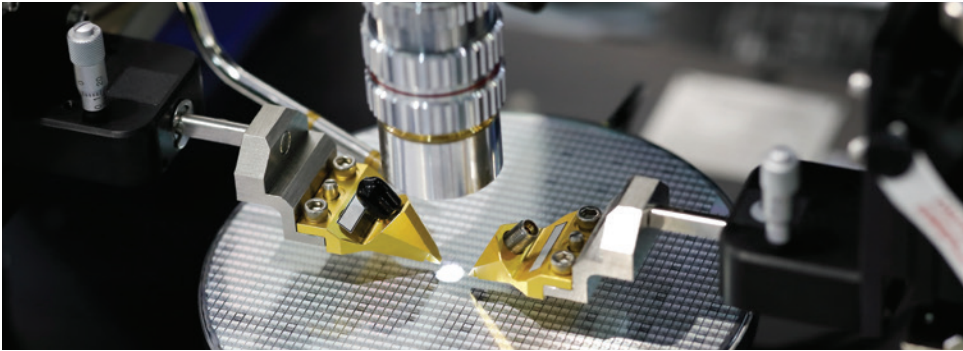


NXP Semiconductor saves 7.2 million gallons of water per year with 3D TRASAR™ Technology for Cooling Water



BACKGROUND

Semiconductor manufacturing requires large volumes of water to convey process chemistry and to wash and rinse the wafers at many stages during fabrication. Semiconductor fabs also use large chiller systems to supply chilled water to the production area's PCW (process cooling water).

Regulating a fab's manufacturing environment is critical, as even slight variations in temperature and relative humidity can have profound effects on chip quality, and the cost of downtime is very high. The chiller assets used to provide this climate control have high value as well.

Cooling water systems are prone to three primary types of water-related stress: corrosion, microbiological growth and scale, which can be exacerbated by varying water quality and water temperatures. An adaptable, responsive water treatment program is key to managing these risks as well as optimizing the related mechanical, chemical and operational conditions.

NXP Semiconductor is a major manufacturer of MEMS, microcontrollers,

radio frequency transceivers and amplifiers. At their Austin, Texas, facility, the fab has a cooling tower in a central utility system, supporting the chillers that supply PCW to the fab. Like most semiconductor manufacturers, NXP has strong environmental and local community commitments.

The fab's biggest challenge was finding a way to reduce water use and discharge without jeopardizing utility support functions. One obvious option would be to reclaim water from the fab's processes for use in the utility center's cooling towers. However, this could only work with protections against contaminants in the fab's reclaimed process water. Such contaminants include phosphates, fluorides, sulfates, chlorides, ammonia and silica, as well as naturally occurring hardness (calcium and magnesium), which can increase the risk of corrosion, microbio and scale in the cooling water system.

Unfortunately, the fab's existing cooling water treatment program was incapable of managing such a reclaim scenario. An additional investment of approximately \$60,000 - \$120,000 would be required to revamp the existing cooling water treatment system to effectively use the reclaimed water.

ANNUAL SAVINGS



WATER

Reduced municipal water consumption by

7.2 million gallons
per year



WASTE

Reduced wastewater discharge by

8.5 million gallons
per year



PRODUCTIVITY

Optimized operational labor needs to save

\$30,000
per year



COSTS

Reduced program costs by

\$14,000
per year

VALUE DELIVERED

\$114,865
ANNUALLY

SOLUTION

Through extensive discussions with NXP personnel, the Nalco Water team gained a solid understanding of the reclaimed water streams and proposed 3D TRASAR Technology for Cooling Water in response. In tandem, the site's chemical delivery systems were also upgraded.

3D TRASAR Technology for Cooling Water uses three major innovations to provide adaptable, flexible control for microelectronics fabs that want to reclaim water streams to the cooling tower:

- Real-time corrosion monitoring and control
- Chemistry that outperforms traditional polyphosphate scale and corrosion inhibitors
- Tagged and inert fluorescent polymers that enable the chemical program to adapt in real time to changes in stress

In addition to the 3D TRASAR program, NXP and Nalco Water implemented a process that included complete overhaul of automation systems.

Chemical delivery and drum handling

At right is a photograph of the previous and Nalco Water chemical delivery and storage systems. The Nalco Water PORTA-FEED™ system drastically reduced the number of chemical drums on site, thereby reducing drum handling.



New chemical treatment program automation

The photo at right shows the previous chemical control automation and feeding system versus 3D TRASAR Technology for Cooling Water.



RESULTS

Table 1 shows the drastic reduction in corrosion realized after switching to the 3D TRASAR program: corrosion was reduced 93% and real-time corrosion data is now provided.

The 3D TRASAR program includes support from the Ecolab Global Intelligence Center (EGIC), a team of trained engineers that monitors trends, reviews alarms, and troubleshoots systems 24/7. The EGIC can contact local Nalco Water personnel or fab staff to initiate corrective action before a small problem becomes a large incident.

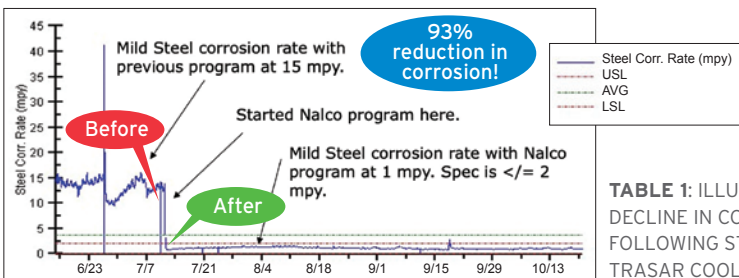


TABLE 1: ILLUSTRATES THE DRAMATIC DECLINE IN CORROSION RATE FOLLOWING START-UP OF THE 3D TRASAR COOLING WATER PROGRAM

The 3D TRASAR program's ability to tolerate variable water quality enabled the fab to increase the cycles of concentration in the cooling tower from 7 to 15. The program also enabled NXP to use more reclaimed water.

- Municipal water consumption was reduced by 7.2 million gallons (27,250 m³) annually, resulting in cost savings of \$23,680
- Discharge flows were reduced by 8.5 million gallons (32,180 m³) annually, resulting in \$47,185 of additional cost savings

Labor to operate the program was also optimized, enabling a savings of \$30,000, and allowing operations labor to focus on higher value tasks. Overall program costs were reduced by \$14,000 as well. Lastly, the project came in under budget, ahead of schedule and exceeded savings targets.

CONCLUSION

Upon seeing the significant benefits of the 3D TRASAR Cooling Water program in their operation, and \$114,865 in total value delivered, the NXP team opened up new conversations with Nalco Water to consider several additional projects:

- A cooling tower bio-detergent program to further improve tower cleanliness, reduce the need for manual cleaning, and reduce filtration backwash costs
- A new boiler water management program using 3D TRASAR Technology for Boilers to help improve control and optimize operational labor. Projected annual savings are \$10,285
- Improved automation and treatment programs for the PCW systems
- Remote chemical tank level monitoring to optimize inventory control, provide just-in-time delivery, and reduce labor directly associated with those tasks

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