Oxide Growth Rate Up to 18% Faster

Wafer-to-wafer and across-wafer uniformity improved with the RASIRC Steamer

Recent tests show that the **RASIRC Steamer** delivered up to 7% improvement in oxide growth rate compared to a pyrolytic torch. Operating costs were also significantly reduced by eliminating carrier gases and oxygen. When compared to bubblers or direct liquid water injection, the **RASIRC Steamer** delivered a 18% improvement in oxide growth rate.

With the RASIRC Steamer, users are able to fully saturate the furnace tube with 100% pure water vapor at flow rates not normally available from alternative techniques. This leads directly to increased growth rate and uniformity. Results reached maximum theoretical growth rate.

Throughput

- Increases throughput by delivering high quantities of pure steam
- 100% UHP Steam eliminates oxygen and hydrogen, so there is no interference with steam diffusion into the silicon oxide and theoretical maximum growth rate is achieved
- Eliminates thermal shadow introduced when using a torch, so the entire furnace tube can be used for thermal oxidation
- Runs process recipes with multiple flow set points High and Low

Cost Reduction

- Eliminates hydrogen/oxygen costs
- Delivers bottom line savings via increased throughput and process uniformity
- Eliminates chillers and spares for torches

Contamination Control

- Equals or exceeds the purity of pyrolytic steam by enabling the use of water vapor from purified steam
- Eliminates the torch and the particles it generates
- Prevents particles from passing through with the steam by employing a nonporous membrane
- Eliminates metal components and catalysts, ensuring metallic free steam

Repeatability

- Improves front to back uniformity by eliminating thermal shadow from the torch
- Ensures furnace saturation by delivering high quantities of steam (greater than possible with a torch)
- Maintains 100% partial pressure of water vapor resulting in better chamber uniformity
- Purifies steam instead of DI water, yielding ultra high purity and consistency

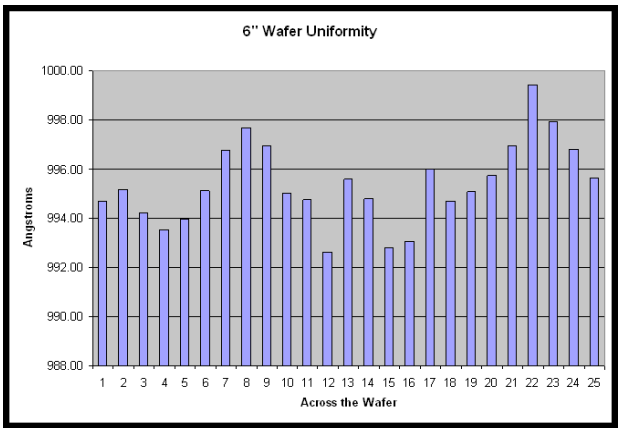

Figure 1: Tests of wafer uniformity on 1000 Angstrom film show less than 1% variation across 25 points when the RASIRC Steamer is the source of ultra pure steam.

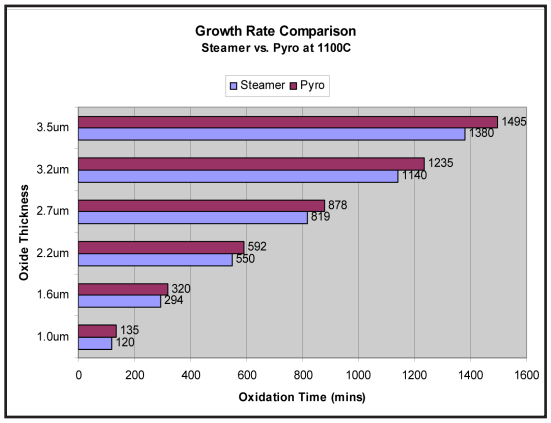

Figure 2: Faster oxide growth with RASIRC Steamer versus torch due to higher partial pressure of steam species.

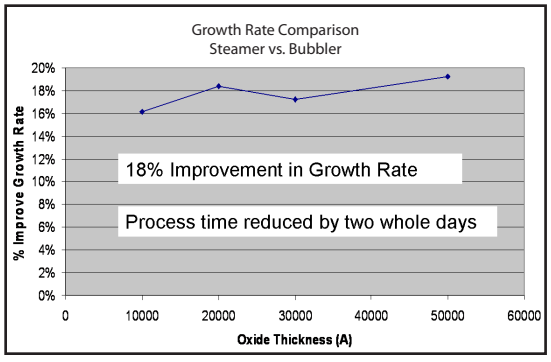

Figure 3: Tests comparing RASIRC Steamer performance versus a bubbler show continuously faster growth rate exceeding 18%.

Safety

- Eliminates explosive hydrogen and oxygen
- Eliminates high temperature external torch
- Operates at a safe temperature, significantly lower than torches

About RASIRC

RASIRC develops products that purify and deliver ultra pure liquids and gases, with a primary focus on water vapor. While steam is used extensively in the semiconductor industry, RASIRC technology is the first to purify live steam to generate ultra high purity (UHP) steam. Starting with de-ionized water and using specialized membranes to reduce total metals to less than 10 parts per trillion, this technology reduces cost, improves yield, and dramatically improves safety. The UHP steam generated by RASIRC products is of critical importance for many applications in the semiconductor, photovoltaic, pharmaceutical, medical, biological, fuel cell, and power industries.

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