



ON Semiconductor®

Water Conservation in the Semiconductor Industry

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ON Semiconductor

- Provide comprehensive portfolio of energy efficient solutions
- Help customers solve their unique design challenges
- Empower design engineers to reduce global energy use
- Operate a responsive, reliable world-class supply chain and quality program
- Maintain global environmental sustainability and social responsibility programs

ON Semiconductor (cont.)

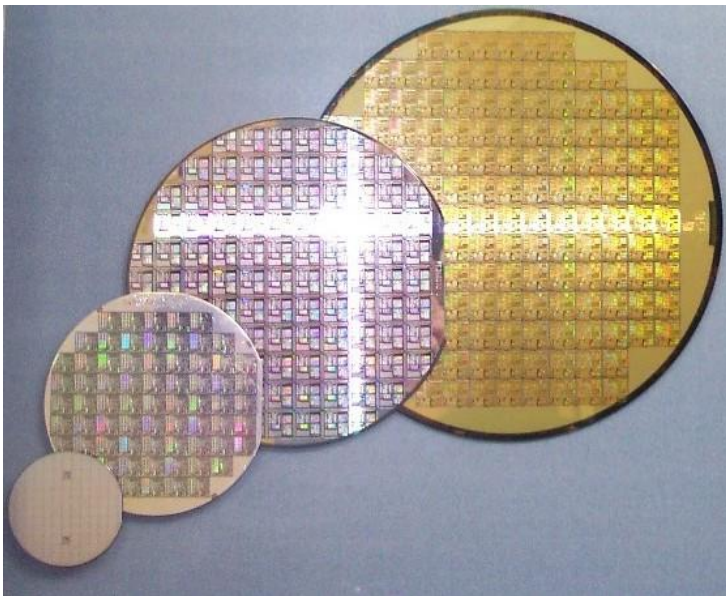
- Headquartered in Phoenix, AZ
- Numerous design centers around the globe
- 22,000 employees world wide
- 17 Manufacturing Sites around the world
- 2014 Revenue of \$3.162 billion

Semiconductor Manufacturing

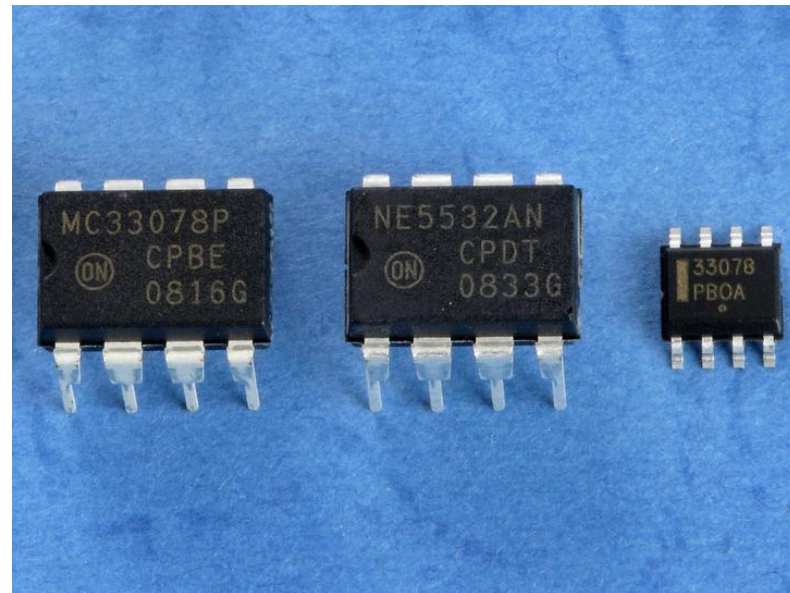
- Two types of manufacturing facilities
 - Wafer Fabs
 - Assembly Test Factories
- Main Uses of Water
 - HVAC
 - Process

Products from the Factories

Wafer Fab Products



Assembly Test Products



HVAC Water Use

- HVAC intensive industry
- Required for maintaining process stability and comfort
- Largest user is cooling towers
 - Blow down goes to drain

Process Water

- Reverse Osmosis/Deionized Water (RODI)
- City Water

With and Without Manufacturing

- 2010 we used 120 million gallons of water
- Factory closed in 2011, with cleanup going into 2012
- 2013 the site was substantially stable and used 28 million gallons of water
- So the factory used 77% of our water in the process

Projects from Around the Globe

- Maximize water to abatement devices
- Change water types to point of use abatement
- Process Improvements/Tool idle flows
- RO reject usage
- Rinse water reuse

Rinse Water Reuse

- Process Acid Hoods have multiple tanks
- There may be one or more rinse tanks for cleaning the residual acids off the wafers
- The rinse water will contain small quantities of acid, but generally be highly dilute
- So rinse water has a high potential of being reused

Where can we use it

- **HVAC Systems**
 - Cooling Tower Make Up Water
 - Boiler Make Up Water
 - Air Abatement Devices
- **Process**
 - Make Up Water for the DI System

Pros and Cons for Use

- **HVAC**
 - Water is very clean so little treatment may be needed
 - May be corrosive depending on system
- **Process**
 - Concern about introducing contaminant(s) into system
 - Very clean and reduces DI manufacturing chemical usage

What we decided

- Initially send water to air abatement systems (scrubbers)
- Collect data and make provisions for using it for make up to the DI system

Program

- **Install new drain system**
 - Challenging given the current conditions of the building
- **Hook up tools to new drain system**
 - Needed to work closely with manufacturing to modify their tools
- **Build new treatment system**
 - Had to be fool proof

The Manufacturing Tools



Hood can have multiple
baths

Older hoods had a single
plenum for all waste

Needed to add weirs and
drains

Scheduling with 24x7
manufacturing was difficult

Treatment System

- Designed to minimize risk to operations
- Involved two tanks for water storage and two chemical totes
- Monitored pH, TOC, and TDS

Treatment Process

- Water would gravity feed into the main treatment tank
- Tank constantly agitated with a mixer
- 50% NaOH would be metered into this tank to adjust pH to a value of 7 to 8
- Water then overflowed to a large storage tank
- When storage tank was full, then the system would pump to the abatement system make up

When there were problems

- If the system detected a problem with pH, TOC, or TDS, then the flow would divert to our industrial waste treatment plant
- We also changed to 20% NaOH after the initial start up

How we did

- Eventually, we were able to sustain about 45gpm from the factory, saving approximately 24 million gallon per year
- Sent to the abatement scrubbers to supplement city water make up
- Eventually redirected to the incoming make up water for DI