I could see the exterior wall of a large building that was still under construction. Viačeslav Jaroševič, Teltonica's head of Asia, who escorted the reporters, explained, "We plan to invest 500 million euros (about 700 billion won) to build a semiconductor facility with a land area of 50,000 square meters." He continued, "The pace of expansion of business sites is not keeping up with demand," adding, "Teltonica's growth is steep thanks to the increase in demand for semiconductor lasers."

We asked Teltonica's Head of Asia about the status of cooperation between Teltonica and ITRI. He said, "The technical cooperation agreement signed with ITRI consists of three phases," adding, "Last year, we conducted the first stage, a feasibility study. feasibility studies for semiconductor design, manufacturing, assembly, testing, and power module production." He reaffirmed that Teltonica's ultimate goal is not only to provide laser technology, but also to produce semiconductors.

The recent close ties between the governments of Lithuania and Taiwan cannot be explained without mentioning the cooperation between Teltonica and ITRI. Currently, there is a Taiwanese representative in Vilnius, not a Taipei one. China strongly objected to

Currently, the Teltonica-ITRI contract is worth 14 million euros (about 20.5 billion won). Of this, 10 million euros will be paid by Taiwan's Ministry of Foreign Affairs and 4 million euros by Teltonica. The two sides made detailed plans for four projects, including semiconductor design, manufacturing, assembly and test, and power module manufacturing. This is why it is interpreted that Lithuania and Taiwan have in mind a semiconductor alliance similar to the future semiconductor alliance "Chip 4 (South Korea, the United States, Japan, and Taiwan)."

The University of Vilnius is a model of industry-academia cooperation

View of the Laser Research Center at the University of Vilnius. Prof. Vytautas Jukna (far left) and Prof. Dalia Kaškelytė (far right). Three of them are PhD students at the University of Vilnius. / Photo: Kim Tae-wook

Next, I visited Lithuania's two major laser mountain ranges, known as Light Conversion. Sitting across from us on the first floor of the company building, CEO Martynas Barkauskas introduced LightConversion as a company founded in 1994 at the Laser Research Center of Vilnius University. The company, which started 30 years ago in a university laboratory, is a global leader in the femtosecond laser market, along with another Lithuanian company, Ekspla. The 'PHAROS femtosecond laser' is the representative weapon of Light Conversion.

I walked out of the front door of the company and headed to the University of Vilnius. I was curious to know what the university's Laser Research Center, the cradle of the world's leading laser companies, would look like. The University of Vilnius is considered one of the most prestigious universities in Lithuania as well as in Central and Eastern Europe. In particular, the Laser Research Center of the University of Vilnius, established in 1982, is a 'laser school' that has produced a large number of laser technicians.

As we entered the main gate of Vilnius University, we were greeted by Professor Dalia Kaškelytė, Director of the Research Center. Unlike the rigid atmosphere that is usually associated with a laboratory, the free-spirited start-up atmosphere was impressive. The graduate students were sitting across from their advisors, drinking coffee and chatting. When a Ph.D. student told the reporter that he was from South Korea, he said, "It's nice to meet you," and wrote the reporter's name on a piece of glass with a laser.

Professor Vytautas Jukna, who was explaining the current situation of the university to a reporter, said, "The CEO of Light Conversion also developed his dream by researching lasers here," adding, "As such, the industry-academia cooperation at Vilnius

talent reshoring." He explained that Lithuanian talents studying abroad are on their way home. Earlier, Martinas Balkauskas, CEO of Light Conversion, is a representative example. He received a bachelor's degree from the University of Vilnius and a master's degree from the Netherlands. Later, he returned to the University of Vilnius to study for his doctorate in order to work in Lithuania's excellent industry-academia cooperation system and research institute.

When asked by a reporter, "What is the secret to 'reshoring' talent?", the CEO of Light Conversion, who accompanied him, pointed to the excellent facilities of Vilnius University. "The physics laboratory at the University of Vilnius is equipped with the best laser equipment in the world. That's why I'm back home." "When I was pursuing my Ph.D., I never thought I would become the CEO of Light Conversion," he said with a smile, "When I was a graduate student, the company was located across the street from Vilnius University, so it was convenient to travel to and from the school."

"Ideal for cooperation with Samsung Electronics and SK hynix"

Viačeslav Jaroševič, Head of Asia at Teltonica. / Photo: Kim Tae-wook

In Lithuania, there are many companies like Right Conversion, which started as startups and become one of the pillars of the Lithuanian economy. Although it is not known in the world, it is representative of the famous startup 'QS Lasers' in Lithuania. QS Lasers, which supplies picosecond and nanosecond laser technology, was established in 2018. The startup's technology has major applications in laser-induced plasma spectroscopy (LIBS), OLED processing, and medical applications. I found the headquarters of Q.S. Lasers, which is a 15-minute drive from the city center. Upon entering the headquarters building, we were greeted by Voldemaras Vanagas. The reporter's first question was, "Did you have any fears about starting a business?" "I've just joined the company," he said, "but most of my friends have dreamed of starting a startup since they were undergraduates, rather than jumping into the job market. Of course, you can fail, but I think it's important to try."

The last stop on the itinerary was the Lithuanian Laser Association (LLA). Gediminas Račiukaitis, president of the Laser Association, looked at the reporter and was happy to see him, saying, "We have a guest from Korea, a semiconductor powerhouse." "Lithuania is leading the world in ultra-fast pulsed lasers," he said, adding that Lithuania is "the perfect place to cooperate with South Korea's Samsung Electronics, LG Electronics, and SK Hynix." "In Lithuania, a country of 2.7 million people, there are more than 60 laser companies competing. Most of the entrepreneurs studied laser at Vilnius University," he said, citing industry-academia cooperation as the key to Lithuania's success.