Advanced trace contaminant detection (ppb to ppt) with enhanced accuracy and reliability

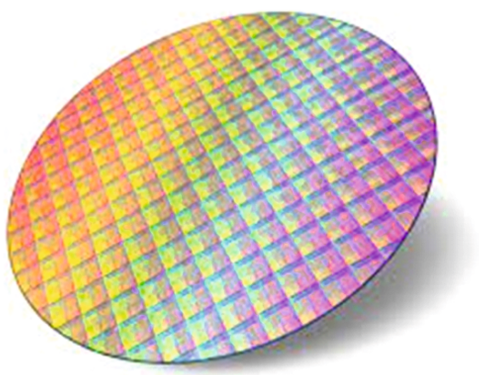
Water quality measurement in semiconductor wafer foundries

On a semiconductor production line, the wafer cleaning stage is crucial. The quality of the final product, such as microprocessors and memory chips is completely dependent on the effectiveness of this process. Contaminants on the component surface can cause issues like response time failures in memory chips and junction leaks that lead to functional errors.
Wafers undergo multiple cleaning cycles during manufacturing to remove contaminants and prepare surfaces for subsequent processes. Ultra-Pure Water (UPW) is extensively used throughout the wafer manufacturing process, both in chemical bath mixtures and in the rinsing steps that follow. These wet cleaning operations can make up to one-third of the total processing steps, depending on the product type.

A typical wafer fabrication facility in semiconductor plants processing 40,000 wafers per month uses between 7 and 11 million litres of water per day, with UPW accounting for 70% of this consumption.

Semiconductor plants are strictly prohibited from discharging large quantities of fluoride and ammonia directly into the environment. Wastewater treatment is essential so it can be safely returned to the environment, as per regulatory norms.

Silicon wafer cleaning



Acid Cleaning

(HCL + H2O2)
Remove organics and metals on the wafer surface

↓

Alkali Cleaning

(NH4OH + H2O2)
Eliminates particles adsorbed on water

↓

Dilute HF cleaning

Removes the native oxide film on the wafer

↓

UPW Cleaning

Eliminates the residual chemicals

↓

Drying

Evaporates ultrapure water to avoid formation of traces on surface

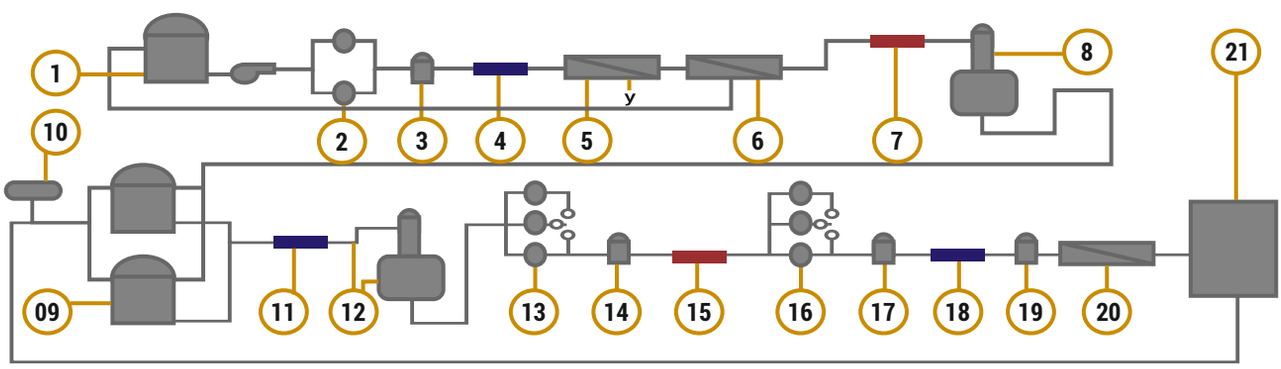
The Forbes Marshall Solution

In semiconductor and photovoltaic manufacturing facilities, ultra-pure water must be continuously monitored for various analytical parameters. The industry demands state-of-the-art setups and top-notch monitoring systems to ensure high-quality wafer production.

In collaboration with SWAN Switzerland, Forbes Marshall India provides comprehensive monitoring solutions for over 50 parameters, including Silica, TOC (organic contamination), pH, resistivity, conductivity, ORP, fluoride, and chloride.

Continuous online monitoring of these parameters is crucial for the water used in wafer fabrication, especially for repeated washing processes, to achieve contamination-free layers and prevent defects and reliability issues in the final product.

Ultra Pure Water (UPW) and Reclaim Water System Layout



Applications and Parameters Measured

1. Source Water: **TOC**
2. Multimedia Filter: **Turbidity**
3. Pre filter (ACF): **Free chlorine**
4. 254 nm UV Disinfection
5. Reverse Osmosis First Stage RO: **pH, conductivity**
6. Reverse Osmosis Second Stage RO: **pH, conductivity**
7. 185 nm UV TOC Reduction: **TOC**
8. Degasifier: **DO2**
9. Storage Tank
10. Ozonator: **Dissolved O3**
11. nm UV Ozone Destruction: **Dissolved O3**
12. Membrane Degasifier: **DO2**
13. Mixed-Bed (Primary): **Silica, conductivity/resistivity**
14. 1.0 Um Filter
15. 185 nm UV Reduction
16. Mixed-Bed Polishing: **Silica, Resistivity and TOC**
17. 45 Um Filter
18. 254 nm UV Disinfection
19. 1.0 Um Filter
20. Ultra filtration: **Resistivity**
21. Points Of Use: **Silica (LL), Resistivity and TOC**

Recyle & Reclaim water – **Fluoride, hardness, Chloride, pH, Conductivity, Chlorine**

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