

Uniformity Improves to +/- 5% Across the Wafer

Uniformity across the furnace tube improved 98% with RASIRC Steamer

Recent customer test results show:

- +/- 5% uniformity across wafer
- 98% uniformity improvement across the furnace
- 76% batch-to-batch uniformity improvement

Users of the **RASIRC Steamer** demonstrated improved uniformity by being able to fully saturate the furnace tube with 100% pure water vapor at a constant vapor pressure.

Throughput

Recent test results delivered up to 20% improvement in oxide growth rate for thin films and over 5% for very thick oxides when replacing bubblers or direct liquid water injection with the **RASIRC Steamer** Steam Generation System. Operating costs were reduced significantly by eliminating carrier gases and hydrogen/ oxygen for pyrolytic generation.

- 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

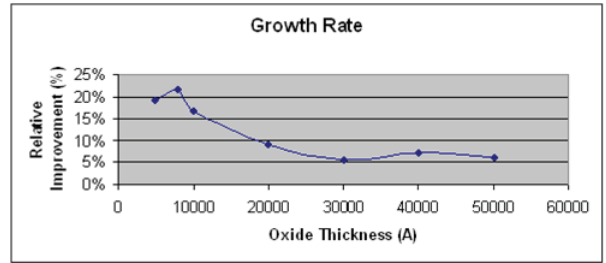


Figure 3: RASIRC Steamer users saved \$8,000 on a 30-day oxidaton process.

Safety

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

Water Vapor (slm)	Oxygen (slm)	Furnace Location			Uniformity %
		Inlet	Middle	Rear	
8.0	0.4	5275	5335	5275	10
8.8	0.0	5550	5595	5425	3
10.0	0.0	5630	5600	5550	1.4
11.2	0.0	5630	5620	5620	0.2

Figure 4: RASIRC Steamer improved uniformity from greater than 10% to less than 0.2%.

About the RASIRC Steamer

The **RASIRC Steamer** uses a non-porous hydrophilic membrane that selectively allows water vapor to pass. Selectivity is significant with up to 1,000,000x relative to nitrogen molecules. In the vapor phase, the membrane only allows water. All other molecules are greatly restricted, so contaminants in water such as dissolved gases, ions, TOCs, particles, viruses, bacteria, pyrons, and metals can be removed in the steam phase.



www.rasirc.com

(858) 259-1220 • info@rasirc.com
11760 Sorrento Valley Road, Suite E
San Diego, CA 92121

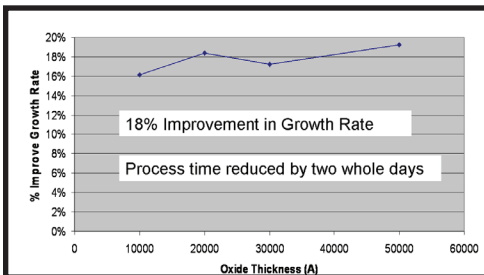


Figure 1: Tests comparing bubbler performance versus the RASIRC Steamer show continuously faster growth rate exceeding 16%.

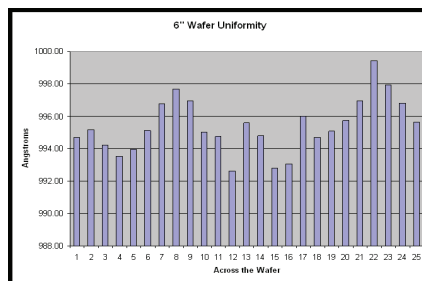


Figure 2: Tests of wafer uniformity on 1000 Angstrom film show less than 1% variation across 25 points when the RASIRC Steamer is the source of ultrapure steam.