

Replacement of CO2 laser welding systems by fiber laser technology

1. Project context

NEOTISS France, a subsidiary of the NEOTISS group and located in Venarey-Les-Laumes since 1976, specializes in thin welded tubes for the energy sectors, particularly nuclear power, which will account for 90% of its revenue in 2023 and 2024.

NEOTISS France is part of Nuclear Valley, a competitiveness cluster for the French nuclear industry, present in the Bourgogne Franche-Comté and Auvergne-Rhône-Alpes regions. In addition to its regional presence, NEOTISS France also has national representation through its membership in the French Nuclear Energy Industry Association (GIFEN) and the French Nuclear Energy Society (SFEN). It benefits from a strategic position in a context of nuclear revival in France (France 2030 program, 6 EPR2 by 2050, for a total investment estimated at 67.4 billion euros (Cour des Comptes, 2024)). Faced with the increase in orders and industrial constraints, it has launched a project to modernize its site to remain competitive, increase its productivity and capacity, reduce its carbon footprint, preserve local employment and support the national nuclear ecosystem.

The rapid increase in orders, driven by both nuclear power and diversification into new sectors, is creating pressure on certain industrial equipment. Bottlenecks are emerging, particularly in specialized manufacturing lines (welding, finning, non-destructive testing, heat treatment, etc.), highlighting the need to modernize production tools and invest in new capacity.

Furthermore, in a context of tightening environmental regulations, the company must combine industrial performance with reducing its carbon footprint, in line with the industrial decarbonization objectives supported by French and European public policies.

To address these issues, NEOTISS has begun replacing its obsolete CO₂ lasers with more reliable and efficient fiber lasers, significantly reducing breakdowns while lowering the equipment's energy consumption.

The project will achieve the following objectives:

- Support French clients such as EDF in developing innovative solutions.
- Offer engineering firms in Europe and abroad (GE, Siemens, Eiffage, Balcke Dürr, etc.) a local tubular solution to produce the equipment required for nuclear activities and enable efficient facility maintenance.
- Secure a strategic production site employing 100 people while creating additional jobs and maintaining skills to ensure the continuity of nuclear-related operations.
- Strengthen technical expertise and capacity for innovation in the nuclear field in the region.
- Ensure opportunities for the future French Nuclear University.
- Reduce the activity's energy consumption and carbon footprint.

2. Choice of fiber laser technology

2.1. Problematic

Laser welding is used on two strategic and busy production lines. Neotiss France's CO₂ lasers are over 20 years old and are therefore prone to obsolescence due to breakdowns and difficulties finding replacement parts. This investment helps reduce multiple breakdowns at this point, which lead to a decrease in customer reference and market losses. In addition, the high maintenance and operating costs of the CO₂ laser will be reduced with the use of a fiber laser.

Problematics:

- Obsolete lasers
 - Multiple breakdowns, i.e. loss of market
 - High maintenance costs
- High energy consumption of CO₂ equipment
 - Low energy efficiency
 - High industrial gas consumption
- Strategic and busy lines
- Specific and demanding product quality
- Maintaining employment and key skills
- Openness to diversification

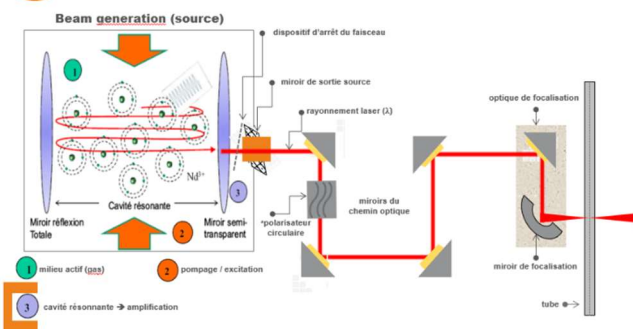


2.2. Fiber laser technology

The CO₂ laser is a type of gas laser that uses a mixture of gases, primarily CO₂, nitrogen, and helium, to produce very powerful infrared radiation. At NEOTISS France, it is used in the welding process of thin stainless steel tubes. Its use results in gas consumption, which is completely eliminated by replacing it with a fiber laser.

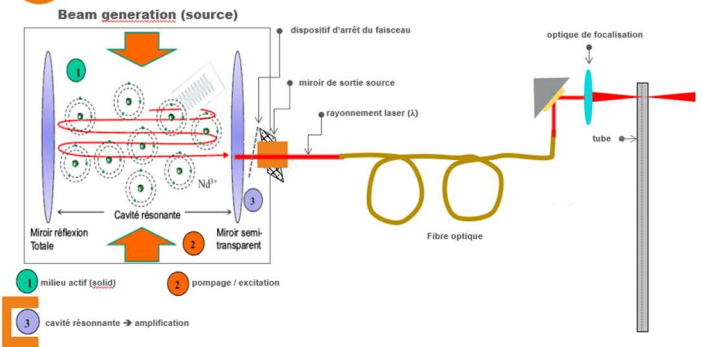
To ensure the reliability of the installations and the long-term performance of the equipment, NEOTISS France has incorporated robust and proven technological choices into its project. Replacing the CO₂ laser with a fiber laser significantly reduces the risk of breakdowns thanks to a more stable, less energy-intensive technology that requires less maintenance. This new equipment is subject to a specific training plan for operators to ensure optimal operation in compliance with good industrial practices.

2.1 PRINCIPLE OF CO₂ LASER SOURCE



CO2

2.1 PRINCIPLE OF FIBER LASER SOURCE



Fibré

Laser	CO ₂ Laser	Fiber laser
Wavelength	10 600 nm	1070 nm – 1090 nm
Spot profile		
Efficiency	< 10 %	≈ 40 %

3. Project implementation and benefits

3.1. Project progress

The first fiber laser has been operational in production since August 2024. The installation was carried out according to the following schedule:



The second fiber laser will replace the CO₂ laser, which employs 18 people (6 people over 3 x 8 hours). If the laser breaks down, it shuts down the entire production line. All staff cannot be reassigned, and this requires taking measures such as partial unemployment, incentives for taking leave, etc. Finally, the use of a more recent laser including more modern technologies will allow the production and maintenance teams to improve their skills.

3.2. Environmental considerations

Environmental impact

Greenhouse gases reduction (better efficiency)

- Energy consumption = **6T eqCO₂/year** ^{1,2}
 - 110 000 kWh avoided/year
- Gas consumption = **1T eqCO₂/year** ^{3,4}
 - 2000 L/year helium avoided
 - 400 L/year nitrogen avoided

Low carbon energy production

- Supply of equipment for nuclear power

Optimization of resource consumption

- Reduces the rates of non-compliant tubes (saving raw materials, consumables, and process energy)

1: <https://fr.statista.com/infographie/33063/intensite-carbone-production-electricite-par-pays-en-europe/> (1 kWh = 56 g eqCO₂)

2: <https://eagle-group.eu/en/fiber-vs-co2-laser>

3: <https://pubs.aip.org/aip/ltp/article/49/8/967/2905263/Carbon-footprint-of-helium-recovery-systems>

4: <https://www.messer.ch/fr/helium-liquide#:~:text=En%20d%27autres%20termes%3A%201,748.5%20litres%20d%27h%C3%A9lium%20gazeux!>

3.3. Production benefits

Despite positive feedback, this point will not be disclosed