

Vanox™ System for Ultrapure Water Point-of-Use Purification

Ensure consistent ultrapure water, enhance optic life,
and decrease cost of ownership



Siemens Water Technologies

Vision, Mission and Values

SIEMENS

Our Vision:

We take care of the world's water.



Our Mission:

We enable our customers to improve the quality and reduce the cost of their water and wastewater.

Our Values:

We operate safely and in environmental compliance.

We take great care of our customers.

We achieve profitable, market-leading growth.

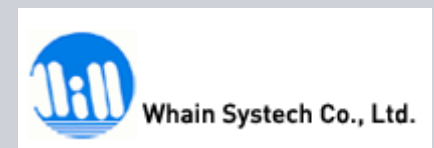
We treat our employees and business partners with respect.

Water Technologies

Sample list of Microelectronics Customers



Panasonic



What is Important to You?

Greater Wafer Production

- Eliminate particles, metals, particle , organic and temperature variations in process water providing consistent statistical control
- Maximum control of ultrapure water quality at the tool results in lower defect rates and higher wafer yield

Improved Litho Optic Life

- Reduction of water contaminants to extend the life of the litho tool lens thus reduced tool Cost of Ownership.

Increased Production Uptime / Lower Maintenance

- Consistent UPW quality to reduce maintenance requirements at the tool and support systems and increase tool run-time

Enhances Water Safety

- Use technologies to lower Environmental / Health & Safety (EH&S) risk
- The use of ozone and the proper destruction of residuals can represent a significant health risk to operators. Vanox does not require ozone technology.

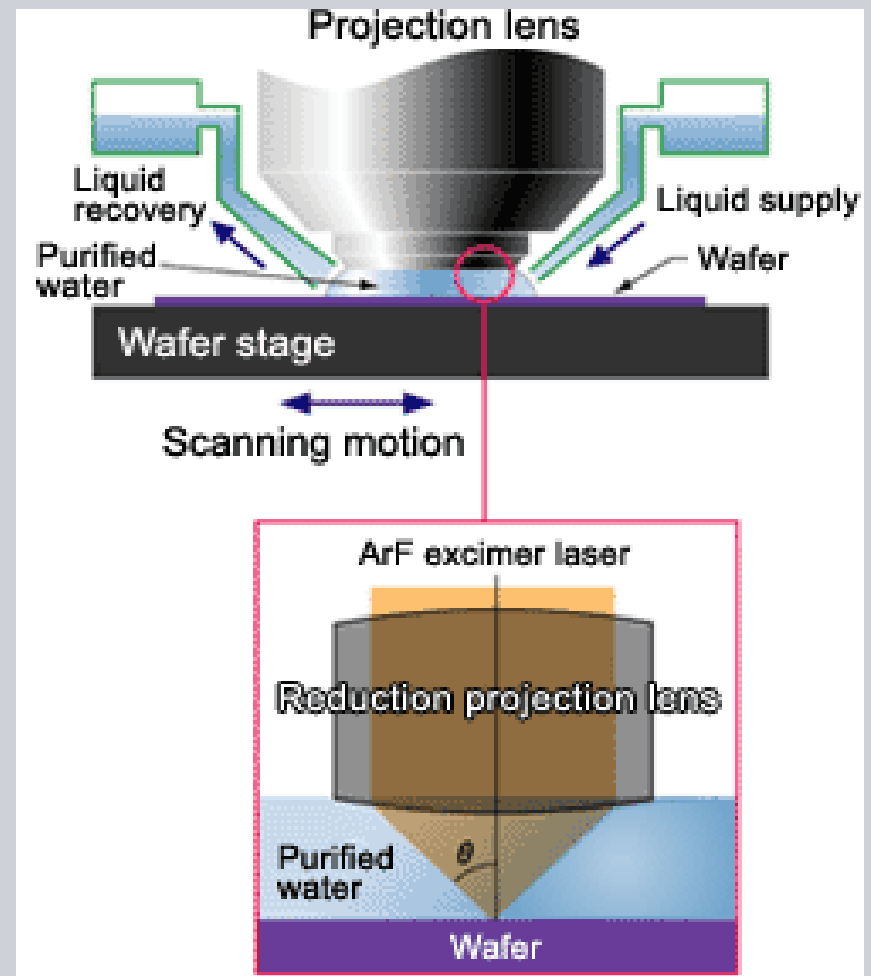
Meets or exceeds all ITRS requirements for < 28 nm

- Typical UPW systems cannot achieve the higher water quality needed for next generation architecture.

Purified Water Quality affects immersion lithography

The following water quality parameters affect the effectiveness of IM technology:

- TOC reduction
- Particles
- Trace organics
- Temperature
- Pressure
- Metals



TOC Reduction – The Main Problem

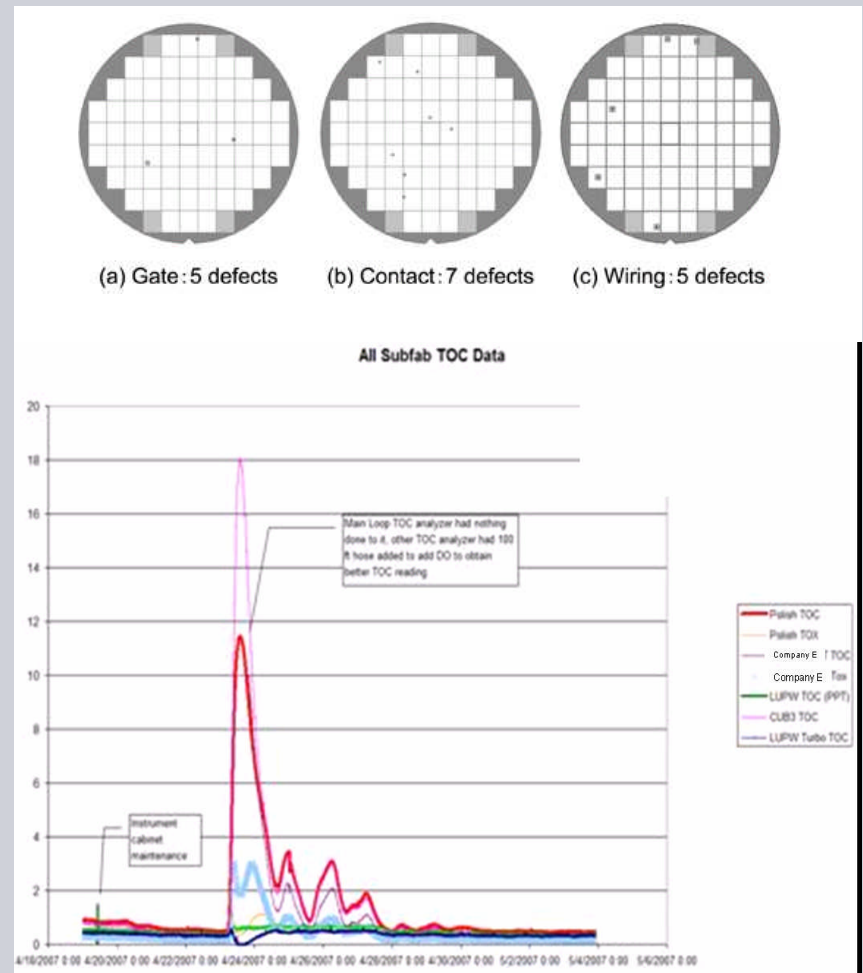
Problem: TOC and trace organics in Purified Water such as:

- Urea
- Isopropyl alcohol (IPA)
- Trihalomethanes (THMs)

Why: TOC interferes with the IM tool laser

The IM laser operates at a particular wavelength during the wafer exposure step. Certain types of TOC destruct at the same wavelength. With TOC in the water, there is potential laser interference causing defects. This would be due to pH changes from TOC destruct and potential microbubble creation.

Vanox Solution – Using a patented combination of chemical injection and UV, Vanox creates a more effective oxidation radical to break down TOC when compared to other AOP processes to maintain a stable low TOC condition. The increased effectiveness enables Vanox to handle TOC spikes due to feedwater changes like seasonal conditions or UPW excursions.

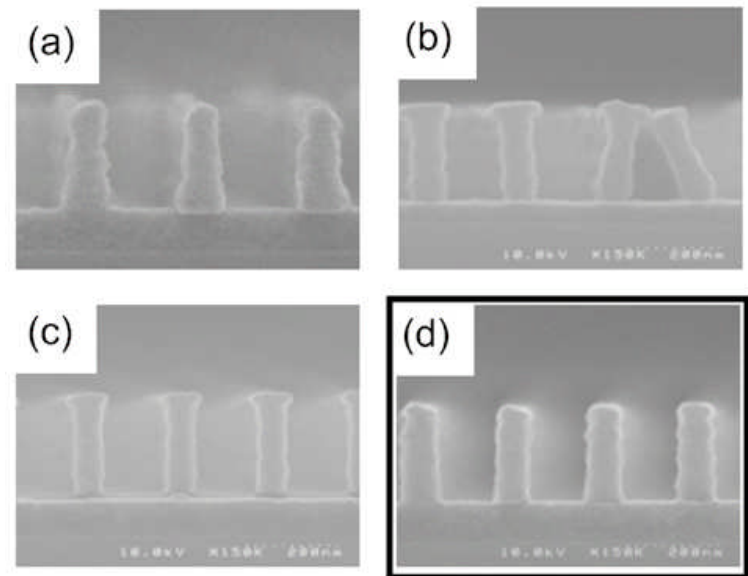


Temperature

Problem: Temperature Control

Why: Fluctuations in purified water temperature impact the optic refraction index. Changes in refraction decrease the accuracy of the IM tool laser.

Vanox Solution: To minimize optic refractive changes, stable water temperature control is a requirement. Vanox uses DI water heat exchangers with finely tuned controls to maintain stable product temperatures

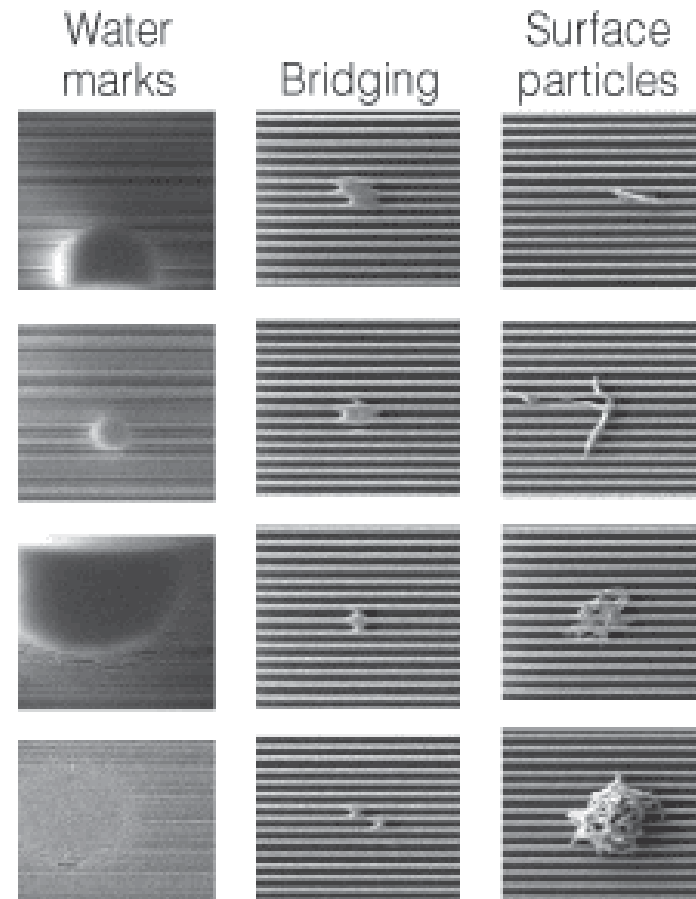


Particles and Metals

Problem: Metals and Particle Control

Why: Particles in purified water temperature erode the optic, interfere with the IM laser, and deposit on the substrate. Metal deposition can create bridging. These issues increase the defect rate, optic life and tool cost of ownership.

Vanox Solution: To control particles, Vanox uses 0.005um ultrafiltration to achieve maximum particle control.

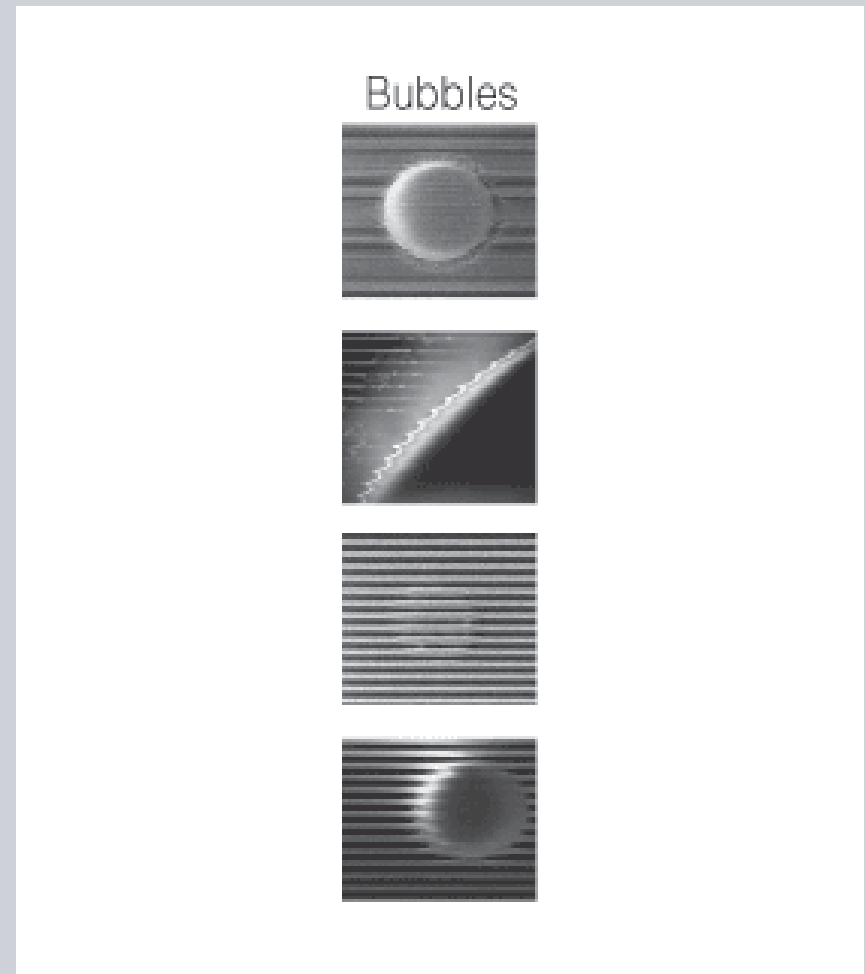


Pressure and Dissolved Gases

Problem: Pressure and Dissolved Gases

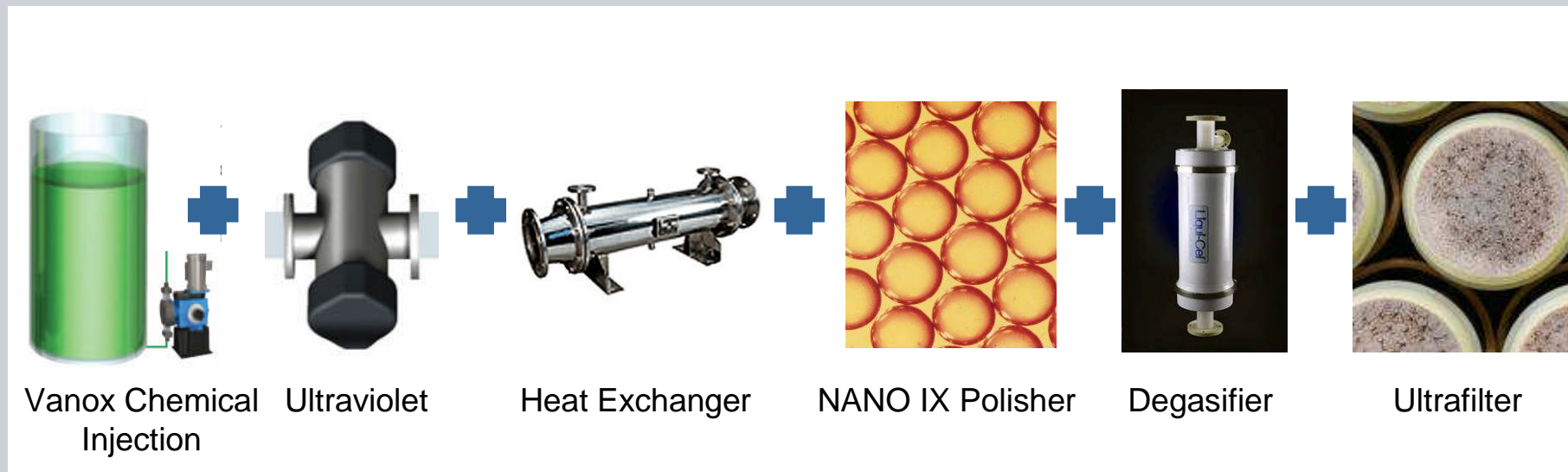
Why: Bubble generation interferes with the IM laser. Micro bubbles can appear when there is too much dissolved gas in the immersion water or when photo-resist outgases during exposure.

Vanox Solution: Vanox uses membrane degasifiers and pressure control systems to maintain low dissolved gases and constant pressure to minimize bubble generation.



What is Vanox™?

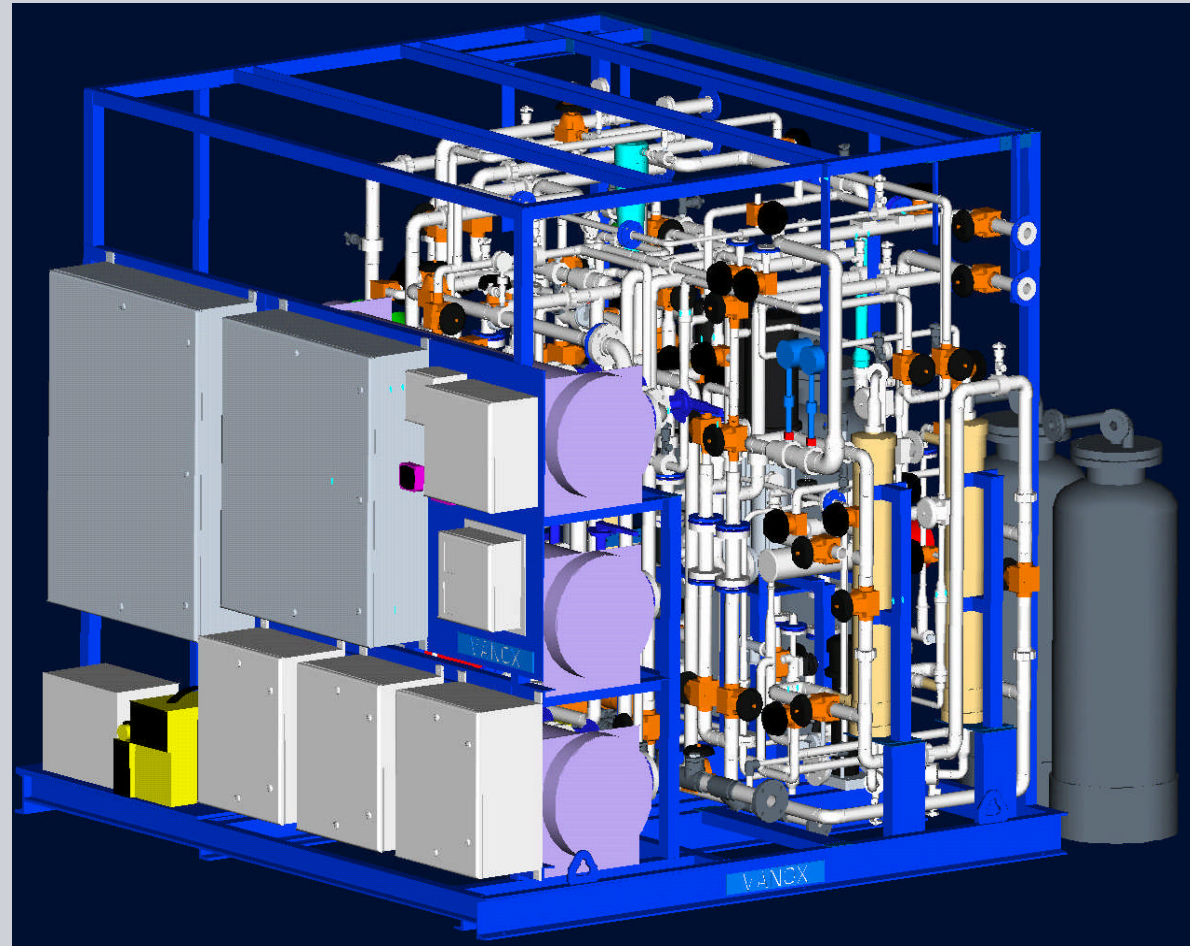
The Siemens Vanox™ POU system is truly the next generation in ultrapure water purification. Our proprietary advanced oxidation process is a proven design to consistently reduce TOC to 0.5 parts per billion (ppb) and manage the typical treatment of seasonal TOC variations in feed water. It includes a combination of technologies (shown below) that have been optimized for the latest wafer manufacturing water purification requirements.



What is Vanox™?

These technologies have been packaged into a compact system and is proven to effectively improves / stabilizes existing UPW quality.

Vanox supports the next generation tool needs (ITRS) without having to upgrade the complete UPW system.

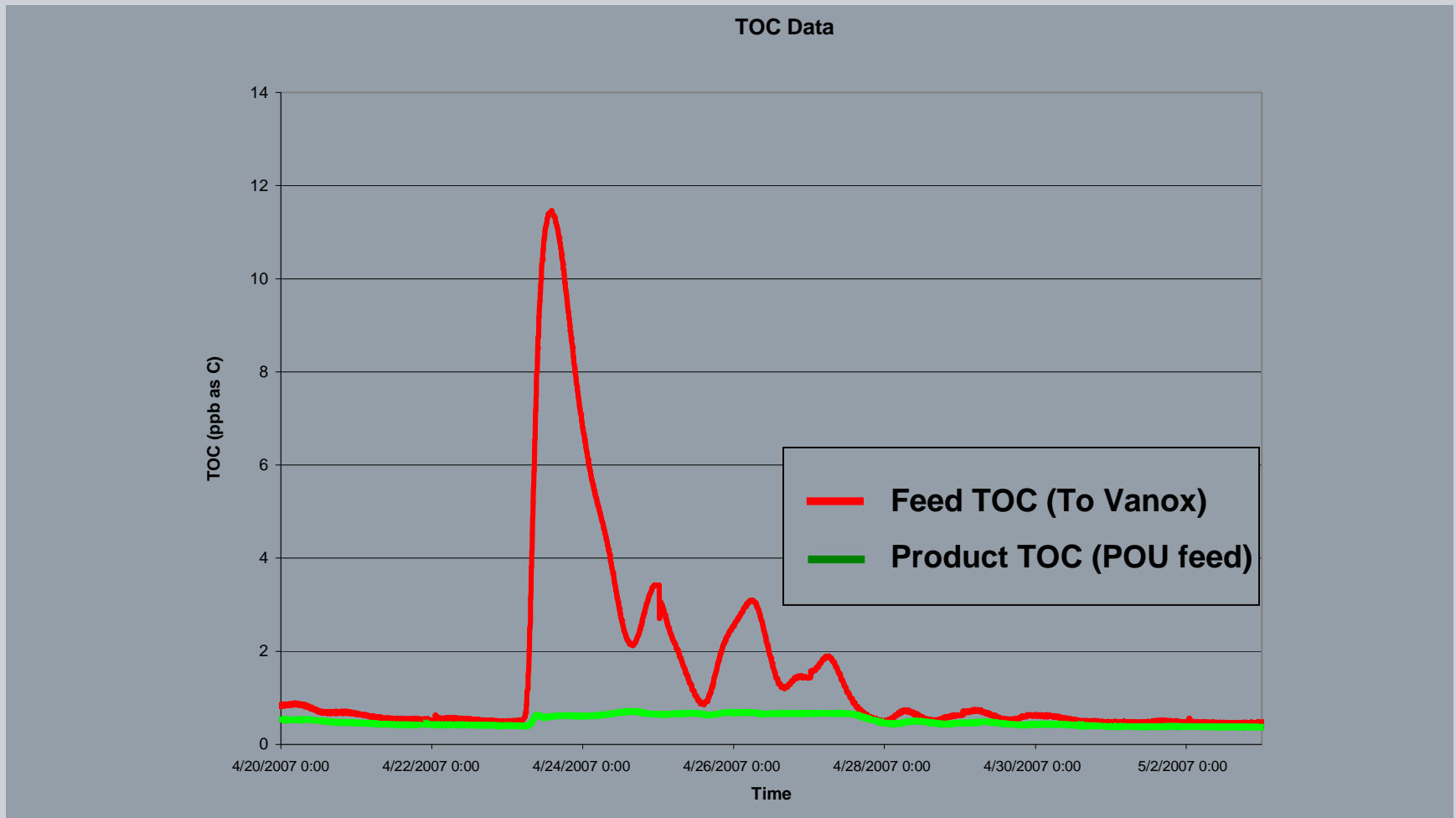


Vanox™ – Performance

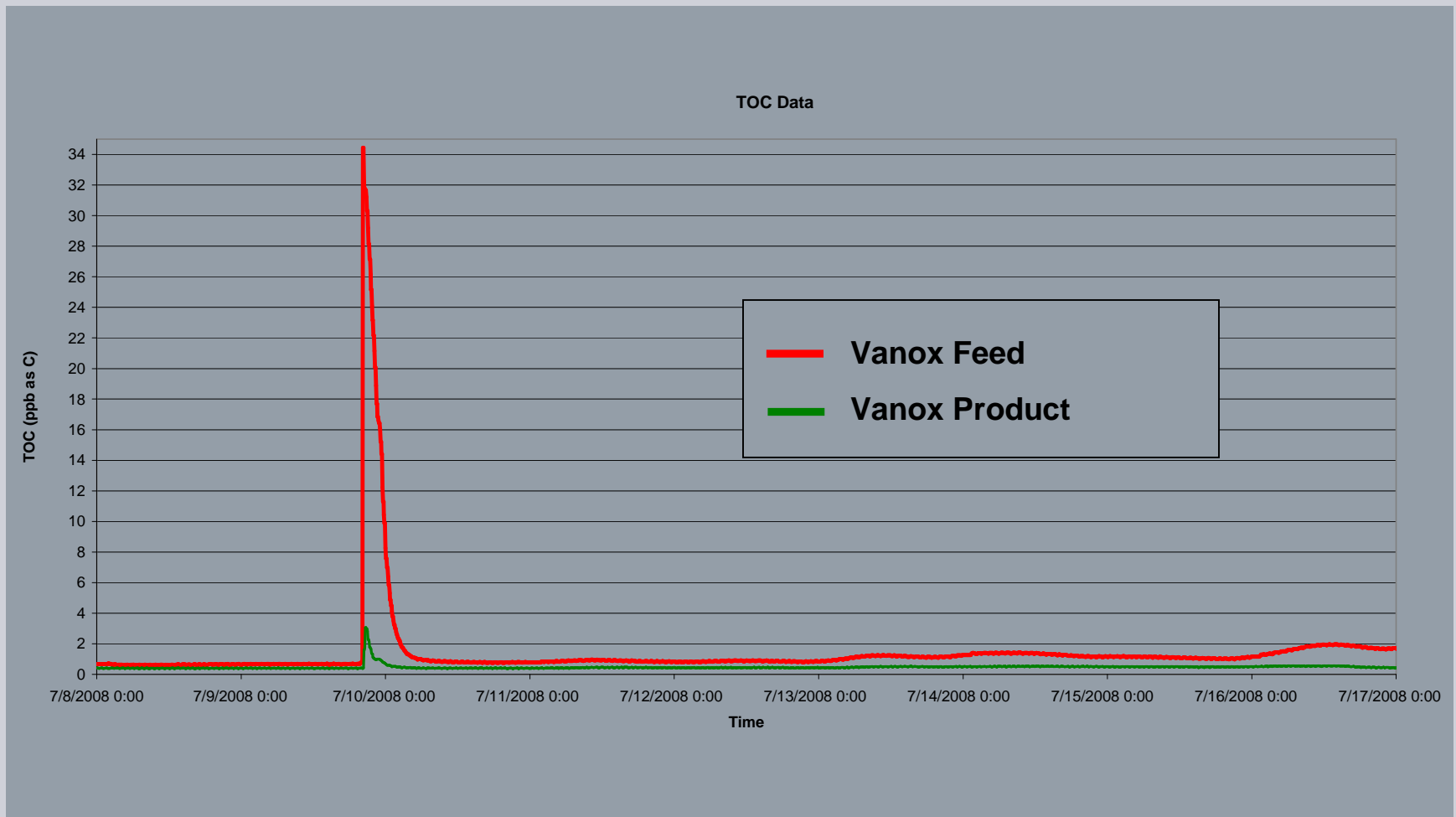
Parameter	ITRS (<28 nm)	Vanox min performance*	Typical Range
TOC	<1 ppb	<1 ppb	0.2-0.4 ppb
Metals	<1 ppt	<1 ppt	<1 ppt
Temperature	± 1 °C	± 0.5 °C	< 0.2 °C
Particles	<200 cts/L @ critical size	<100 cts/L @ 0.05 micron	50 cts/L
Dissolved Oxygen	<10 ppb	2-3 ppb	0.2-0.4 ppb
Total Silica	<0.3 ppb	<0.1 ppb (reactive)	<0.1 ppb
Dissolved Nitrogen		1000-3000 ppb	
Pressure		± 0.5 psi (0.034 bar)	

* Actual performance based upon feedwater levels

Vanox™ Performance – Urea



Vanox™ Performance – IPA



Why the Vanox™ Process is Right for You?

Consistent TOC reduction: Treats seasonal TOC variations in feed water – either from raw water and / or reclaim

Targets trace organics: Significantly shown to improve product yields due to effective removal of troublesome, difficult to remove organics such as Urea, IPA, THMs

Metals and particles reduction:

- < 1 ppt metals
- Reduces particles to less than 100 cts / L at 0.05 micron

Superior to competing AOP processes:

- Creates the most effective radical for TOC reduction for this application compared to competing AOP processes
- Results in a more stable water quality
- Delivers critical temperature control +/- 0.2 °C
- Lower power consumption
- Smaller footprint

Vanox™ – POU Benefit Summary

Effectively improves / stabilizes existing UPW quality to support the next generation tool needs (ITRS) without having to upgrade the complete UPW system.

- Consistently reduces TOC to 0.5 ppb
- Removes trace organics such as Urea, IPA, and THMs
- Maintains consistent process control during seasonal variations in feed water
- Consistent statistical control on manufacturing yields
- Eliminates temperature, TOC, metals and particle variations in the process



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