US $12.50

July/August 2012 — Volume 34, Number 4

SPONSOR OF IAPMO UNIFORM CODES

OFFICIAL

THE PREMIER SOURCE OF PLUMBING AND MECHANICAL NEWS SINCE 1958

LOST GENERATION

It's been 75 years since the tragic gas explosion at New London School forever changed the way natural gas is delivered to homes, schools and places of business

OTHER FEATURES:

- Industry Leaders, World Champions
- Altered States?
- Pitching Inside
- More or Less?
- Emerging Technology Symposium Tackles 'Great Challenges'
- Young Artists Celebrate World Plumbing Day

2011 APEX AWARDS FOR PUBLICATION EXCELLENCE

COMMUNICATOR AWARD WINNER

More or Less?

STUDIES FIND THAT ACTUAL RESULTS CONTRADICT EFFICIENCY CLAIMS ABOUT SENSOR-ACTIVATED VALVES

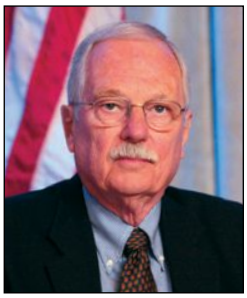

PHOTO BY JEFF ORTIZ

"No decrease in water demands when the flush valves were converted to sensor-operated did not come as a surprise."

JOHN KOELLER, P.E.
KOELLER AND COMPANY

Opposite page: A significant increase in water demands occurs when manually operated plumbing fixtures are converted to sensor-activated "touch-free" models.

Story by John Koeller, P.E., and William Gauley, P.E.

Over the years, there has been much debate among North American water efficiency professionals, manufacturers, green building advocates, and others regarding the water savings associated with using sensor-activated valves (also known as "hands-free" or "touch-free" valves) in restrooms. This includes the three main types of valves found in commercial restroom facilities, i.e., flush valves for urinals, flush valves for toilets, and flow control valves for tapware (faucets). While it is commonly accepted that these sensor valves are more hygienic than manually operated valves, there remains some question as to whether or not they are more water efficient.

Because of this uncertainty, our team selected a multi-tenant office tower building in Hillsborough County, Fla., as an ideal candidate to study the "real world" situation. The purpose of the project was to evaluate the effectiveness of sensor-operated valves to save water. The project included a comprehensive pre- and post-auditing program involving physical inspections, sub-metering, data logging, and maintenance staff surveys. It evaluated changes in water demands when manually operated toilet and urinal flush valves and faucets were replaced with sensor-operated fixtures. The study was conducted over a 23-month period beginning February 2007 and concluding January 2009.

To help quantify any change to washroom water demands related to the introduction of sensor-activated plumbing fixtures, the project was divided into four phases:

- **PHASE 1:** pre-monitor water demands of washrooms with existing manually operated fixtures
- **PHASE 2:** monitor water demands after manual faucets replaced by sensor-activated tapware,
- **PHASE 3:** monitor water demands after manual urinal flush valves replaced by sensor-activated valves, and
- **PHASE 4:** monitor water demands after manual toilet flush valves replaced by sensor-activated valves.

While the results achieved in this relatively small-scale project may not necessarily be indicative of results that might occur in other projects, they clearly indicate a significant increase in water demands when manually operated plumbing fixtures were converted to sensor-activated "touch-free" models. The total average daily demand of the men's and ladies' washrooms almost doubled from 654 gallons (2,475 liters) to 1,243 gallons (4,700 liters) per day when all faucets, urinals, and toilets were converted to sensor-activated units.

That there was no decrease in water demands when the flush valves were converted to sensor-operated did not come as a surprise, as one would not expect there to be fewer flushes with sensor-activated fixtures (most of us have experienced "phantom flushes" with sensor valves, something that does not occur with manual valves). However, the measured increase of 54 percent in water demands when sensor-activated toilet flush valves were installed was much higher than expected. As for the faucets, water demands increased by 31 percent when "touch-free" fixtures replaced the manual fixtures.

Prior to Hillsborough, two other studies had been performed that also indicated sensor-activated faucets in public settings were not water savers.

The writers believe there is little doubt that automatic sensor-activated taps are not the optimum choice when it comes to water efficiency.

PHOTO COURTESY OF PLUMBING CONNECTION MAGAZINE

Thames Water Research & Technology conducted the first of those studies in 2000 at the Millennium Dome in London. Over the period of one year, tap (faucet) use was measured for 240 taps, including both manual and infrared (sensor-operated) fixtures. Results showed the following:

AVERAGE WATER USE PER USER VISIT:
- **Manual** – 0.24 gallons (0.9 liters)
- **Infrared** – 0.5 gallons (1.8 liters)
- **Increase** – 100 percent

The study summarizes faucets use with this statement: "Surprisingly over the year the conventional swivel top (manual) taps used significantly less water than the purported more efficient types, with each user of the swivel top (manual) taps using, on average, just less than 1 liter of water."

The second study was conducted in 1997-1999 and was directed at photovoltaic water heating. As part of the analysis, faucet use was again measured for one year each for manual and sensor-activated units. The following results are for faucets rated at 2.2 gallons per minute (gpm), which equals 8.3 liters per minute (Lpm):

AVERAGE HOT WATER CONSUMPTION PER DAY PER WASHROOM (LITRES):
- **Manual** – 98 gallons (372 liters)
- **Infrared** – 155 gallons (586 liters)
- **Increase** – 58 percent

Study reports for all three projects may be downloaded from our MaP testing Website: http://www.maptesting.com/view/reports.html#faucets.

Unfortunately, manufacturers in North America continue to claim "touchless" faucets save water. The results of the studies referenced above clearly contradict those claims. There is little doubt that automatic sensor-activated faucets are not the optimum choice when it comes to water efficiency. However, the question remains: why is the intuitive choice for automatic faucets not necessarily the water-efficient choice? One reason is that automatic sensor-activated faucets are set to open at their full flow rate (average of 1.2 gpm-4.6 Lpm in the case of the Hillsborough study) while manually operated faucets are typically used at flow rates much less than 0.8 gpm-3.0 Lpm (users rarely fully open manual faucets, possibly to avoid splashing).

It should be noted that the U.S. national standard (ASME A112.18.1-2011/CSA B125.1-11) for faucets installed in non-residential installations (such as in the Hillsborough building) sets a maximum flow rate of 0.5 gpm (1.9 Lpm). Other studies have shown that if both manual and sensor-activated faucets are fitted with 0.5 gpm-1.9 Lpm flow regulators, water use will be virtually the same. A disadvantage of the maximum 0.5 gpm-1.9 Lpm flow rate for commercial installations, however, is the likelihood that hot water may never arrive at the tap in most circumstances.

In conclusion, we recommend that manufacturers of sensor-activated valves and faucets promote these products based upon their true attributes, hygiene and touch-free convenience, rather than fictitious water use efficiency claims.

This article has been reproduced with permission from *Plumbing Connection Magazine*, Autumn 2012.

HTTP://WWW.CONNECTION-MAGAZINES.COM.AU/PC_MORE.HTML