



## **What Reclaimed Water Users Should Know About Flushometer Performance in Harsher Water Conditions**

*Commercial facilities using reclaimed water for flushing toilets and urinals should be mindful of the negative impact this harsher water can have on plumbing systems such as flushometers. New Sloan flushometers, which have been specifically engineered for reclaimed water applications, build on the standard Royal® diaphragm flushometers with their semi-red brass bodies to, provide an even higher level of operating performance.*

All the water that is currently on the Earth is all the water that we will ever have. The Earth's water is used and reused constantly in a never-ending cycle. As our population grows, and increasing water demands tax the limited supply of this precious resource, it is clear that conservation alone cannot sufficiently meet our existing and future water needs.

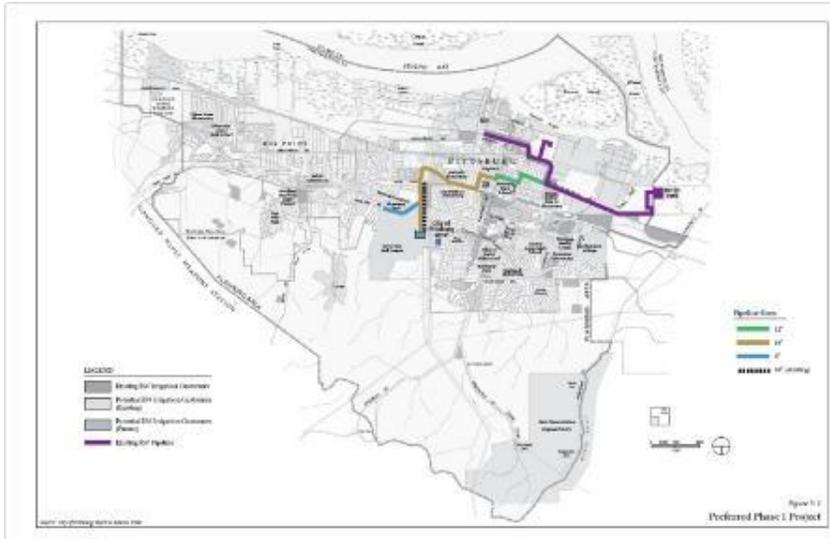
Water scarcity is a pressing issue for communities, urban planners, developers and others, particularly in arid regions and metropolitan areas across the U.S. Even for those who are currently in areas with more abundant water resources will in years to come find that they, too, cannot afford to ignore their responsibilities in using water more wisely.

### **Reclaimed Water Makes Sense for Flushing**

The drive for smarter uses of water has been behind certain initiatives to incorporate what some refer to as greywater. Reclaimed water is a preferable term for this green resource, however, because it indicates a purposeful action to recycle water for certain non-potable applications.

In fact, some communities and companies are already demonstrating that it is entirely possible and feasible to reuse water for certain applications. Water reuse for flushing toilets/urinals and for irrigation have proven to be the most popular applications thus far, although there are many other options, such as for manufacturing processes and heating and cooling systems.

Many groups and code authorities recognize reclaimed water as an appropriate and environmentally responsible means for flushing human waste. Few areas in the U.S. are using reclaimed water so far. Municipalities that do offer reclaimed water service may only have the means to deliver reclaimed water to select commercial customers within range of their pipelines (see Pittsburg, Calif., purple pipeline map). Reclaimed water usage will accelerate, however.



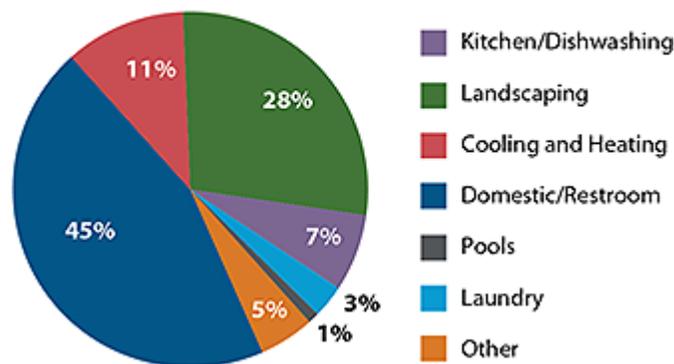
*Map of the Purple Pipeline through Pittsburg, CA*

San Francisco has one of the most comprehensive building codes regarding reclaimed water: Its code now mandates that any new construction or substantially renovated structure over three stories must provide separate piping to supply non-potable water—even if there are no immediate plans for its use.

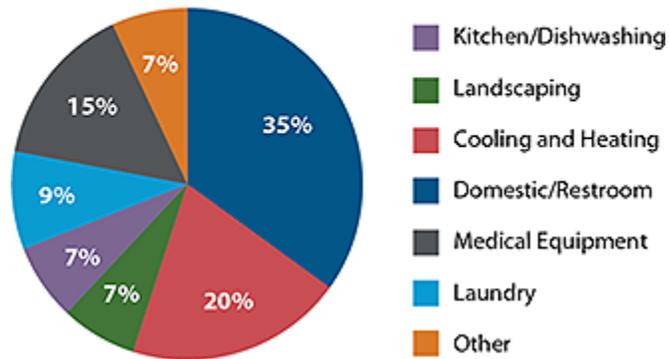
Other select municipalities and water districts across the U.S., most notably in Florida, Texas, Arizona and elsewhere in California, have adopted rules and regulations regarding the use of reclaimed water. Florida, in particular, has far-reaching water re-use programs: As of 2012, 49% of the state’s treated wastewater was reclaimed and reused. In other states, however, usage is far lower. Despite the low usage thus far, many states allow toilet and urinal flushing with reclaimed water, including Georgia, Massachusetts, New Mexico and Idaho.

Committing to reclaimed water strategies will substantially reduce the stress on local water sources that impact individual commercial property owners as well as entire communities. Focusing on reclaimed water usage for toilet and urinal flushing is logical, especially given the fact that restrooms usually account for greater water usage than other areas within commercial and institutional facilities. According to the U.S. Environmental Protection Agency, restrooms consume about 37% of the total water usage in office buildings and 45% of the water in schools.

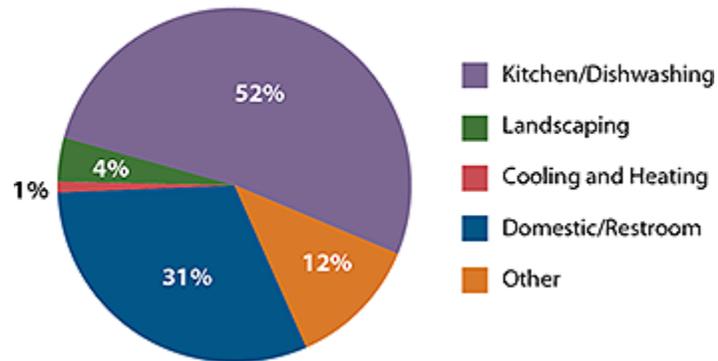
### End Uses of Water in Schools



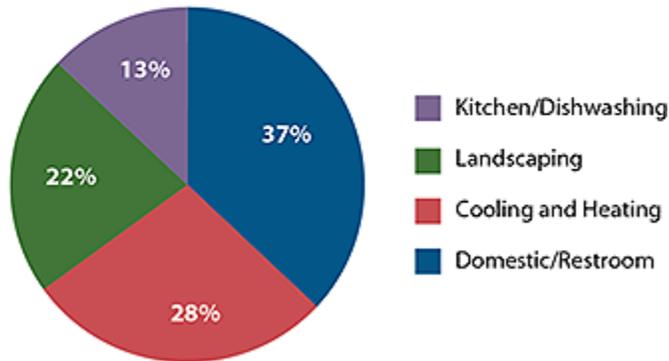
### End Uses of Water in Hospitals



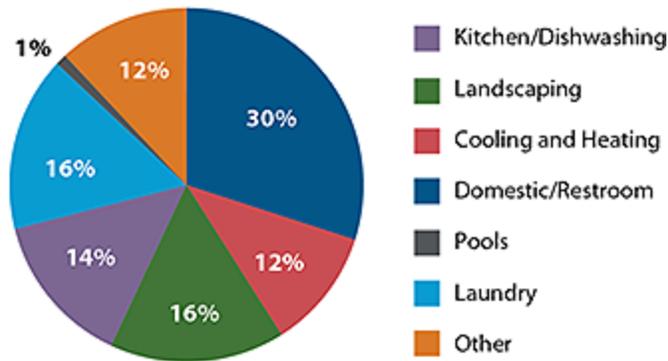
### End Uses of Water in Restaurants



### End Uses of Water in Office Buildings



## End Uses of Water in Hotels



Source: U.S. Environmental Protection Agency

Many plumbing manufacturers have up until now focused on reducing the amount of potable water toilets and urinals use to flush. Realistically, however, there is only so low a flushing fixture can go while maintaining satisfactory drainline carry. Once commercial facilities reach their lowest recommended per-fixture water consumption limit, further potable water savings must then come from other approaches. Reclaimed water offers an additional viable solution.

### Composition of Reclaimed Water

Various types of water affect plumbing systems differently, and the chemical composition and overall make-up of water can differ even within a single city. Above-ground fresh water sources such as rivers and springs, for instance, tend to have more dissolved oxygen than well waters, resulting in more zinc corrosion. Other factors impacting corrosion include water hardness, flow rate and temperature.

Likewise, reclaimed water originating from various water sources also differs in composition from place to place, and its quality varies significantly even within allowable guidelines. Reclaimed water generally has many types of particulates and more constituents, such as salts and minerals, which make it harder than potable water.

The main sources of reclaimed water are: municipal systems, harvested rainwater and stormwater, and water captured from lavatory sinks, showers and other indoor sources.

- Select municipalities pipe reclaimed water to its customers. Municipalities treat the water before distributing it, using many different chemicals and processes.
- Rainwater is relatively clean water coming from rooftops and other above-ground surfaces. On-site treatment may not be necessary before using rainwater for non-potable applications.
- Stormwater, which is rainwater that has hit the ground, is typically collected from parking lots and landscaped areas. Because stormwater may be contaminated with oil, road salt, fertilizers and more, it usually requires on-site filtration and cleaning.

- Sites may also choose to capture used water from lavatory sinks, showers and other indoor water-using sources. Permissible water re-use sources vary by municipality, and on-site filtration and cleaning is typically needed. Blackwater, which is the output from toilets, kitchen sinks, and sometimes, washing machines, is largely ineligible for re-use.

Although the state of California allows reclaimed water to be used untreated for subsurface irrigation, the water must be treated for all other applications. Treatment processes subject non-potable water to ammonia, chlorine and other harsh chemicals. Worse yet, treatment chemicals spike when water systems are shocked to disinfect the reclaimed water lines.

Most flushometers have simply not been designed to operate under these highly challenging water conditions.

### **Flushometers for Various Water Conditions**

Sloan has long understood the correlation between water characteristics and the operating effectiveness of plumbing systems. Although Sloan's extended testing and engineering have determined that piston flushometers are the best choice for certain environments, diaphragm-style flushometers are optimal for most water conditions, including many types of harsh environments. It would be a gross oversimplification to designate any single flushometer technology as being ideal for all water types and operating environments.

Whereas piston flushometers generally are the choice for weak or low-pressure water conditions, diaphragm models are the top choice across a wider range of water quality types and environments. Diaphragm flushometers are far better suited when using reclaimed water for flushing water closet and urinal fixtures because the diaphragm technology is more adept at handling water with high chloramine content and in overcoming back pressure that can occur with High-Efficiency Toilet and Urinal fixtures.

Moreover, diaphragm flushometers are engineered to operate with water containing sand, calcium deposits and other particulates more effectively than piston flushometers. This is partly due to the fact that the material composition of piston flushometers' main high-pressure seal is more prone to abrasion from such particulates, resulting in compromised flush performance and leaks. Dissolved and non-dissolved particulates also clog small orifices. Although specific components within any flushometer will slowly deteriorate over time, the diaphragm technology is designed to endure harsh water conditions and resist abrasive forces.

Having a flushometer that can operate well in the presence of particulate matter is critical, because reclaimed water is far more likely than potable water to contain particulates, even within the same facility. Simply put, reclaimed water environments can cause a flushometer that is not engineered to work in these harsher operating conditions to malfunction or operate inefficiently.

For a broader discussion of the diaphragm vs. piston flushometer technology issue, please refer to the white paper, *Diaphragm or Piston Flushometers? It Depends...*, at: [http://sloanvalve.com/Water\\_Efficiency/SLV3583-Diaphragm\\_Piston\\_White-Paper.pdf](http://sloanvalve.com/Water_Efficiency/SLV3583-Diaphragm_Piston_White-Paper.pdf).

## **Flushometers Designed for Reclaimed Water**

Hard water, salinity and other factors all negatively impact flushometers. It only stands to reason that reclaimed water would also prove more difficult for valves. This logic is not simply theoretical, however.

To understand the specific affects of reclaimed water on flushometers, Sloan subjected its flushometers, as well as competitive models, to rigorous laboratory and field testing. Sloan has conducted tests with both potable water, as is standard in most commercial buildings, and with reclaimed water that has been chemically treated, as required, for flushing water closets and urinals.

Among the test conclusions: **Reclaimed water takes a significantly greater toll on the longevity and performance of flushometers than fresh water.**

To mitigate longevity and performance degradation, manufacturers must specifically engineer flushometers to operate successfully with reclaimed water. ***Standard diaphragm flushometers that have been designed for use with potable water do operate sufficiently with reclaimed water, but cannot be expected to last as long or perform as well as they do with potable water.***

The composition of reclaimed water makes it highly advisable to install flushometers that can withstand dezincification, a dealloying process that results from leaching zinc from brass. Dezincification eventually leads to mechanical weaknesses—the central focus of failures in reclaimed water environments.

Semi-red brass construction, which has superior dezincification properties, is but one of the flushometer design features ensuring proper performance in reclaimed water environments. Flushometers made of semi-red brass have already proven to hold up satisfactorily in reclaimed water sites. ***Because Sloan uses a high copper, semi-red brass, its flushometers have a much greater ability to withstand the attacks on the metal that reclaimed water conditions can cause*** as opposed to a yellow brass flushometer that is higher in zinc.

## **Modifications to Improve Performance, Longevity**

Flushometers comprise numerous material types and mechanical parts, however. Following laboratory and field testing, which analyzed and checked every flushometer piece and part exposed to water for behavior in challenging water conditions, Sloan engineers have made additional internal modifications to the standard Royal flushometer body and its non-brass components. ***These improvements enable these new reclaimed water flushometers to operate far more effectively and efficiently with reclaimed water over the long term than competitive flushometers on the market.***

Another key component to engineering flushometers to better withstand sustained, reclaimed water exposure is incorporating diaphragm components made of Permex<sup>®</sup> synthetic rubber instead of natural rubber. Sloan had switched many of its internal flushometer parts to Permex years ago because the synthetic rubber is more reliable in harsh potable water environments; reclaimed water further intensifies the need for plumbing components that successfully resist chlorine and other chemicals. For its reclaimed water flushometers, Sloan has completely eliminated natural rubber components.

Sloan has also adopted the industry-standard purple color, which is used on water district/municipal water lines and other systems using reclaimed water, as mandated by both the Uniform Plumbing Code and the International Plumbing Code. Architects, engineers, code officials and other professionals familiar with reclaimed water systems immediately recognize the significance of purple to identify reclaimed water lines as opposed to lines conveying potable water and other utilities.

A number of components within each Sloan reclaimed water flushometer are purple, including the flange, the diaphragm guide, the inner cover and optionally the handle. This color marking, along with a wall plate adjacent to each flushometer that denotes the fixture's use of reclaimed water, will provide a visual cue to separate reclaimed water flushometers from standard



### **Benefits in Spite of Challenges**

Flushometers engineered specifically for use with reclaimed water are successfully positioned to overcome some of the long-term, point-of-use challenges accompanying these applications. Engineers and facilities owners should be aware, however, that depending on the type and source of their reclaimed water, it may be incumbent on them to filter or disinfect the water onsite. (Check with your local water district or municipality for more information.)

Canada, which has been at the forefront of reclaimed water usage in North America, can lend examples of water management, treatment and service best practices. (Refer to Health Canada guidelines for safely monitoring and maintaining reclaimed water: [http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/reclaimed\\_water-eaux\\_recyclees/index-eng.php#executive](http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/reclaimed_water-eaux_recyclees/index-eng.php#executive)).

Additionally, reclaimed water flushometers require just as much service and maintenance as any other flushometer on the market—or possibly more, due to the harsh water conditions—and should be checked periodically to retain high performance levels.

### **Conclusion**

Although the idea of using reclaimed water is new to most U.S. commercial water users, and its adoption will cause some growing pains, Sloan believes that further reclaimed water usage is critical and inevitable. Reclaimed water applications efficiently conserve our precious and limited fresh water supply that should be reserved for necessary potable applications.

Sloan understands that the plumbing used for these applications must adapt to step up to the challenge. Existing diaphragm flushometers made of semi-red brass have heretofore been the best solution for flushing with reclaimed water. New reclaimed water diaphragm flushometers, which have been specifically engineered to accommodate these more challenging water environments, offer even greater performance and longevity for commercial facilities.

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