



## Air Liquide is advancing global semiconductor production with advanced UHP gas solutions

Best practice category

Materials, chemicals,  
and equipment

Stakeholder group

Large enterprises

Value chain position

Materials and chemicals

## General Information

Air Liquide (AL) is a French multinational company which is the second largest supplier of industrial gases by revenues (following Linde). It supplies industrial gases and services across industries including medical, chemical, and electronic manufacturers. Headquartered in Paris, it also has major sites in Tokyo, Houston, Newark, Delaware, Frankfurt, Shanghai and Dubai. The company's R&D primarily targets the creation of industrial gases, alongside gases used in semiconductors, healthcare, foods, and chemicals.

Ultra-high purity (UHP) gases like nitrogen, helium, hydrogen and argon are instrumental in the semiconductor industry and are used across the production process to ensure impurity control, etching, deposition and annealing, among others. Air Liquide is the #1 co-leading global provider of UHP specialty gases to the microelectronics industry, enabling sustainable innovation in Europe and beyond.

## Activities and best practices

Air Liquide supplies the semiconductor industry with both UHP carrier gases and precursor molecules (specialty and advanced electronics materials), in addition to providing the equipment and services necessary for the safe and optimum handling and distribution of the products. Across the production line, AL's products contribute to the optimisation of semiconductors. A few of the company's cutting-edge products and services in the chip sector are highlighted below.

During chemical mechanical planarisation (CMP), wafers are smoothed and flattened through etching techniques that allow for achieving desired planarity of the wafer. Chemical etching – done using slurries – is a preferred method for removing excess material as it avoids introducing surface defects or flattening the surface, unlike mechanical etching. Air Liquide's slurries blending distribution systems like the FabChem series are modular and highly sophisticated slurry dispense platforms in the form of cabinets. This equipment offers high performance with user-friendly HMI and easy maintenance, along with a series of safety and emergency features.

Air Liquide offers a line of gas-handling equipment that ensures a continuous and high-reliability performance of fabs. The ALIM 2 gas cabinet is a fluid delivery system for specialty and inert gases that allows operators to safely manage the distribution of the most toxic, flammable, corrosive, pyrophoric, and oxidising gases. AL offers a dedicated team of experts that conduct the setup, training, and maintenance of the machine.

With FabStream gas delivery cabinets, manufacturers achieve a fully automatic distribution of gas that operates across gas applications, from low rates to over 3,000 slpm. Finally, its gas mixer series offers on-site gas generation and analysis equipment, for doping and forming gas mixtures alike. This highly automated and efficient solution allows for better reproducibility, stability and safety than cylinder-based supply.

## Challenges addressed with this practice

Air Liquide addresses several challenges in the chip manufacturing process. Through its optimised and automated equipment, like the gas mixer series, AL ensures that the UHP gases are handled meticulously and according to high safety standards on site. By offering its support services for the setup, training, and maintenance of the equipment, AL addresses the need for specialised knowledge and support in handling and maintaining sophisticated gas delivery systems.

Moreover, ensuring the smoothness and planarity of wafers without surface defects remains challenging in semiconductor manufacturing. Air Liquide's sophisticated slurries blending distribution series offers precise chemical etching solutions. Overall, these practices by Air Liquide contribute to addressing challenges related to precision, safety, efficiency, and expertise within the European semiconductor manufacturing chain, ensuring smoother operations and fostering innovation within the industry.