



Grundfos Case Story: Semiconductor Manufacturing

Grundfos Pumps Enable Water Recycling in Semiconductor Manufacturing

EXECUTIVE SUMMARY

A semiconductor company focused on silicon carbide wafers for electric vehicles aimed to improve sustainability by retrofitting an existing building into a new production facility in North Carolina. They partnered with Pureflow and Grundfos to create an innovative ultra-pure water (UPW) and process water recovery system. The collaboration resulted in exceeding the facility's water recycling targets and reducing maintenance costs.

THE LANDSCAPE: AN INDUSTRY AT A CROSSROADS

The semiconductor industry is the invisible engine powering modern life, from smartphones to electric vehicles. The race to become the leader in AI, 5G technology, and electrification has companies across the world accelerating semiconductor production to build more data centers, communication infrastructure, and electric car factories. It's also one of the most water-intensive manufacturing sectors today with production facilities consuming up to 10 million gallons of UPW a day. It's estimated the industry's annual water consumption will increase by approximately 10% each year¹, with the average semiconductor manufacturing plant using as much water as a city with 7.5 million people – roughly the size of Hong Kong.¹

10M gallons of UPW = the daily water use of 33,000 U.S. households¹

Chip production on its own requires a large amount of UPW, which also requires a combination of energy intensive processes to create. Chip production also generates a significant amount of wastewater that contains hazardous materials.

As demand increases, the semiconductor industry is facing mounting pressure to develop and follow more sustainable production practices — and quickly. A 2023 survey of semiconductor executives revealed that 73% listed access to natural resources, especially water, as the top environmental risk to their operations.¹

THE CHALLENGE: A SEMICONDUCTOR COMPANY'S WATER GOALS

A semiconductor manufacturer specializing in the production of silicon carbide wafers — used primarily for microelectronic chips in electric vehicles — was looking to increase the sustainability of their operations. When planning a new production facility in North Carolina, which required retrofitting equipment into an existing building, they sought to incorporate cutting-edge equipment and processes that would help them reduce their water use and contribute to corporate sustainability goals.

The manufacturing company's leadership saw water reuse not just as an environmental responsibility, but also as a competitive advantage in a resource-constrained industry. For the project, they chose Pureflow, a purified water equipment manufacturer and service provider with over 40 years of experience designing and maintaining purified water systems.

GRUNDFOS 

Possibility in every drop



THE RIGHT PUMP PARTNER: GRUNDFOS STEPS IN

In a water intensive manufacturing facility, choosing the right pumps is critical to building a water recycling system. Pumps are used throughout every stage of the water purification and filtration processes, so Pureflow wanted high-volume, high-performance pumps that were both efficient and reliable.

To meet the manufacturer's performance and water recycling goals, Pureflow turned to their long-standing partner — Grundfos. A global manufacturer of intelligent, high-performance water pumps known for innovation, efficiency, and reliability, Grundfos pumps have powered Pureflow systems for over two decades. This trusted relationship and reputation made them the top choice for another important Pureflow project.

“Grundfos not only makes superior pumps, which are an integral part of our pre-engineered systems — they're an incredible partner to work with,” says Stephen Boles, process engineer at Pureflow. “We always have an open line of communication with their team, collaborating to find the best possible solution. Time and time again, they've proven that they care about our customers as much as we do.”

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- Stephen Boles, Process Engineer, Pureflow

THE SOLUTION: SMART SYSTEMS, SUSTAINABLE DESIGN

The customer needed to remove silicon carbide from the processed deionized (DI) water with the goal of reusing as much water as possible. Pureflow got to work designing, engineering, fabricating and installing a UPW and process water recovery system optimized for water recovery, energy efficiency, and tailored to the manufacturer's new facility space.

Each pump was carefully selected not just for its individual performance, but also for how well it integrated into a smart, responsive control system. The intelligence and reliability of Grundfos pumps allow Pureflow's service team to see performance metrics in real time and minimize the system's maintenance needs.

The system is designed with 100% Grundfos pumping solutions across every critical process step. Grundfos pumps are utilized for city water boosting, RO feed, ozone recirculation, chemical injection and metering, CIP skid operation, and final distribution of high-purity water to the fab. Using a single, consistent pump platform supports streamlined maintenance, system reliability, and long-term performance.

The system includes three different Grundfos pumps:

- Grundfos CRN 95-1 Multistage Centrifugal Pumps
These high-performance pumps were chosen for the ultrafiltration process, providing the necessary pressure to move large volumes of water through fine membrane filters — up to 400 gallons per minute.
- Grundfos CRN 125-1 Multistage Centrifugal Pumps
Used for membrane backwash cycles, these pumps have the power needed to clean equipment. Capable of pumping up to 650 gallons per minute, the CRN 125-1 is known for its performance, ease of maintenance and long operational life.
- Grundfos DME and DDA Digital Dosing Pumps
Accurate chemical dosing is vital for maintaining the water's pH and chemical balance during treatment. Grundfos's DME and DDA digital dosing pumps ensured consistent chemical feed at various stages throughout the process.

With the Grundfos pumps integrated into their pre-engineered solution, Pureflow was able to provide their customer with a reliable, more efficient system and a significant reduction in water use.



THE RESULTS: MEETING SUSTAINABILITY TARGETS

As a part of recent corporate sustainability goals, the semiconductor manufacturer had set a water-related target of increasing water recycling rate by 25% by 2025 compared to a base-year of 2019. Thanks, in a large part, to Pureflow's system design and Grundfos pumps, they met that target within the first year.

- The new system recycled an average of 180,000 gallons of water-per-day
- Maintenance costs dropped due to high pump reliability and faster servicing
- Designed with scalability in mind, the new system will allow the manufacturer to expand its reuse rate in the future



LOOKING FORWARD: BUILDING THE FUTURE TOGETHER

The partnership between the semiconductor manufacturer, Pureflow and Grundfos is a testament to what's possible when engineering meets environmental responsibility.

With the semiconductor industry continuing to boom, resilient business strategies such as water recovery in manufacturing will become an increasingly important way to preserve our planet's most precious natural resource. To that end, Pureflow and Grundfos continue working together on the next generation of systems, pushing the boundaries of what's possible in water recovery technology.

Sources:

1. James, K. (2024, July). Semiconductor Manufacturing and Big Tech's water challenge. World Economic Forum. <https://www.weforum.org/stories/2024/07/the-water-challenge-for-semiconductor-manufacturing-and-big-tech-what-needs-to-be-done/>

