

Water Conservation Programs and Technologies in the USA

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Abstract

Approximately 26 billion gallons (100 billion liters) of water are used in the United States alone. According to United States Geological Survey (USGS), the average American uses between 80 (300 liters) and 100 gallons (385 liters) of water daily. With growing population and recent drought in some parts of US, water conservation has gained an urgent focus of water utilities and regulators. Regulatory agencies are calling for reduction in water usage which is prompting public utilities to adopt various water conservation technologies. Conserving water helps to ensure that this important resource will be available for many generations to come. Conserving water also saves energy – the energy needed to treat, transport, and heat our water. The objective of this work was to review the current water conservation programs and current water-saving technologies in the US. It focuses on the measures and technologies currently utilized in domestic and irrigation sector to promote water conservation. The work specifically looked at the State of Georgia which is currently undergoing a severe and historic drought.

Keywords: Conservation, Drought, Drip Irrigation, Water-Saving Technologies

Introduction

In the US, there are several programs that promote water conservation. United States Environmental Protection Agency (USEPA)'s WaterSense® tests and labels products such as high-efficiency toilets, faucets, and showerheads. Other products such as weather – and sensor-based irrigation technologies are slated for WaterSense® labeling in near future. The Alliance for Water Efficiency was created in 2007 to advocate for water efficiency products and programs. The alliance is developing a web-based clearinghouse of information on water-efficiency programs, policies, products, research, and technology. The Food Service Technology Center (FSTC) is the industry leader in commercial kitchen energy efficiency and appliance performance

testing. The FSTC has developed more than 30 standard test methods for evaluating the performance of commercial kitchen appliances.

The Consortium for Energy Efficiency develops initiatives for its North American members to promote manufacture and purchase of energy-efficient products and services. Smart Water Application Technologies is an international partnership initiative of water purveyors and irrigation industry representatives created to promote landscape water-use efficiency through the application of state-of-art irrigation technologies. Many universities in the United States and Canada have tested and continue to test both indoor and outdoor water-efficiency technologies as independent third-party testers. American Water Works Association (AWWA) Water Conservation Division promotes the use of Best Available Technology (BAT) in utility water conservation program and practices. The Energy Policy Act's *Greening the Government through Efficient Energy Management* directs the Federal government to implement all cost-effective water conservation measures in its facilities by 2010.

Water conservation programs are typically initiated at the local level, either municipal water utilities or regional governments. Common strategies include public education campaigns, tiered water rates (charging progressively higher prices as water use increases), subsidies for showerhead and toilet retrofits, and seasonal restrictions on lawn sprinklers. Cities in dry climates often require or encourage the installation of xeriscaping or natural landscaping in new homes to reduce outdoor water usage. One fundamental conservation goal is *universal metering*. Although individual water meters have often been considered impractical in homes with private wells or in multifamily buildings, the USEPA estimates that metering alone can reduce consumption by 20 to 40 percent. In addition to raising consumer awareness of their water use, metering is also important way to identify and localize water leaks.

Water-conserving technologies for indoor use include: low-flow shower heads, low-flush toilets, waterless urinals, faucets aerators, high-efficiency cloth washers, treated wastewater use in flushing toilets and the garden.

Outdoor water conservation technologies include on-site sensors that read weather conditions and receivers for actual data on evapotranspiration to determine when watering is needed. Use of rain collection systems and cisterns to store for landscape irrigation is gaining ground. Many water-efficient measures are enforced like limited turf area, proper grading and soil preparation, mulching and composting, and grouping plants with similar water needs.

In light of the fact that crop irrigation accounts for 70% of the world's fresh water use, the water conservation agencies are urging on more water-efficient crops and less wasteful irrigation techniques. Drip irrigation is one of the best methods for delivering water to plants with minimal loss. As changing irrigation systems can be costly undertaking, conservation efforts often concentrate on maximizing the efficiency of the existing system. This may include chiseling compacted soils, creating furrow dikes to prevent runoff, and using soil moisture and rainfall sensors to optimize irrigation schedules.

Water conservation technologies provide important benefits to facilities in drought and dry areas. In recent years, water conservation programs are encouraged and even enforced due to high energy cost and recent drought in

some states. The State of Georgia through conservation measures and technologies – both indoor and outdoor – has been able to reduce the water usage by 10 to 20% during this historic drought. The City of Atlanta which is in State of Georgia is considering to make some of the water conservation measures as permanent. Even areas where water resources are not scarce, they are likely to see an increase in the use of water-conserving technologies in homes, businesses and in irrigation sector, because they are cost-effective and they help save natural resources.

Last year, City of Atlanta banned all outdoor watering as a result extreme drought conditions in North Georgia. It stopped selling irrigation meters and doubled the rate on irrigation water for those who already had meters. Inside the house, City of Atlanta has funded a one-million-dollar toilet rebate program. Although City had low-flow standards in place since 1993, up to now City's toilet rebate program has only been for low-income [residents] and senior citizens.

Three years after it began thinking about water conservation, Delta Airlines which is among largest water users in City of Atlanta began assessing the feasibility of installing a system to recycle a majority of the water used in the Operations Center. It eventually resulted in a system that will come online in late 2008 or early 2009, to recycle 300,000 gallons a day and save approximately 110 million gallons of water per year. The company expects to save \$2 million dollars annually on this \$3.8 million water-recycling investment. The airline has also installed an automatic metering device that will fill a pre-determined amount of water onboard aircraft, and automatically shut off without operator intervention, thereby saving approximately 2.9 million gallons of water a year.

In 2004, Delta Airlines partnered with Georgia's Pollution Prevention Assistance Division, to focus on its plating shop, which used 80,000 gallons of water a day. The first phase of the project included installing water meters to monitor exact water usage and establish employee awareness. Overflow valves were replaced, and a program was implemented to ensure all meters and equipment were calibrated and maintained on a regular basis. Water usage dropped 55% to an average of 30,000 gallons per day, which has saved Delta \$510,000 in water, chemicals, and hazardous waste disposal.

In a completely opposite direction, Georgia Aquarium (located in Atlanta) has applied its particular brand of creativity to the challenge of water conservation. The aquarium, which is the largest in the country, is housed in a 550,000-square-foot building that contains 8 million gallons of water and houses over 100,000 animals—from fish to penguins. The water coming into the building is city water, and all of it goes through carbon filters that remove chlorine and heavy metals to make it safer for the animals. The filters are set up to automatically backwash and it was found that backwashing operation is longer and more frequently than was necessary. So, by adopting a less frequent and shorter duration of backwashing resulted conserving a significant amount of water.

In wake of 2007 extreme drought in North Georgia, the top 50 largest commercial and industrial customers were asked to help achieve 10%

reduction in water use. These customers put together conservation teams; and did some real thinking, planning, and implementing the measures.

The pressures of a growing population and economy, combined with traditional approaches to water supply and management have led to unsustainable use of fresh water resources in various parts of the world. Improved efficiency and increased conservation are the cheapest, easiest and least destructive ways to meet the future water needs. Many technologies are available for using water more efficiently, in every sector. These include low-flow toilets, faucets, showerheads; efficient residential and commercial washing machines and dishwashers; drip and precision sprinklers; commercial and industrial recycling systems.

New technologies are constantly evolving. Computer-controlled “smart” sprinklers can greatly reduce over-watering. Dual-flush toilets can improve upon current technology. Waterless urinals are promoted in government buildings. Pre-rinse spray valves are tested for washing dishes. In addition to technologies, it is necessary to promote the water conservation programs and educate the public effectively to change attitudes and behaviors toward water efficiency. It is also important to monitor and evaluate each program to ensure sustained water savings and success.

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