

RAYLASE launches clean room production

Opto-mechanical deflection units manufactured in the clean room enhance stability and reduce costs in laser material processing

Wessling, June 2021 RAYLASE is again offering a unique value proposition the industry has been waiting for. The laser system provider from the so-called "Five Lakes" region near Munich has been producing ISO class 7 low-particle deflection units for laser beam control and modulation in "clean rooms" since the spring. This seemingly futuristic production environment offers many advantages: complex laser systems with multiple optics, sensors and axis systems protect against contamination and burn-in at high kilowatt laser output, while at the same time keeping spot size in the short wavelength range very small. In e-mobility and additive manufacturing clean room manufactured products offer greater process stability and lower maintenance and scrap costs - allowing for more sustainable production with less CO2 output.

Two market trends sparked the introduction of clean room processes at RAYLASE. Firstly, customer demand for high power lasers in the 1-8kW range which requires production to be as particle-free as possible. Partially invisible to the human eye, microscopic particles collect in the increasingly complex deflection units, which are essentially closed in. Particularly on scanner optics, even the tiniest particles can cause the greatest damage. They burn in, rendering the lenses unusable. Hassle, outages, and additional costs are inevitable! Secondly, there is increasing demand for laser systems in the short-wavelength range of 532 nm and smaller, as most often used in the surface treatment of metallic construction materials and micromachining applications. These requirements convinced RAYLASE to invest in the "clean room" -because the shorter the wavelength, the more easily the laser beam is scattered by particles. "Measuring beam quality before and after the deflection unit has shown us that this accumulation of small particles significantly deteriorates the process. As a result of this scattering, the beam or the minimum achievable focus becomes increasingly larger. This is the exact opposite of what the industry needs: the beam should have the smallest spot possible to generate as little heat as possible on the workpiece", says RAYLASE CTO Berthold Dambacher describing the fatal effect of the tiny troublemakers. In the short-wavelength range, particle-free optics are fundamental to the quality of the entire laser process.

A year and a half of planning was needed to implement all the necessary steps for the clean room project. "It is our goal not only to keep the air inside the clean room absolutely "pure", but also everything that gains access to it. This was a big challenge for our employees who work there because they had to change their entire behaviour accordingly. And so, once again, we had to completely rethink our whole process chain, from product development, purchasing, production, and warehousing to sales and distribution", emphasises the CTO, responsible for innovation at RAYLASE.

Assembly in the clean room: an exercise in awareness

Manufacturing in a clean room is not an easy task, it requires extra effort that reaches far beyond the technical concept. It is essentially a consciousness process that leads to great gains in knowledge. All the steps need to be internalised by employees and constantly improved to create a particle-free environment. The more complex the products, the more care must be taken during assembly to keep each component clean at each process step. The reason being that hidden particles cannot be eliminated retrospectively. And the greatest source of contamination? "We humans, as we are all unquestionably contaminated. Just as an example, each of us loses 40g of skin particles a day", says Dambacher, underlining the effect humans have as veritable particle "superspreaders".

This means the central focus lies on the employees themselves. They are the deciding factor as to whether a clean room remains clean over time. Of course, that includes the right clothing: "For example, we wear special socks, shirts and trousers, shoes, a hairnet plus cap or hood, beard cover if necessary, and then another gown on top. That way, everything is completely covered except for part of the face and neck", states Matczak-Johannsen, clean room representative at RAYLASE. Just putting on the cleanroom clothing is a workout! The reason is: the clothing must not touch the floor, nor must the employees touch the clothing with their hands from the outside, instead they must "slip in" to the inside. "We really had to practice that. Not everybody had the necessary flexibility at the start, so we had many "sporty" training sessions to practice the right behaviour", grins Matczak-Johannsen.

Technology in the clean room: only the best

To access the clean room, employees enter through a personnel airlock system. At 220 square metres, the clean rooms are already impressive simply due to their sheer size, not to mention their sophisticated technology: "All major systems in our cleanrooms are fully digitalized and can be operated from the office or from home", enthuses Berthold Dambacher. Overpressure is constantly maintained in the clean rooms and the air is filtered 60 times an hour. The rooms that must remain the cleanest have the highest overpressure of at least 25 Pascal, while the airlocks have a slightly lower overpressure, so that the air is continually extracted outward and does not draw particles into the clean room. In winter, the air is humidified and in summer dehumidified accordingly. This creates the most comfortable atmospheric environment possible and ensures ESD (electrostatic discharge) protection. The external blinds can be controlled via a weather station, which reduces direct solar radiation and provides the necessary cooling capacity for the system technology in summer. The clean room has maintenance access from all sides. "We use this to ensure the supply of media, since in a clean room all media such as cooling water, electricity, LAN and compressed air are provided only via the walls and ceilings. This leaves the floor area completely clear and accessible so that we can ensure 100% cleanliness", emphasises Berthold Dambacher. And, last but not least, measurement of airborne particles can be carried out "remotely". Additionally, two cameras monitor all activities in the clean room. And on the ground floor there is also an energy-efficient component cleaning system, as all the individual parts of the deflection units are, of course, also cleaned before assembly and only reach the clean room via a material airlock system.

Products from the clean room: unique market quality

"We offer laser manufacturers and machine builders products they can blindly trust in the future. Because our deflection units built under clean room conditions demonstrate unique quality and process stability", assures RAYLASE CEO, Dr. Philipp Schön.

Particle-free deflection units not only have a longer service life and require less maintenance, they also fulfil certain market requirements in highly automated production processes such as in electromobility, photovoltaics, the solar industry, additive manufacturing and fuel cell technology. "And that's why they are worth all the effort for us, both for our customers and for the challenges that new markets will bring", concludes CTO Berthold Dambacher positively.



Two RAYLASE employees assembling the deflection units

About RAYLASE

RAYLASE GmbH is a highly innovative, international laser company based in Wessling near Munich. Founded in 1999, the Bavarian company offers high-precision opto-mechanical components, control cards and software for the rapid deflection and modulation of laser beams for laser material processing in industrial manufacturing. With over 130 employees worldwide, the RAYLASE Group stands for innovative technology of the highest quality. Since 2007, the company has a subsidiary and its own production facility in Shenzhen, China, as well as several international representatives in the US, Italy, Japan, Korea, and Taiwan.

The laser deflection units comprise opto-mechanical scanners and digital control electronics with an intuitive software interface. These form the core of industrial laser systems and enable more flexible, economical, and precise processing of a wide variety of materials such as metal, plastic, paper, textiles and many more. Opto-mechanical deflection units also offer excellent image processing for better calibration, simple automation, and exact monitoring of a range of laser processes.

Customers come from the electronic, automotive, photovoltaic, textile and packaging industries. RAYLASE's current focus markets are electromobility, for example, in battery production, solar wafer production for photovoltaics in the solar industry and additive manufacturing. RAYLASE supports its customers primarily in four core applications: laser cutting, laser welding, laser surface processing and selective laser sintering or welding for additive manufacturing. In each of these areas, the company drives digital innovations by combining these with established technologies.

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