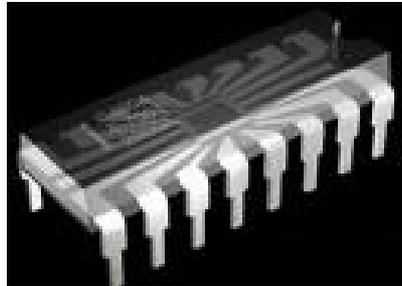
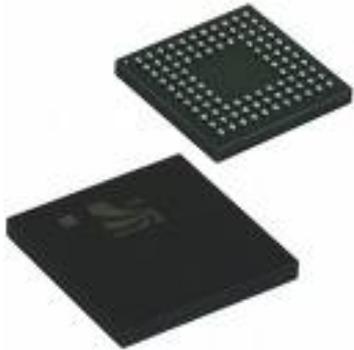
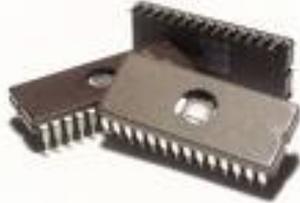
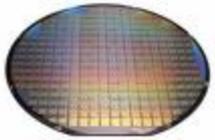


Water Reduction Efforts Analog Devices, Inc.

November 2010



Semiconductor Manufacturing: Basic Steps



- ▶ Sand to silicon
- ▶ Ingot to wafers
- ▶ Photolithography
- ▶ **Clean/Etch**
- ▶ Implant/Deposition
- ▶ Test/Slice
- ▶ Assembly/Packaging

Where does the water go?

Potable Water 5%
Used in bathrooms, kitchens
drinking fountains



Industrial Water 35%
Used to run facilities
equipment



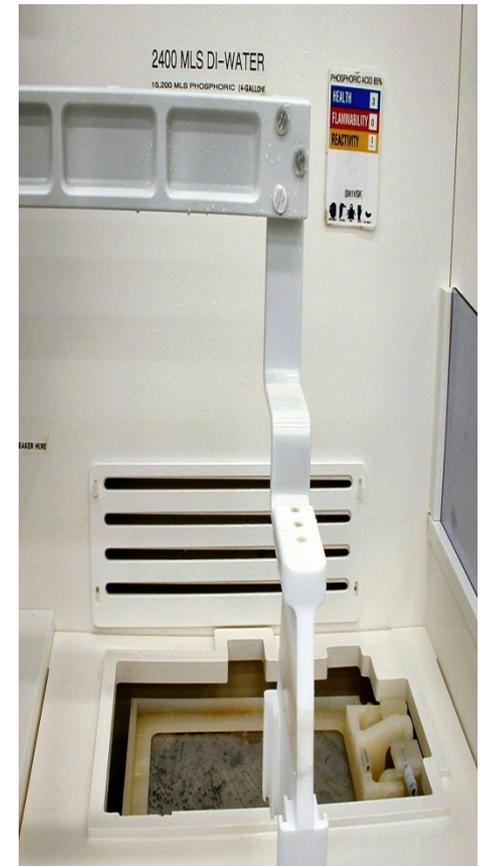
Ultra Pure Water 60%
(City water filtered onsite)
Used by production

Typical Water Use Wafer Manufacturing



Total Use =
0.25 to 0.35
gal/cm²

UPW use =
0.10 to 0.20
gal/cm²



* Normalized to Surface area of wafer outs x mask layers
** Semiconductor Industry Association Benchmark Study

Semiconductor Manufacturing Water Use Terminology

▶ City Water

▶ UPW or DI

- Ultrapure Water, Deionized Water

▶ RECYCLE

- UPW **returned** as UPW make-up

▶ RECLAIM

- UPW **downgraded** to another process
- UPW **downgraded** to facility use

Water Conservation Activities

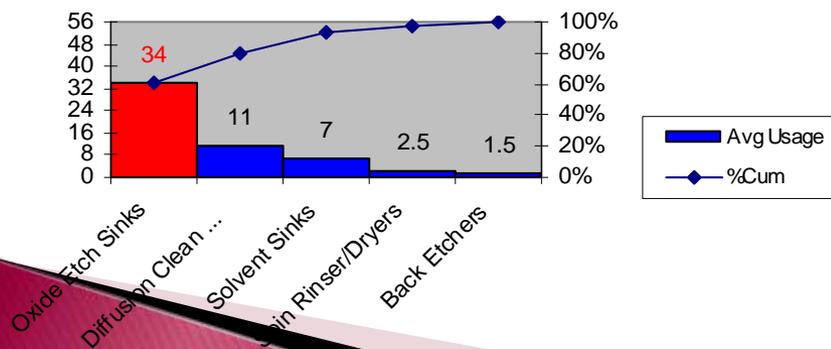
- ▶ Install Flow meters and regulators
- ▶ Audit for checking reset points after a shutdown (Facilities and Fab)
- ▶ Water efficiency audits on process tools and facilities equipment
- ▶ SOPs for installation and modification of any equipment utilizing water
- ▶ New equipment approvals
- ▶ Identify opportunities for reclaim/reuse

Water Conservation Activities

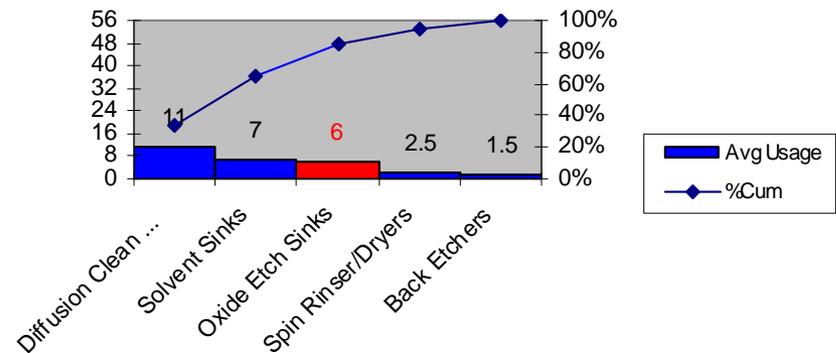
▶ Tool Upgrades

- Oxide etch sinks were upgraded to more effectively utilize water, which resulted in an *83% reduction in DI water usage* (or approximately *15 million gallons per year* at an estimated cost savings of \$115,000 per year).
- Decreased overall water use by 50% in Mod B

DI Water Usage by Service Chase Sink types -
Before Upgrade

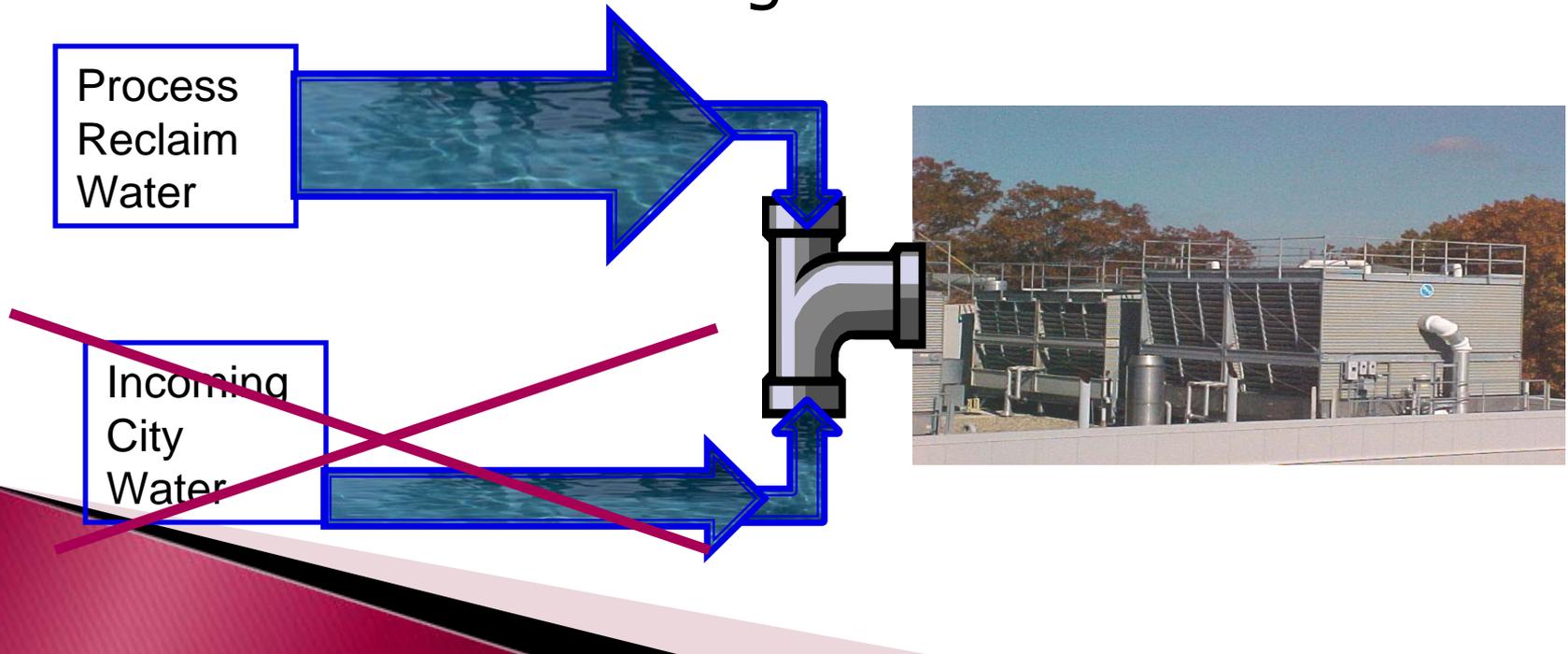


DI Water Usage by Service Chase Sink Types -
After Upgrade



Water Reclaim Activities

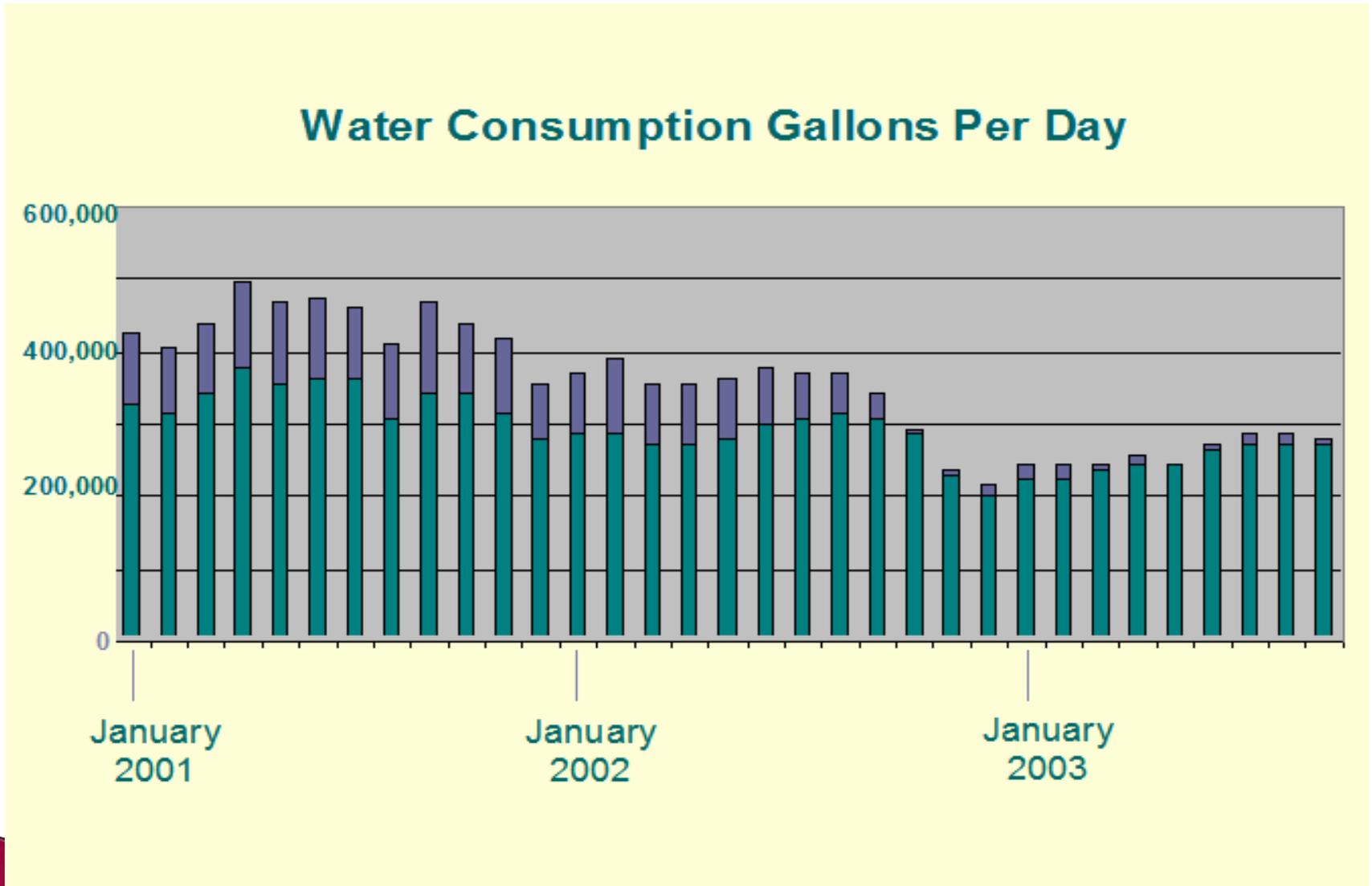
- ▶ The use of city water for industrial/facilities equipment has been reduced by approximately 200,000 gallons per day or 75% via water treatment/reuse for scrubbers and cooling towers.



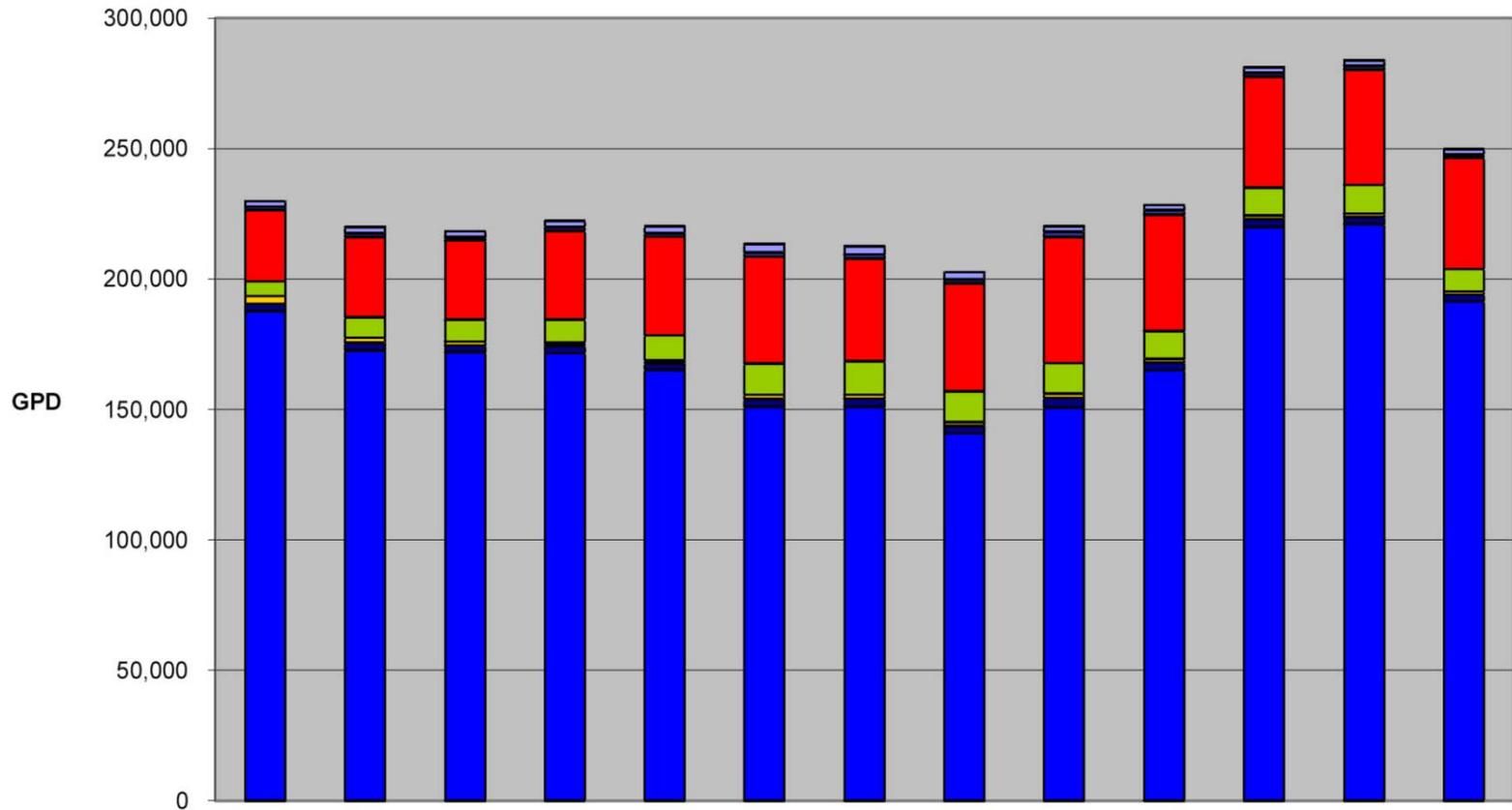
Water Conservation Achievements

- ▶ To date, efforts have saved >250,000 gallons per day of city water use.
- ▶ > 50,000 gallons per day of DI Water
- ▶ DI water has been reduced in one wafer fab by over 50% while production output was increased – Tool Upgrades
- ▶ Continuing improvements to DI water system efficiency are ongoing.

Monitoring the Results....



Water Consumption (GPD) - FY2009 / FY 2010



	Sep-09	Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10
■ Building 1 - All	2,089	2,344	2,211	2,388	2,588	3,213	3,118	2,728	2,071	2,034	1,977	1,999	1,927
■ Building 2 (Café)	1,360	1,428	1,280	1,517	1,366	1,595	1,627	1,603	2,081	1,683	1,389	1,528	1,205
■ Building 3 - All	27,342	30,873	30,430	33,921	37,813	40,902	39,315	41,434	48,324	44,625	42,664	44,182	42,813
■ Building 4 - All	5,633	7,734	8,410	8,842	9,506	12,030	12,842	11,789	11,633	10,714	10,584	10,961	8,554
■ Building 5 - All	2,915	2,047	1,421	1,296	1,220	1,581	1,480	1,430	1,624	1,333	1,596	1,288	1,175
■ Building 6 - All	2,868	2,871	2,576	2,694	2,497	2,925	3,029	2,797	3,776	2,910	2,857	2,754	2,626
■ CUP	187,635	172,586	171,976	171,596	165,125	151,089	151,063	140,832	150,678	165,068	219,931	221,033	191,401

AWARDS and RECOGNITION

"Analog Devices was the most concerned and proactive firm of all the industrial water users assessed under this program...taking the issue of water conservation the most seriously".

***Excerpt from Wilmington Town Water Report**



MEMORANDUM

Analog employs several water saving practices for their non-production water use. The majority of rest rooms have been provided with low-flow fixtures and motion-sensing activators, and the remaining rest room fixtures are being upgraded on an ongoing basis. The cafeteria uses disposable plastic utensils to reduce dish washing. Water for landscaping irrigation is obtained from onsite groundwater, which is collected both through building underdrains and from a dedicated well.

Water Use Assessment

Analog has done a remarkable job reducing water consumption in the past five years. Their efforts in this time have reduced water use from over 400,000 gpd to less than 250,000 gpd, saving more than 55 million gallons annually. It should be noted that this reduction in water consumption occurred while maintaining consistent product production levels.

Of all the industrial water users assessed under this program, Analog Devices was the most concerned and proactive firm, taking the issue of water conservation the most seriously.

Potential Improvements

One of the biggest uses of water at the facility is for wafer production rinse water. Because the process requires ultra-pure water, the rinse water must flow continually, even when production has ceased, to prevent stagnation, microbial growth, or even atmospheric gas absorption in the pipes. In recent years, Analog has experimented with the amount of flow required to maintain quality of the rinse water, and as a result has minimized the flow to the extent practically possible. Although there is potentially room for an additional reduction in water use by altering the rinse tank maintenance procedures, this would require a significant capital outlay and additional personnel monitoring requirements. Moreover, the added complications could jeopardize integrated circuit production runs. Since production quality is at the heart of Analog's operations, it is unreasonable to put this at risk. Fortunately, as mentioned above, there has been some movement in the industry away from wet etching into dry etching, using gasses rather than water to rinse the product. This has been happening slowly over the past five years, with more movement in this direction expected.

Ipswich River Watershed Association (IRWA)



Together we can make a difference!

The Ipswich River Watershed Association (IRWA) depends on the support of its members to enable its vision of "Municipal governments, businesses, environmental organizations, and regulatory agencies working cooperatively to effectively manage natural resources."

Analog Devices, Inc. (ADI) is a proud supporter of the IRWA. ADI's corporate sustainability philosophy is consistent with the IRWA vision of "a sustainable regional economy based on a foundation of environmental stewardship". According to ADI chairman and CEO Jerry Fishman, "sustainability plays an integral role in achieving our business goals". Innovation, performance, and excellence are the pillars upon which ADI was founded more than 40 years ago. These same governing principles which have helped drive ADI's business success are also reflected in its approach to environmental sustainability.

ADI understands that preserving and protecting our natural resources, including the Ipswich River Watershed, is key to the sustainability of both business and the environment. ADI recognizes the importance of corporate leadership in this area and provides economic support to help fund the IWRA efforts. Additionally, ADI contributes to the vision of IWRA by implementing and maintaining programs designed to minimize the impacts of its operations on the environment and ensure sustainability of natural resources.

For example, water is an important resource for both business and the community at-large, and must be managed wisely to preserve important resources like Ipswich River Watershed. The Town of Wilmington recently commended ADI for its significant achievements in water conservation and recycling efforts. The ADI Wilmington Manufacturing site reduced its use of water by 75% through reclaiming and reusing process water in facilities support operations. ADI equipment and manufacturing processes are designed to maximize efficiency of energy and water use, and ADI engineers apply their innovation to continually seek and implement opportunities for enhancements.

Driven by a commitment to continual improvement, ADI and its employees work diligently toward ongoing sustainability efforts. ADI was the first U.S.-based semiconductor manufacturer to be certified to the international ISO 14001 environmental management system standard. As a result of its ongoing achievements, ADI is a recognized corporate environmental leader, and was named 4th in the most recent Boston Business Journal (BBJ) List of "Greenest Publicly Traded Companies" in the region. ADI was also honored by the U.S. Environmental Protection Agency (EPA) with a merit award for its "outstanding efforts in preserving New England's environment".

ADI encourages other businesses, organizations, and individuals to support the efforts of IWRA so that together we can make a difference and sustain these important natural resources.

Corporate EH&S Policy: Analog Devices, Inc. and its employees are committed to protecting the environment and the health & safety of fellow employees, customers, and the public by endeavoring to adhere to stringent regulatory and industry standards across all our facilities, encouraging pollution prevention, and striving towards continual improvement. Analog seeks to go beyond compliance with regulatory standards in pursuit of excellence in environmental, health and safety management practices, as an integral part of its total quality management system.

On-Going Water Conservation Activities

- ▶ Current maintenance goal of zero % increase in water use while increasing production output
- ▶ Continue to optimize with the addition of new and existing operations



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