



Semiconductor industry

Heat transfer solutions for the semiconductor manufacturing industry

In the microelectronics industry a semiconductor fabrication plant (commonly called a fab) is a factory where devices such as integrated circuits are manufactured. A business that operates a semiconductor fab for the purpose of fabricating the designs of other companies, such as fabless semiconductor companies, is known as a foundry. If a foundry does not also produce its own designs, it is known as a pure-play semiconductor foundry.

Fabs require many expensive devices to function. The central part of a fab is

the cleanroom, an area where the environment is controlled to eliminate all dust – even a single speck can ruin a microcircuit, which has features much smaller than dust. The cleanroom must also be dampened against vibration and kept within narrow bands of temperature and humidity.

Controlling temperature and humidity is critical for minimizing static electricity.

The following applications are all manufactured in a semicon fab:

Microchips: Manufacturing of chips with integrated circuits.

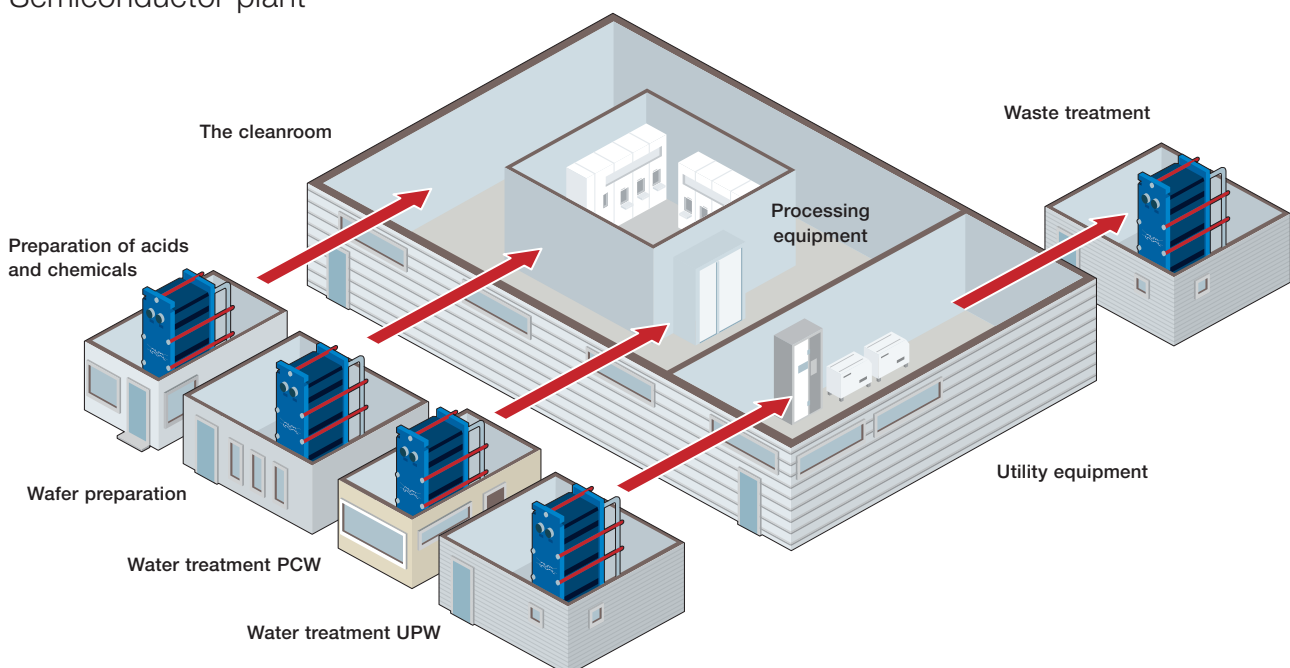
LED lighting: Manufacturing of LED lamps for lighting purposes.

PV industry: Manufacturing of solar cells, based on Si wafer technology or thin film technology.

Flat panel displays: Manufacturing of flat panels for everything from mobile phones and other handheld devices, up to large size TV monitors.

Electronics: Manufacturing of printed circuit boards (PCB), computer and electronic components.

Semiconductor plant





The principal layout and functions of the fab are similar in all the industries.

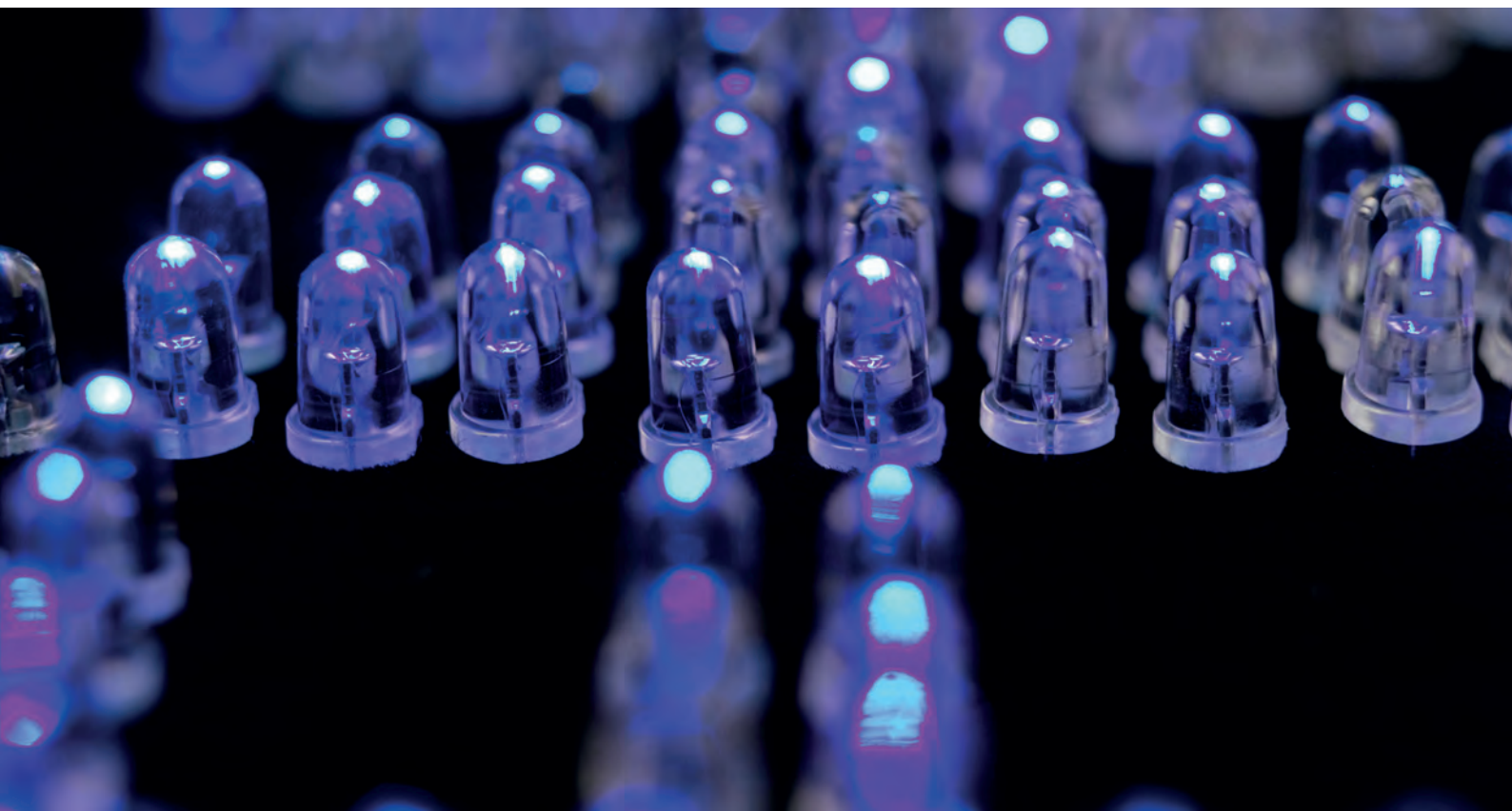
The cleanroom: This is the central part of the plant where the actual manufacturing takes place. The substrate (wafer for microchip, solar cell, flat screen, or LED) goes through several processing steps in various processing machinery, “tools”. The manufacturing of microchips is the most complex with numerous processing steps, while a solar cell

would be the least complex, requiring only a few processing steps.

Utility equipment: This includes vacuum pumps, maintaining the vacuum that is often required in the processing tools, scrubbers that clean the exhaust from the vacuum pumps, and chillers that provide cooling for the processing tools and utility equipment.

Alfa Laval heat exchangers come in a variety of materials, sizes and

capacities. Unique materials combined with Alfa Laval’s expertise in materials selection ensure highest purity operations, reduction in contamination of ultrapure water, resistance to aggressive media, and long materials lifetime. Whatever the duty in your semiconductor plant, Alfa Laval has precisely the right heat exchanger to match your needs.





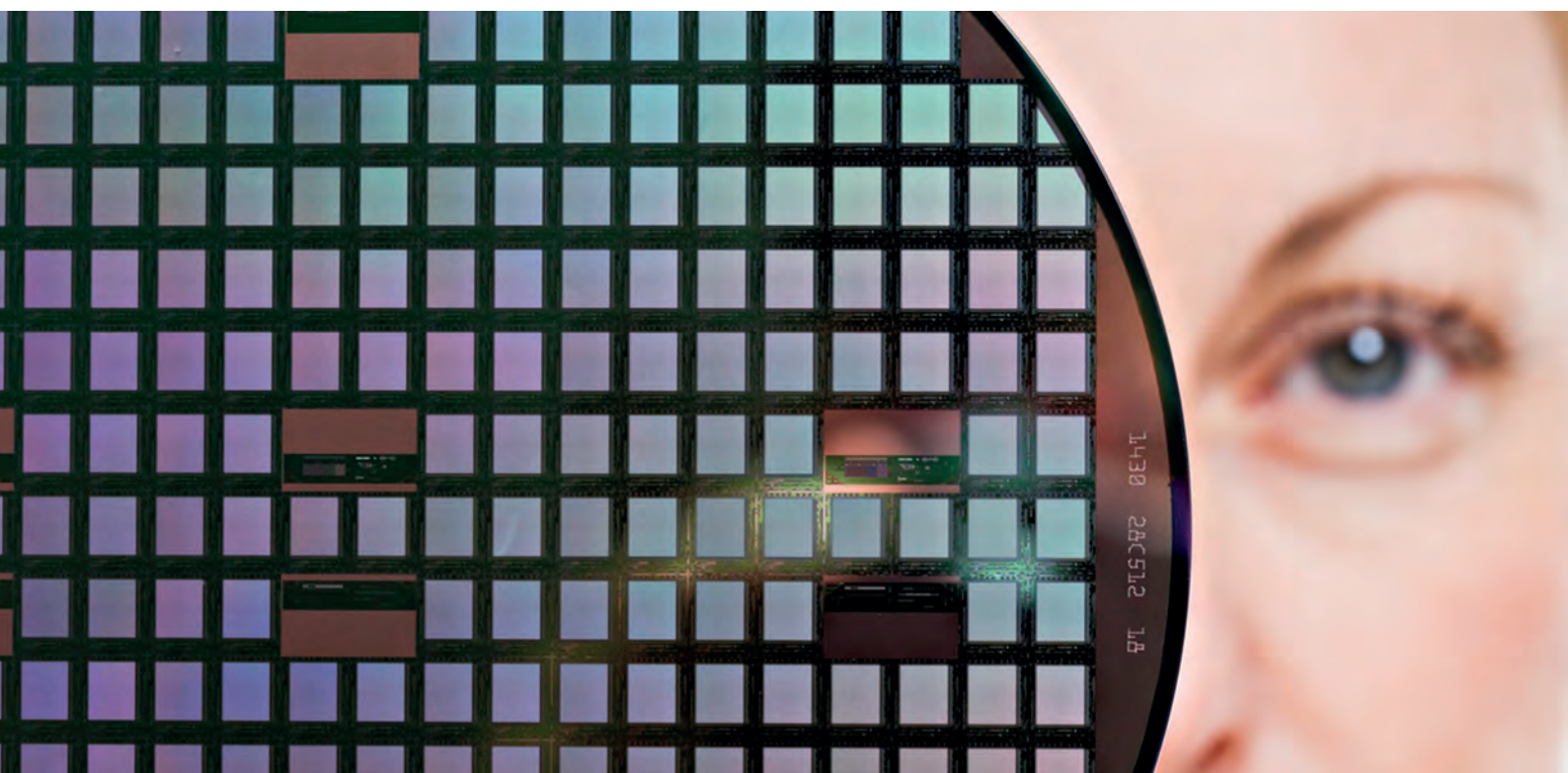
Wafer preparation

In electronics, a wafer is a thin slice of semiconductor material, such as a silicon crystal, used in the fabrication of integrated circuits and other micro-devices.

The wafer serves as the substrate for microelectronic devices built in and over the wafer and undergoes many microfabrication process steps, such as doping or ion implantation, etching, deposition of various materials, and photolithographic patterning. Finally the individual microcircuits are separated (dicing) and packaged.

When cutting Si ingots into wafers using wire saws it is necessary to cool

the coolant/cutting slurry. Suitable solutions from Alfa Laval's heat exchanger range are gasketed plate heat exchangers, AlfaNova all-stainless steel heat exchangers, and brazed heat exchangers. All are compact, reliable and offer high heat transfer efficiency.



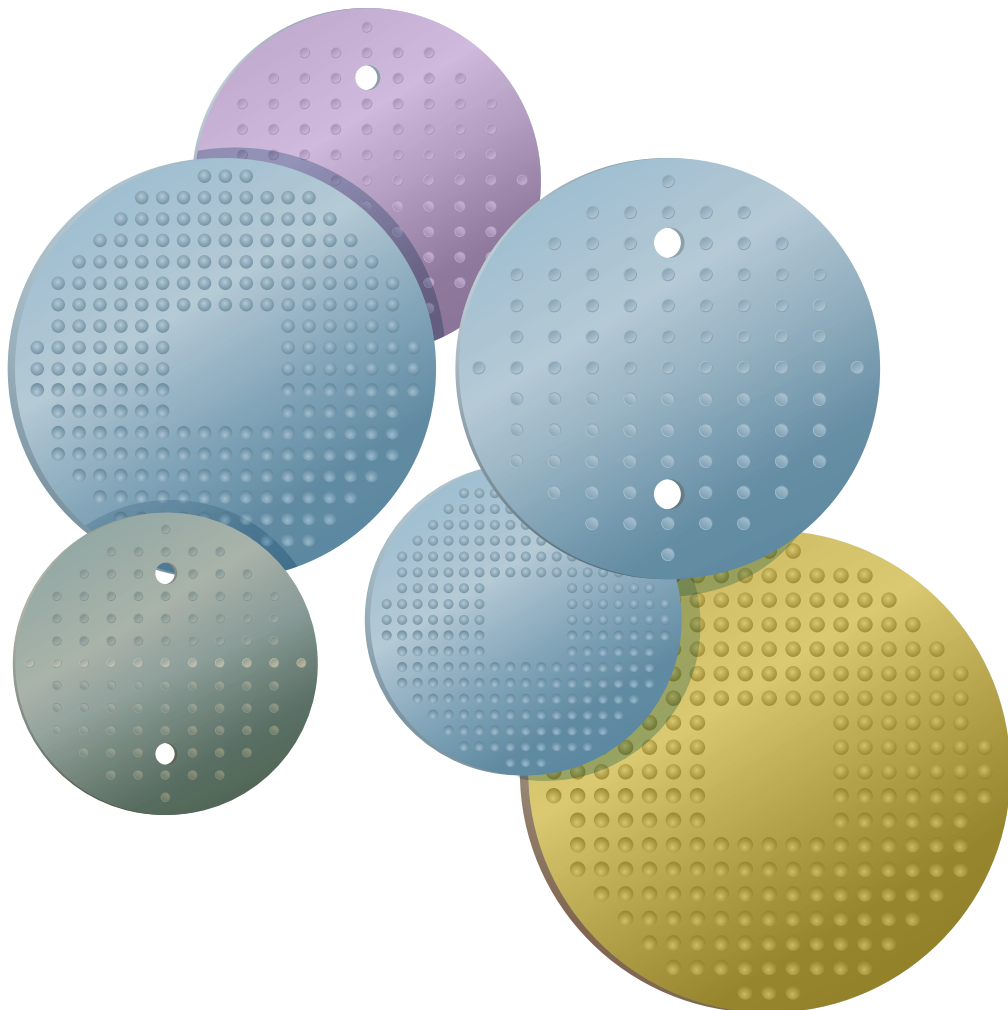


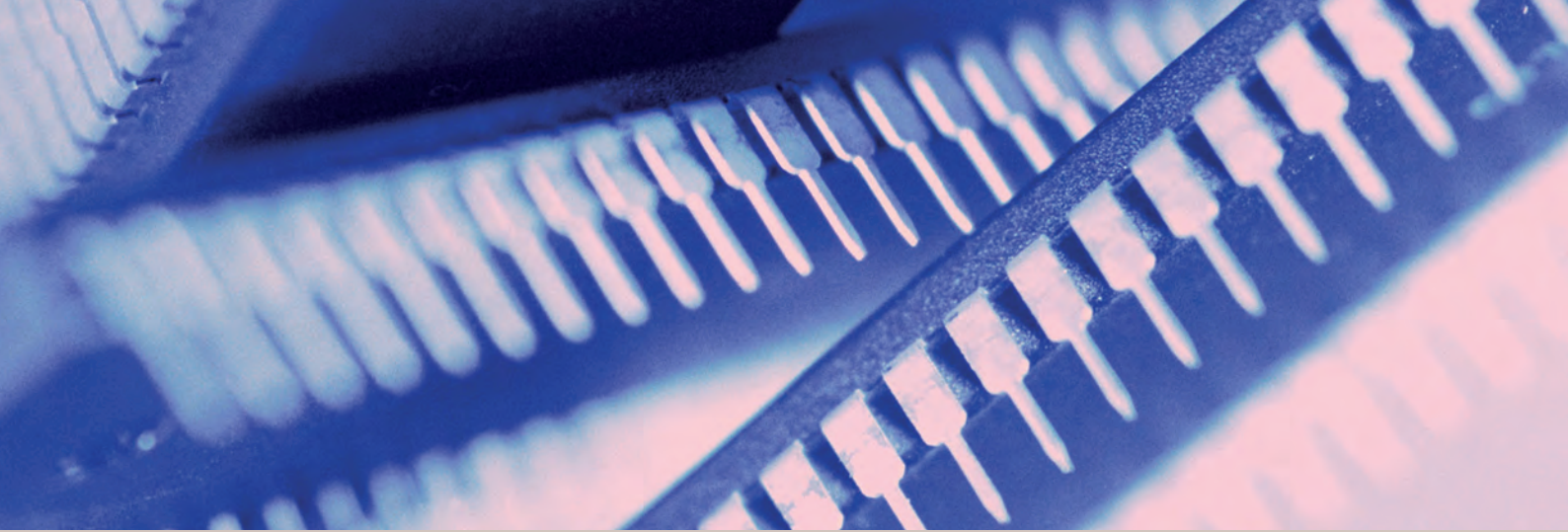
Preparation of acids and chemicals

Industrial etching is the subtractive manufacturing process of using baths of temperature-regulated etching chemicals to remove material to create an object with the desired shape. It is mostly used on metals, although other materials are increasingly important. It was developed from armour-decorating and printing etching processes

developed during the Renaissance as alternatives to engraving on metal. The process essentially involves bathing the cutting areas in a corrosive chemical known as an etchant, which reacts with the material in the area to be cut and causes the solid material to be dissolved; inert substances known as

maskants are used to etch specific areas of the material. Today one of the most common applications for etching is in the semiconductor fabs when preparing acids and chemicals before and inside the cleanroom.





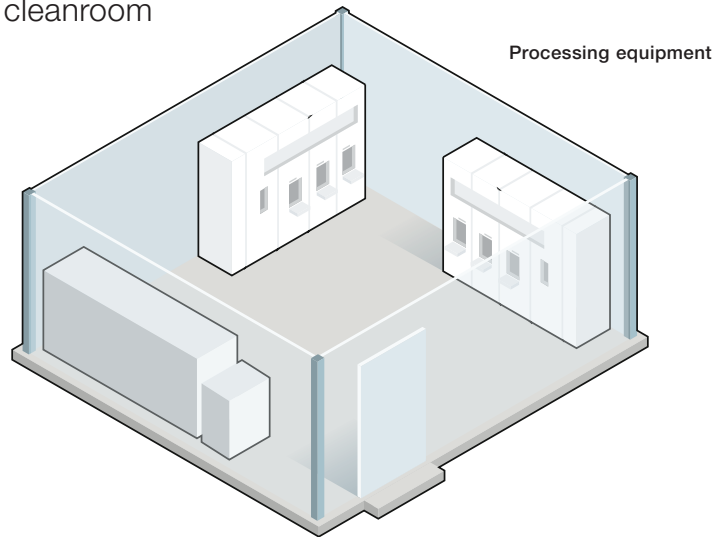
Water treatment

Water treatment of ultrapure water (UPW) and process cooling water (PCW) is necessary in order to control the temperature of all the various manufacturing steps. General manufacturing in the semiconductor industry consumes large amounts of water, which need to be at the correct temperature. In Alfa Laval's broad portfolio of plate heat exchangers you will find models that cater to the specific needs of any duty.

The illustrations on the right show the various "water consumers".

Ultrapure water (UPW) is used extensively in the fabrication steps of making computer microchips. Ultrapure water is needed to ensure the cleanliness of critical process steps, where regular PCW cannot be used. Using Alfa Laval's all welded plate exchangers with titanium plates the cleanliness of the ultrapure water can still be guaranteed.

The cleanroom



Utility equipment

