

The Power of Water

By Paul Gagliardo, MPH, PE www.thewaterentrepreneur.org

Flowing water is unbelievably powerful. A small river can deeply etch rock into a canyon, turn an arid desert into a Garden of Eden and generate enough power to electrify a city. It is also a universal solvent because more substances dissolve in water than any other liquid. This has to do with the polarity of the water molecule where it can attract both positive and negative ions. Focusing political will, regulatory mandates and infrastructure funding on water supply and management issues can solve many problems we face as a society.

The 2021 City Water Optimization Index Report reviewed the status of water systems in 51 cities and found that more than half had non-revenue water levels of at least 25%. A dozen had NRW levels of over 40%. Many of these cities are in high water stress areas. According to the UN a territory that withdraws 25% of its renewable freshwater resources it is said to be 'water-stressed'. Projections from the World Resources Institute for 2040 show the problem will get worse. The Economist Intelligence Unit states that 44 countries will face either "extremely high" or "high" water-stress levels by 2040.

There are over 2.2 million miles (3.5 million km) of water distribution system piping in the United States, delivering 39 billion of gallons (171,800 mega liters) of water each day for public use. It is estimated that 6 billion gallons (26,400 mega liters) per day, or 15.3%, of that is lost to leakage from ageing pipelines. Some of this is leakage that surfaces and can be identified and fixed, and some is non-surfacing leakage. The non-surfacing leakage is the recalcitrant water loss that causes the bulk of the issue.

Reducing this real water loss has value well beyond the saving of water. Customers save money due to the lower net cost of water production. It benefits workers and the economy by creating thousands of new good paying jobs repairing pipelines. It effectively creates a new water supply that can be used to support residential population growth, industrial and commercial activities, and agricultural activities, or, can provide environmental benefits. It also reduces the overall energy footprint of the municipal water sector. It is estimated that it takes 3340 kWh per million gallons (760 kWh per mega liter) to treat and distribute drinking water to US customers. It takes 270 gallons (1020 Liters) , or 6.4 barrels, of oil to produce the electricity needed to treat and deliver one MGD of water to the public. The EPA calculates that 1.4 metric tons (1400 kg) of carbon dioxide equivalent greenhouse gas is created per million gallons (3.8 mega liters) of water delivered.

If the real water loss from the US potable water system can be reduced to 10% from its current rate almost 2 billion gallons (7570 mega liters) of water per day will be saved. This equates to 12,800 barrels of oil per day or 4.7 million barrels of oil per year. In addition, 2800 metric tons (2.8 million kg) per day, or 1 million tons per year, of GHG emissions would be eliminated.

Governments can institute incentives or mandates like car fuel efficiency standards related to maximum loss rates from water systems. Direct grant or loan programs can incentivize utilities to act as was done in the 1970's pursuant to the United States Clean Water Act. A program such as this would encourage and accelerate water resource stewardship, promote economic development through the addition of raw material to industrial, commercial, and agricultural endeavors, reduce customer utility costs, create good paying jobs, reduce dependence on imported oil and reduce GHG emissions. It can slow or reverse the trend toward elevated water stress situations. The power of flowing water is great but the impact of plugging leaks and stopping that flow can be greater. This is a universal infrastructure program we should all support.