Water Consumption Savings System

USA Water Sewer Management Solutions, LLC

201-525-0066

Water Management

***Saving money and energy through proprietary technology**

***Realistic, conservative savings of 20% or higher on Water & Sewer**

***Ability to minimize capital expenditures through energy savings**

***No cost installation and guaranteed performance by Master Plumbers and Engineers**

***Helping to reduce costs and save precious resources**

"THE CLEAN TECHNOLOGY ALTERNATIVE TO WATER SAVINGS"

Nation's water costs rushing higher

While most Americans worry about gas and heating oil prices, water & sewer rates have surged in the past dozen years. Prices at least doubled in more than a quarter of locations and even tripled in a few.

Businesses and Facilities could easily overlook the steady rise in water rate hikes, yet the cost of Water and Sewer have outpaced other Utilities taking over a larger piece of annual budgets.

Finally, there is a way to reduce the costs of Water and Sewer with new cost effective technology from USA Water Sewer Management Solutions, LLC.

Water- A Precious Resource

AIR & Its Impact on a Water and Wastewater System

One of the most misunderstood aspects of the Water & Wastewater industry is the presence of air in a pipeline and its impact on operations. Many operational problems, especially at the time of initial start-up, including broken pumps, valves and pipe, as well as faulty instrumentation readings, are blamed on inadequate thrust blocking, improper pipeline bedding, etc. In reality, many of these problems are not caused by improper installation of the line, but by failure to de-aerate the line. Properly de-aerating your pipeline will safeguard it from air-related problems, however if no steps are taken to accomplish this, you should be ready for trouble.

SOURCES OF AIR

Air in a pressurized, operating pipeline comes from three primary sources. First, prior to start-up, the line is not empty - it is full of air. To entirely fill a pipeline with fluid, it is necessary to eliminate this air. As the line fills, much of this air will be pushed downstream to be released through hydrants, faucets, etc. but a large amount will become trapped at system high points (Figure 1). This phenomenon will occur because air is lighter than water

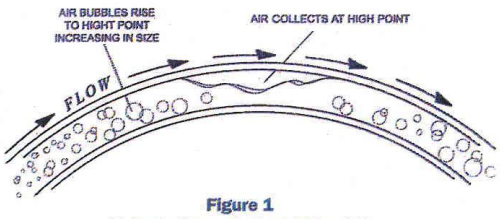

Figure 1
Air in pipeline collects at high points

and therefore, will collect at the high points. This air will continuously be added to by the second and third sources as the system continues operation.

Source number two is the water itself. Water contains approximately 2% air by volume. During system operation, the entrained air will continuously separate out of the water and once again accumulate at system high points. To illustrate the potential massive amount of air this 2% represents, consider the following: A 1000 ft. length of pipe could contain a pocket of air 20 ft. long if all the air accumulated in one location. Or a one mile length of pipe could contain a 100 ft. pocket of air. This would be true regardless of the diameter of the pipe.

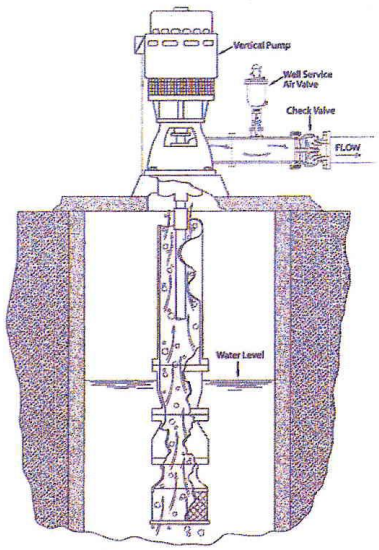

Figure 2
Air entering through mechanical equipment

The third source of air is that which enters through mechanical equipment (Figure 2). This includes air being forced into the system by pumps as well as air being drawn in through packing, valves, etc. under vacuum conditions. As one can see, a pressurized pipeline is never without air and typically the volume is substantial.

IMPACT OF AIR ON SYSTEM

Now that we have identified the air sources, let us consider their impact on the system. Two problems are apparent. The pocket(s) of air accumulating at a high point(s) can result in a line restriction (Figure 3). Like any restriction, the

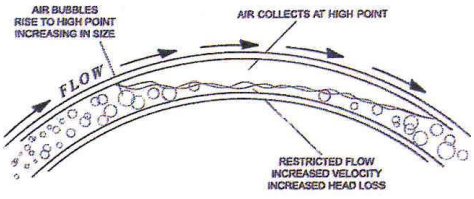

Figure 3
Air pockets can lead to line restriction

"Air in a pressurized pipeline is a serious concern. Obviously, its removal will result in a more efficient, cost effective operation and potentially avoid more serious problems."

pocket(s) of air increases headloss, extends pumping cycles and increases energy consumption. The presence of air can also promote corrosion of pipe and fittings. As air continues to accumulate at system high points, the fluid velocity increases as the fluid is forced through a smaller and smaller opening.

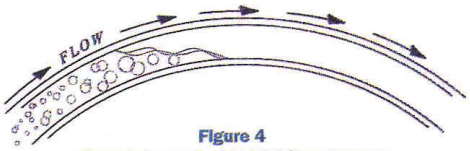

Figure 4
Air pockets can lead to total flow stoppage

As the pocket(s) grows, one of two phenomena will occur. The first possibility is a total flow stoppage (Figure 4). If system dynamics are such that the air cannot be continuously removed by the increased fluid velocity and pushed downstream, then this could happen. As the pocket(s) continues to accumulate air, a pressure drop higher than pump capacity can develop and stop all flow.

The second, and more likely occurrence, is that the increased velocity will cause all, or part of, the pocket to suddenly dislodge and be pushed downstream (Figure 5). The sudden and rapid change in fluid velocity when the pocket dislodges and is then stopped by another high point, can and often will, lead to a high pressure surge (water hammer). Serious damage to valves, fittings, gaskets, or even breakage of the line can occur. This is the most serious of the possible consequences of air being allowed to accumulate in system high points.

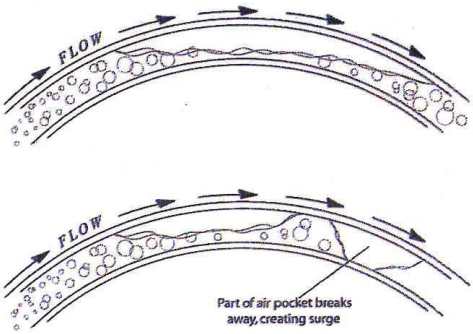

Figure 5
Air pockets can lead to surges in the line

HISTORICAL SOLUTIONS

As we can see, air in a pressurized pipeline is a serious concern. Obviously, its removal will result in a more efficient, cost effective operation and potentially avoid more serious problems. In the early 1900's, engineers and water works personnel started developing an understanding of the problems associated with air and the search for a solution began. Some depended on standpipes, believing that a large portion of the air would be expelled through them.

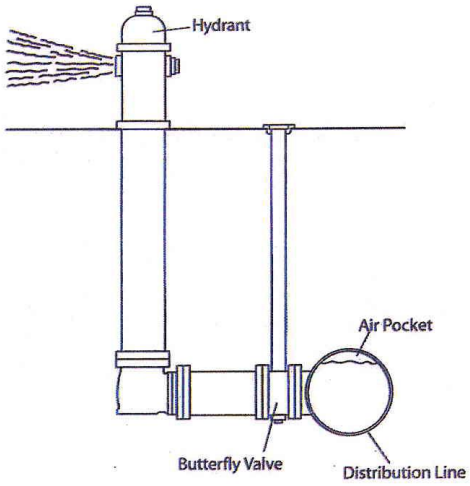

Figure 6
Opening a hydrant may not eliminate air pockets

Many began placing gate or ball valves at system high points to manually bleed off accumulated air. Unfortunately, it has proved impossible to predict when it is time to bleed the air. This proved impractical, especially on larger systems. Open fire hydrants (Figure 6) are frequently used under the assumption that all air in the pipeline will be released. Unfortunately, hydrants are generally connected to the side of the pipe, leaving air trapped at the top and at system high points. It should be noted that there are still municipalities using these methods.