



## Reducing water waste by 44 million gallons annually becoming a reality for global coffee chain.

A few years ago, a leading coffee chain set a goal to reduce water consumption by 25% in all company-owned stores by 2015. Rising raw coffee bean prices coupled with the economic recession put pressure on the company to reduce store operating costs. The corporate office turned to Pentair for assistance and the partnership resulted in an annual water savings of as much as 260,000 gallons per store, along with an average annual cost savings of up to \$1,300 per store in water and sewer charges.

The specialty coffee industry has boomed in the last 20 years. There was a 70% increase in stores just in the last decade, reaching a count of 22,000 coffee shops in the U.S. alone by the end of 2010.<sup>(1)</sup> Changing consumer tastes for premium coffee has not gone unnoticed by quick service restaurants and convenience stores. The world's largest burger chain rolled out value-priced specialty coffee beverages in 2009 supported by a \$100 million media campaign. Convenience stores made nearly \$2.9 billion from selling brewed coffee.<sup>(2)</sup> Some even have baristas in stores producing high quality lattes and cappuccinos.

The price of coffee beans has gone up faster than the cost per gallon of gas in recent years. In fact, the price of green Arabica coffee beans, which comprise about 70% of all beans sold today, is at its highest in over 30 years.<sup>(3)</sup> This increase has been driven by a number of factors including rising coffee beverage consumption in emerging economies, the weak U.S. dollar, speculative trading on coffee futures and weather patterns. Other commodities used in large quantities by coffee chains such as sugar, dairy and cocoa have also risen in price, putting further pressure on operating costs.

Economic conditions have also impacted coffee consumption. While over 80% of daily coffee drinkers said that current economic conditions did not change their coffee consumption habits, 66% also said that they've reduced their away-from-home consumption.<sup>(4)</sup>

Despite the industry's amazing growth in recent years, rising costs and increased competition has put pressure on coffee chains to reduce operating costs to maintain margins.

One leading coffee chain sought to reduce costs, while maintaining their strong commitment to energy and water conservation. The chain has been a leader in social responsibility including ethical sourcing, recycling, renewable energy, energy conservation and LEED®-certified stores. Their water conservation goal, set in 2008, was to reduce consumption by 25% by 2015. This meant using water efficient, high pressure sprayers for cleaning blenders, putting a process in place to keep ice machine refrigeration coils clean to reduce ice melt and improve efficiency and finding a means to reduce water waste associated with filtering water used to produce beverages. The need to reduce operational costs and increase efficiency, coupled with a corporate directive to reduce their carbon footprint and waste, led the coffee chain to seek help from Pentair, a \$3.0 billion global water treatment and

technology company. This collaboration resulted in a solution that could save the coffee chain from \$13M to \$22M annually in water and sewer charges across all locations, and could reduce water waste by nearly 44 million gallons annually.

## The Customer Problem Statement: reduce operating costs and carbon footprint.

Every global chain has the challenge of maintaining brand integrity which means providing a superior customer experience and product consistency across every location. For a retailer who relies on coffee beverage sales for the bulk of its profits, its drinks had better be made from the highest quality ingredients and prepared perfectly, consistently at every store.

Since 78% to 96% of an espresso shot is water, having clean, contaminant-free water is critical. Unfortunately for a chain that's so dependent on this key ingredient, water quality varies dramatically from region to region, even from suburb to suburb.

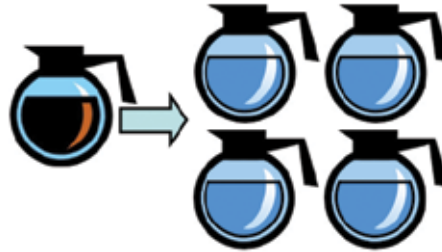
In nature, water is never pure. Rather, it's a complex solution of minerals, chemicals, particles and organics. A glass of water from Shanghai will taste vastly different from a glass in Seattle. Likewise, a cup of coffee will taste different from location to location, no matter how much money is invested in the beans, brewing equipment or barista training. If contaminants such as chlorine and organics aren't removed from the water, the resulting coffee won't taste or smell very good.

Technology is available to provide consistent, high quality water for foodservice operations: Reverse Osmosis. RO uses high pressure to force water molecules through an extremely fine, semi-permeable membrane, with the concentrated solution left behind flushed to drain as waste water. The RO process produces very pure water that has nearly everything removed from it, including the minerals. For coffee retailers, some mineral is then blended back in to enhance flavor.

Due to the consistent water quality produced, this coffee chain historically used reverse osmosis technology in nearly all of their stores globally. There was one problem however: conventional RO systems waste a lot of water. A fact not aligned with the chain's sustainability goals.

## Water Waste with Conventional RO

*For every 1/2 gallon of brewed coffee, nearly 2 gallons of water goes to drain as waste.*



## Unnecessary waste water was costing the chain from \$13M to \$22M annually.

In a specialty coffee shop, there must be enough water to brew the espressos plus to steam and froth the milk for a large number of customers in a relatively short period of time. In addition, a store's ice machines, depending on the rate of pounds per day produced, can use a significant amount of water. It can take from 0.2 up to 2 gallons of water to produce one pound of ice in a commercial ice machine, so a 900 pound ice machine can require from 180 to 1,800 gallons of water per day.<sup>(5)</sup>

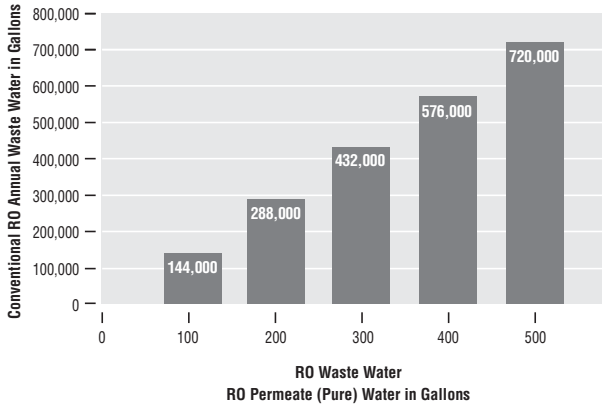
Most light commercial RO systems typically produce pure (also called permeate) water at a rate of about 0.5 gallon per minute, but this varies depending on the volume of dissolved minerals in the source water and the temperature of the water. In order for the store to have enough clean water on hand to meet peak demands, the RO system produces water in the off hours and stores it in a pressurized tank. This tank puts back pressure into the RO system which fights against the pressure being applied to force the water molecules through the RO membrane. This results in inefficiency and reduced output.

Membrane scaling is another problem with conventional RO systems. Scaling is mineral buildup on the membrane that over time clogs its pores and results in a loss of efficiency.

These two primary factors, along with others, result in conventional RO systems being only about 20% efficient. Which means that for every one gallon of pure RO water produced, nearly four gallons goes to drain as waste. For example, it takes 1,000 gallons of raw water to produce 200 gallons of pure water when a conventional RO system is used, with 800 gallons going to drain as waste water. Now imagine all this waste being applied to an entire year and across thousands of store locations. The numbers are staggering.

**Conventional RO Gallons to Drain per Location\***

With only 20% efficiency from a conventional system, a store that uses 200 gallons per day of RO water sends over 280,000 to drain annually.

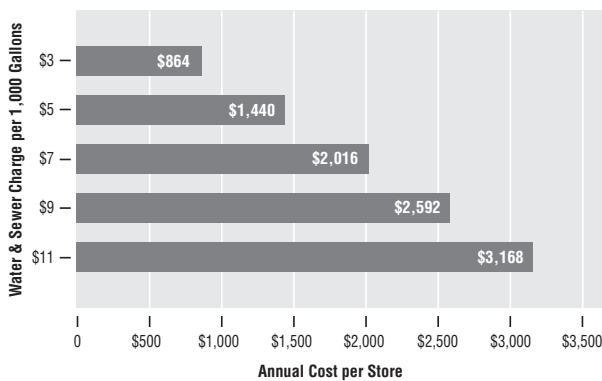


\*Based on 360 operating days.

The cost of commercial water and sewer varies considerably across the U.S., ranging from \$3.00 to \$14.00 per thousand gallons, and the cost is only going up. Between 2001 and 2006, municipal water rates rose by an average of 27% in the U.S., 32% in the United Kingdom, 45% in Australia, 50% in South Africa, 51% in Belgium, and 58% in Canada.<sup>(6)</sup> There are a number of reasons for these increases, but the main reason is that municipalities have maintained fixed consumer rates by using subsidies to cover rising water treatment costs. Today, cash strapped cities can no longer afford to do that.

If you use the 280,000 gallons of waste water example from the above graph when using a conventional RO system, and apply a cost of \$5.00 per 1,000 gallons, a store will spend \$1,400 annually on water and sewer. Apply that expense to a 1,000 store chain and that becomes \$1,400,000!

**Costs for Water with Conventional RO Systems\***



\*Based on 288,000 gallons of waste water annually (360 operating days).

Reducing this high volume of wasted water was a priority sustainability goal for the chain. An added benefit of reducing this waste was the enormous cost savings. And there didn't have to be any sacrifice in quality.

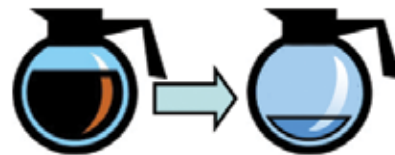
**The customer-supplier collaboration resulted in a 96% reduction in water waste from treating beverage water.**

Pentair worked closely with numerous individuals within the coffee chain, including the directors of sustainability and facilities, to develop a solution that reduced the water waste while maintaining the chain's water specification requirements. A process was followed that included an analysis of the water usage and volumes required by store locations, the brewing equipment used, store layouts and future water requirements.

Once the situation analysis was complete, Pentair's operations managers, product management and engineering teams were brought together to identify available solutions. At the time, Pentair had recently won the National Restaurant Association's Innovation Award for a new high efficiency RO system called the Everpure® MRS-600 HE. This new system was a breakthrough for the foodservice industry because unlike conventional RO systems, which as discussed previously are only about 20% efficient, this new system was nearly 80% efficient. Instead of sending four gallons to drain for every one gallon of pure water produced, the Everpure MRS-600 HE sends only 1/4 cup of water to drain for every one gallon of pure water delivered.

**The Pentair Solution:**

**MRS-600 Systems**  
 For every 1/2 gallon of brewed coffee, only 1/8 gallon of water goes to drain as waste.



While the MRS-600 HE's innovative technology offered significant water savings for the coffee chain, the previous situational analysis revealed that it wasn't the exact "right fit" they required. The system's gallons per day production wouldn't keep up with an individual store's daily water demands, and the coffee chain wanted integrated pre-filtration and carbon filtration for chlorine and particulate reduction.



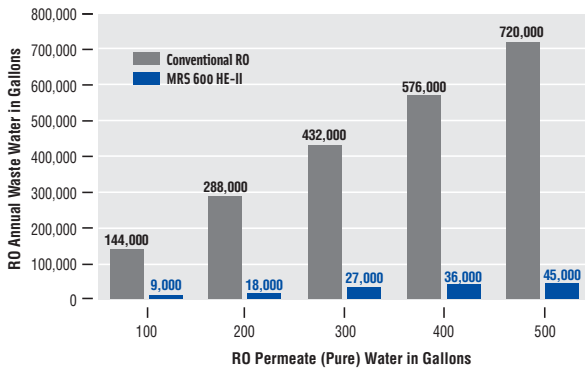
Pentair's engineers modified the system to include two permeate boost pumps instead of one dual-headed pump, a triple bank of pre-filtration cartridges for reducing sediment, oxidizers and scale to maximize RO membrane life, and dual 5-micron high capacity post-filters to further "polish" undesirables from water and to improve the taste and odor of the final product water.

Many of the coffee chain's stores already had water (ion exchange) softeners installed. Pentair was able to further boost the new RO system's efficiency and production by blending softened water with the RO pure water. This increased water production for the RO system by 15 - 20%.

The new system was named the MRS-600 HE-II. This system reduces each store's water waste by as much as 260,000 gallons per year. In 2009, the MRS 600 HE-II won the Specialty Coffee Association of America (SCAA) Sustainability Award.

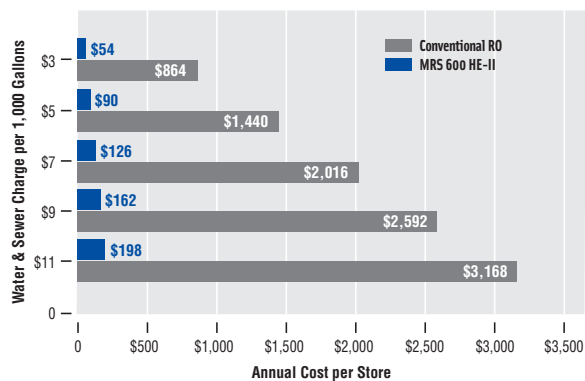
**The Pentair RO Gallons to Drain per Location\***

With 80% efficiency, a store that uses 200 gallons per day of RO water sends **only 18,000** to drain annually.



\*Based on 360 operating days.

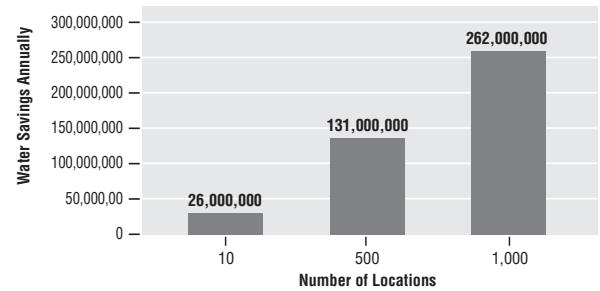
**Comparison of RO Annual Cost for Water & Sewer\***



\*Based on Conventional RO water waste of 288,000 gallons and MRS 600 HE-II water waste of 18,000 annually (360 operating days).

**Total Water Savings**

Converting from a conventional RO system to a high efficiency MRS 600 HE-II RO system can save approximately 260,000 gallons annually per store. Applied across all store locations, and the savings are dramatic.



Today, the coffee chain is rolling out the MRS-600 HE-II RO system across all of its stores. The Pentair Project Management Team is working closely with the chain's operations and facilities teams to coordinate a worldwide store conversion to high efficiency reverse osmosis water treatment technology.

The solution developed by Pentair is helping the coffee chain meet its water conservation target of reducing water consumption by 25%, while still maintaining the high water quality requirements for the chain's premium coffee and espresso drinks. Today, the chain has already reached 22% of their goal. The chain could also enjoy savings on water and sewer charges of \$13M to \$22M across all locations.

If you would like to learn more about how Pentair has helped businesses around the world with innovative water and fluid solutions, or how we can do the same for your business, please contact Pentair Foodservice at 800-942-1153 or sustainable\_solutions@pentair.com.

**Sources:**

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