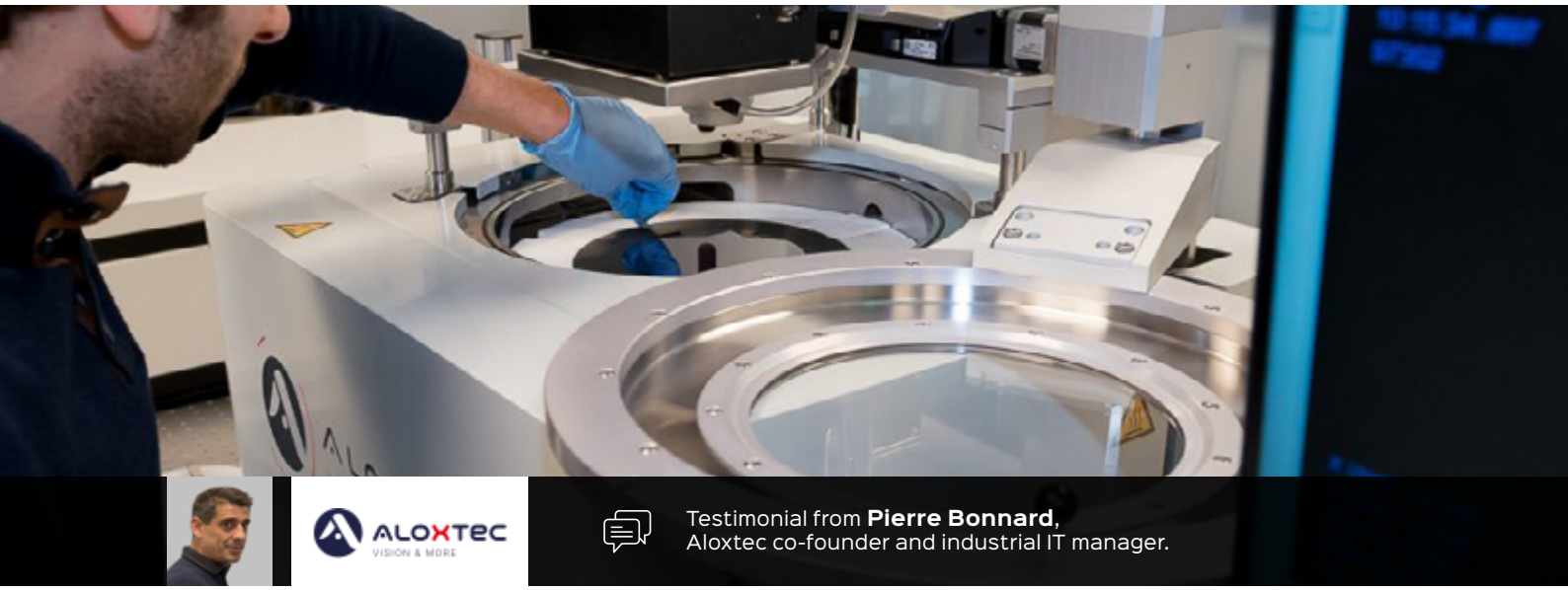
BUSINESS CASE

Aloxtec

• SEMICONDUCTORS • SUPERVISION • PROCESS • VCSEL



Testimonial from **Pierre Bonnard**,
Aloxtec co-founder and industrial IT manager.

“Supervision software for an oxidation furnace controlled using Advanced Manufacturing technology with in-situ metrology”

Controlling **a thermal process** with in-situ imaging

Using a **proven software framework**

A **complete supervision system** that operators can **adapt**

The company: Aloxtec

Aloxtec is a subsidiary of French specialist industrial furnace manufacturer AET Technologies. It designs **semiconductor oxidation furnaces** for the manufacturing of VCSELs (vertical-cavity surface-emitting lasers), which are built into LIDAR systems for use in 3D sensing. Aloxtec holds **a market share of 60-70%** in its sector.

To meet growing demand and capitalize on **its technological edge**, Aloxtec called on the software expertise and resources of Agileo Automation. Its objective was threefold: improve supervision and **control over the oxidation process**, automate furnace loading, and simplify integration into an industrial production line.

In this testimonial **Pierre Bonnard**, Aloxtec co-founder and industrial IT manager, shares his experience on this joint project.

Supervising and controlling the oxidation process

When demand for VCSEL production began to intensify in 2018, the Aloxtec teams sought to improve performance and equip their oxidation furnace with **dedicated supervision software**. *"The existing supervision system, based on a conventional SCADA solution, was not sufficiently scalable,"* industrial IT manager Pierre Bonnard explains.

This was a major challenge: the oxidation of wafers - each of which carries 100,000 VCSELs - cannot be programmed with fixed parameters. It is controlled using **in-situ measurement based on image analysis**. Pierre Bonnard sums up the process: *"You start oxidation, watch what happens on the substrate using spectral image scanning microscopy, and stop when the required diameter is reached."* Each VCSEL measures 30 µm. The aim is to grow one of the component layers until a final oxide layer diameter of a few microns is reached. The target accuracy is less than 0.2µm. Making matters even more complicated, the **optical measurement wavelength** varies and must be adjusted during each production run.

As it searched for integrator partners for this project, **Aloxtec got back in touch with Agileo Automation**, which had worked previously with its parent company AET. *"We decided to embark on this adventure with them because their company is on a human scale, just like ours, they understand our business, and **their A²ECF framework is a fabulous tool**"*, Pierre Bonnard explains.

Combining two machines into one

Agileo's **A²ECF** Semi framework is a set of libraries and low-level software layers designed to **control industrial equipment** in the semiconductors field. Agileo Automation used it to combine oxidation process control with imaging on Aloxtec's machines.

During 2020, Aloxtec's furnaces were hence equipped with a complete supervision and control solution. Drawing on the principle of Advanced Manufacturing, the process is controlled by in-situ metrology through a feedback loop. The solution also manages data storage and interactions hand-in-hand with the operator, who remains free to adapt the process while it is underway.

*"We are the only manufacturer to use in-situ monitoring that stops when the required diameter is reached. **Agileo has combined** all the strengths of our oxidation furnaces **in a single software application**, with a user-friendly, interface ready for industrial integration. And now we have much better control over our processes"*, Pierre Bonnard adds.

Agility and digital twins

At a broader level, Agileo Automation is assisting Aloxtec with an "agile" industrial integration plan for its furnace. Two further milestones have been reached since 2020: **advanced automation**, with the addition of a robot capable of loading 25 wafers into the furnace, and industrial connectivity with the **factory's MES system** via the SECS/GEM protocol. *"Agileo is proactive. We work with its teams as if they were internal departments. For MES integration, they draw up the specifications directly with our customers,"* the manager explains.

Last but not least, Agileo Automation has **simulation capabilities** in the form of digital twins, which it develops for all its projects. This is a big advantage when travel is limited during a pandemic, equipment cannot always be on hand for testing, or it is already **deployed in Asia**. *"In three years, Agileo has only been to visit us physically three times! Our furnace process involves more than 100 inputs/outputs, such as PLCs, robots, cameras and a microscope. Everything can be simulated. Agileo develops in-house, and **everything it delivers works!**"* Pierre Bonnard concludes.

Benefits

- **Better control** over the wafer oxidation process
- Optimized, automated equipment enabling **industrial integration**
- Agile, flexible development using **sophisticated simulation tools**

About Agileo Automation

A long-standing specialist in the semiconductors sector, Agileo Automation enables connectivity between the operating parts and IT systems of production plants. Its Industry 4.0 **A²ECF Semi** framework coordinates between the products to be manufactured, the work orders from the MES and the operating parts of the machines.

Agileo Automation works with OEMs supplying production machinery for **industry sectors including semiconductors, electronics and photovoltaics**.