

ST MICROELECTRONICS

PROJECT VISION

It is a leading global high-tech company developing semiconductors for a smarter, greener and more sustainable future. It is one of the global leaders in the field of microelectronics with production sites in various locations such as France, USA, Singapore, Italy and China and has an annual turnover of \$17.29 billion with a growth of 7.2% in 2023. These figures clearly reflect the size of our client.

ST Microelectronics Catania is a special project because once completed it will become the first global SiC (Silicon Carbide) plant. This is a breakthrough technology, as the production of semiconductors based on this component will be a step forward compared to traditional Si (Silicon). This campus receives a major grant from the European Union, with a total investment estimated at €5.4 billion.

The advantages of SiC vs. Si are the improvement in parameters such as: the critical break field providing a higher efficiency (+800%), noticeable reduction in product dimensions, energy band gap (+300%) with a benefit in component cooling and finally, a substantial increase in thermal conductivity (+310%).

To achieve these significant improvements, process technologies such as epitaxy are used. From one side of a crystal of a semiconductor material, a uniform, thin layer with the same crystal structure as the crystal is grown. With this technique, the level of impurities can be controlled very precisely. It is heated to near melting point and brought into contact with the base material to recrystallise with the appropriate structure.

The process equipment selected for this method is the so-called ProBus.

The most recurrent applications of this technology are the automotive industry, hybrid vehicles, electric vehicles or sectors such as electronics, computers...

For all the above reasons, this project places Valtria in a strong position among cleanroom engineering and construction companies in the field of microelectronics.

PROJECT PURPOSE

The cleanroom project has a surface area of 3,000 m² and a room height of 3.8 m. The temperature and humidity requirements are 21°C and <55%, but the critical point of the project is the room classification, being ISO 6 in 75% of the rooms, reaching ISO 4 in the remaining 25% of the rooms, for which a final filtration U-16, ULPA-16, has been necessary.

This required a total outside air volume of 272,000 m³/h taking into account the process extractions and a large air recirculation of 2,171,198 m³/h thanks to the Fan Filter Unit (FFU) technology.

PROJECT PLANNING AND ROLES

This project was secured by our subsidiary Valtria Swiss AG through Thomas Krauss and Fidel Schupfer. The first contact with the client was made in the year 2021 and a preliminary detailed engineering phase was carried out by our Swiss delegation, supported by our BIM colleagues in Madrid, Andrea Rubio and Elena González.

Subsequently, the commercial phase took place with the help of our commercial manager Dureid Qazzazie, winning the contract for Valtria in the last quarter of 2022.

Mention should be made of the work and support in the first construction phase at the beginning of 2023 by Elena González and the almost 3 months relocated Argentinean colleague Lucas Gómez; the main people responsible for the execution of the project:

- Thomas Krauss: Project Manager & Validation-Qualification. Main client contact.
- Pirmin Eggenreich: Senior Site Manager, Responsible for Health and Safety, validation-qualification. Main on-site contact with the client and subcontractors.
- Andrea Rubio: BIM Project Coordination Technician, assistance with Site Manager tasks, cleanroom architecture specialist, validation and qualification.
- Enrique Luján: On-site Engineering and Studies Technician, assistance in Project Manager tasks, purchasing, validation and qualification.
- Patrick Landis: Automation Expert from our Swiss branch. Integrated management and programming of FFUs and DnC cabinets.

*Mention must be made of the punctual collaboration of the logistics department located in Barcelona and the site assistance technicians of the Basque Country delegation.

INNOVATIVE TECHNOLOGIES

- **MAHUs:** A special feature of the project is the installation of two 120,000 m³/h Make-Up Air handling units, measuring 20 x 3 x 5.9 m (length x width x height) divided into 22 sections, which posed a major logistical and final implementation challenge. Further special features of the individual air conditioners are the cooling and heating capacities of 1512 and 784 kW respectively, with a required humidification of 613 l/h.
- **CCW:** In order to maintain the room conditions and cover the thermal loads of the process equipment, 133 water coils have been installed in the air returns located in the perimeter of the rooms. The air is collected through a raised access floor that rises to a plenum above the rooms, cooled by the coils and recirculated by the FFUs. To feed these 133 batteries, 7 water stations were necessary, with a total water flow of 272 m³/h.
- **FFU:** In order to maintain pressure and room class (ISO 6 and ISO 4), the installation of 1,135 FFUs has been required for an air recirculation of 2,171,198 m³/h and a homogeneous velocity in all of them. This required the implementation and

- programming of each of the FFUs through various automation groups controlled by DnC cabinets.
The final filtration stage in each FFU is U-16.
- **Validation tests:** For the qualification of the room, several tests have been necessary, among them: 100% integrity of FFU filters, electrical resistance of access floor and walls; air velocity, laminarity, lighting and sound tests in room by sectorised areas; and finally room/particle classification test according to ISO 14644-3:2020. All tests passed satisfactorily.

PROJECT CHALLENGES

Every member of the team who has spent a long stay in Catania can write a book full of anecdotes.

One of the most critical challenges of the project has been the change of the client's directive mid-way through the project, which meant a radical change in the project design, with most of the purchases being made in line with the original design. It went from an initial contract of €12.7m to a final figure of €18.1m, all resulting from all the modifications, which speaks of the great adaptability and resilience of the team deployed in Catania.

Another of the challenges to be highlighted has been the high demands of the client in terms of deadlines, which, thanks to the daily efforts of the team, have been met with satisfactory results. Finally, it is also worth mentioning the adaptation to Italian subcontractors and their way of working, overcoming adverse difficulties.

ENLACES Y GALERÍA DEL PROYECTO

Historia de ST-SiC

https://www.linkedin.com/posts/stmicroelectronics_stmicroelectronics-siliconcarbide-activity-7204459767375781888-PRGx/?utm_source=share&utm_medium=member_android

Colaboración ST-HP

https://www.linkedin.com/posts/stmicroelectronics_ourtechnologystartswithyou-stmicroelectronics-activity-7204029318715305984-O-De/?utm_source=share&utm_medium=member_android

Inauguración Campus ST Catania:

<https://www.linkedin.com/feed/update/urn:li:activity:7206996924145532930/>

Colaboración ST-Mclaren: Vehículo eléctrico.

<https://www.linkedin.com/feed/update/urn:li:activity:7194241200650895360/>

Resultados anuales ST

<https://www.linkedin.com/feed/update/urn:li:activity:7156231773704667138/>











