



Advantages of Using Hot DI

- Improved removal of chemical residue and particles
- Reduced DI water consumption up to 70% and usage and discharge of hazardous chemicals
- Reduces bacterial contamination and improves process yields
- Uniform process temperature control
- Reduce thermal shock
- Increased Production throughput

Hot DI water is much better than cold DI Water!

Cleaning processes that use sulfuric acid (i.e., pre-diffusion clean and resist stripping) leave residual chemical particles that can affect yields and throughput. Particulates can be produced in as little as 48 hours via the migration and nucleation of the H_2SO_4 molecules. Additional process steps that have been taken to address this problem include:

- Chemical cleaning (i.e., hydrofluoric (HF) rinses and RCA cleans).
- Multiple DI water rinses (cold water).
- Mechanical agitation of the wafers in a cold DI bath

These additional steps are undesirable because:

- HF and RCA clean processes generate additional hazardous chemical waste.
- Multiple cold DI water rinses waste costly DI water
- Mechanically agitating the wafers adds energy to cold wafer rinses using robotics that requires high maintenance

USING HOT DI WATER TO RINSE WAFERS CAN REDUCE THE NUMBER OF PROCESS STEPS NEEDED OR ELIMINATE THEM ENTIRELY YET STILL RESULTS IN CLEANER WAFERS!

When heated, ultrapure DI water is much more aggressive and therefore effective than cold DI water in rinsing applications. Pre-diffusion cleaning chemicals and photoresist from wafers are more soluble in Hot DI water and therefore more easily removed. Wafer yields are increased, as the process environment is not contaminated with metal ions or other impurities.

REDUCTION IN DI WATER CONSUMPTION OF UP TO 70%, REDUCE USAGE OF HAZARDOUS CHEMICALS

The molecules in heated DI water possess a higher level of energy than cold water molecules. When transferred to the water surface, the high translational energy of the water molecules quickly dissolves and dilute process chemicals off of the wafers. This dramatically reduces the amount of water needed to effectively rinse the wafers. (e.g., a hot DI rinse at post SO₄ locations reduces the total average spin rinse dryer process time needed after the standard rinse cycles from 9 minutes to 30 secs.) In addition, using heated DI water rinsing avoids the need to use hazardous chemicals.

REDUCE BACTERIAL CONTAMINATION AND IMPROVE PROCESS YIELDS

Wet process stations provide an excellent environment for the growth of bacteria. Usual causes are low or intermittent flow of DI water, airborne bacteria and cross contamination from filters. By heating your DI water to 90° C it is possible to sanitize internal plumbing without resorting to the disassembly of the station components or by using potentially hazardous chemicals. Furthermore, downtime is eliminated, as are associated labor costs that would be required for sanitizing via the use of chemicals. By reducing bacteria contamination, production yields can be improved.

ENSURE THAT DI WATER TEMPERATURE IS CONSTANT

DI water temperatures can vary by as much as 10° C depending on location and the season. This undesired variability in water and process temperatures can be avoided by heating the water to a constant temperature. Temperature and humidity in clean are maintained at great expense. Eliminating temperature variations in DI water is as important since DI water will come in direct contact with the wafers throughout numerous processing steps.

REDUCE THERMAL SHOCK

Many strip, etch and develop processes are operated at elevated temperatures. RCA cleaning and silicon nitride etch processes are commonly heated to 45, 140 and 185° C respectively. Transferring wafers from such hot acid environment to a cold 23° C DI water rinse could result in thermal shock and damage the wafers. Heating your DI water can eliminate potential risks associated with thermal shock.

INCREASE PRODUCTION THROUGHPUT

Heating DI water will result in increased throughput for virtually any process. For example, by utilizing hot DI water cleaning times in wafer boat and box cleaning equipment can be reduced by as much as 60%. Rinse times for wafers that have been processed in barrel reactors can be reduced by as much as 80%. By heating the DI water, it effectively removed fluoropolymer contamination from the wafer surfaces.