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Hospitality

Water quality treatment trends

Thoughts on salt based softeners versus physical water conditioners pg. 66

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New trends in water treatment in the hospitality sector

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Anyone who stays in a hotel will know that the one thing that you look at every morning is the shower head. How many times have you seen a scaled up shower head?

If you live in a hard water area you are probably used to seeing scale. But, if you are someone from a soft water area, a New Yorker or Japanese tourist, then you might think, "Yuck! This place is dirty!"

Scale can cause a very negative guest experience. Las Vegas, arguably the hospitality capital of the world, has very hard water, but it is amazing how many hotels don't treat it and accept that shower heads are going to scale up. Even some of the top, five-star hotels accept scale as a natural consequence of their location and do little or nothing to protect against it. Good housekeeping and replacement of deteriorating shower heads is necessary for hygiene, but it is costly and time consuming.

Mostly the reason for not treating hard water is because the conventional method of using ion exchange softeners has a number of drawbacks. The plant is expensive and takes up a lot of space. Buying and storing salt is costly, and if brine tanks are in the same plant room as gas water heaters corrosion and failure of the heaters is very common. Some people don't like that "luxury" or "slippery" feel of the water. Also, if cold water services are softened then the water can taste pretty unpleasant too. Sodium in softened water is not good for you, whereas the calcium it has replaced is actually health-giving.

The attitude amongst many in the hospitality sector in the U.S. is either you have a salt based softener, or you have nothing and you learn to live with the consequences.

In Europe, attitudes are very different, and for many years softer alternatives, Physical Water Conditioners (PWCs), have increased in use to the point now that conventional softeners are seldom specified and very rarely on their own without additional treatment from PWCs.

In the U.S., it is common that softeners are specified to treat only the hot water services, leaving the cold water untreated and hard. This is done not only to save money, but also to reduce sodium in the potable water. The problem of this approach is that even with the hot water softened, scaling still occurs on shower heads, faucets, and work tops, as well as on mixing valves and other appliances. When the hard cold water mixes with the softened hot water, the temperature rise or pressure drop such as in a shower head causes the scale to precipitate. This can stop blending valves from working correctly and leaves unsightly scale on surfaces in guest rooms. The mixed water comes back through the hot water return to water heaters and will cause scaling over a period of time, even though the hot water is being fully softened. A simple way around this problem is to fit PWCs on the cold water services, even when a salt type softener is treating the hot water.

PWCs generally work by creating nucleation seeds in suspension in the water so that scale forms as a suspended powder rather than encrusting surfaces. The scale is still created, but it doesn't stick to surfaces in the way it normally would. The scale formed is a soft powder that stays in suspension in the water as it is washed through the system. It is relatively inert and does not react with soaps to form a scum.

An example of a PWC is the British Aqua-Rex, which



Las Vegas Hotel Valve
in February 2009.



Las Vegas Hotel Valve in June 2009.

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Las Vegas Hotel Valve in December 2014.

uses ultra-high frequency radio waves that travel in the water, both upstream and downstream from the point of installation. These radio waves encourage scale to nucleate on other minerals already in solution in the water, such as iron. A side effect is that it will also break down existing scale within the plumbing system and on exterior surfaces. A heavily scaled property can thus be cleaned in a few weeks, reducing Legionella risk as it removes the scale habitat, and improving flow rates and water pressure. A third effect is that it stimulates scale formation in suspension to such an extent that more scale forms than would otherwise occur, leaving less dissolved calcium in the water. This means that the hot water is chemically softer and it thus produces more lather; effectively delivering most of the benefits of a conventional softener without the extra sodium and without the “slippery” feel that many people dislike.

Aqua-Rex has been used in a number of luxury Las Vegas hotels over the last five years. One of the common problems, not unique to Vegas, is scaling in butterfly valves and backflow preventers. In the photos that accompany this article, a typical scaled valve from the hot services is shown. For evaluation, it was fitted on a cold water line downstream of where an Aqua-Rex 2-inch unit was installed. Ten weeks later, the valve was removed for inspection and the scale fell off.

As a result of this trial, a total of 10 6-inch units were installed in the hotel tower, which has 2,700 rooms on 45 floors; two units were installed in each of the five pressure zones. The total cost was less than \$80,000 and this is a one-off expense with no maintenance or consumables required. Some three years after the initial installation, a few valves were pulled out for servicing and they were found to be completely clean of any scale.



Showerhead in 5-star Las Vegas hotel.



Scale on a worktop around a faucet fed with softened water.

The Cosmopolitan of Las Vegas is a 3,000-room resort casino with two hotel towers, a casino, a convention center, and numerous other facilities. Apart from the kitchens, no water softening was provided at the time of construction, and scaling in the plate heat exchangers quickly became apparent after the hotel opened at the end of 2010. Aqua-Rex units were installed on each of the heat exchanger packs and later on the electric water heaters on the hot water return lines in the towers at a total cost of around \$70,000. The scaling problems in the plant rooms were quickly resolved and once the recirculating systems in the towers were treated, scaling on the shower heads and work tops was significantly reduced.

Housekeeping found that any deposits on the shower heads could be easily brushed away with a light brush. Normally, they would have had engineering replace the shower head for an acid descale, but now they found that with a light brush they could restore them to perfection. Where high quality marble worktops are specified, it is difficult to clean them without damaging the surface so it is very common to find scale on a worktop around a faucet. Housekeeping at the Cosmopolitan found that a toothbrush could easily remove this scale after treatment. This significantly improved the look of the bathrooms on the property and saved money on shower head replacement.

The Panorama Towers in Las Vegas is a 635 unit luxury high rise condominium of two towers. Conventional softeners were installed on the hot water services at the time of construction in 2006, but by 2013 a major replacement of the softeners was required. Aqua-Rex was trialled on one of the three pressure zones in one of the towers. After six months, it was found there was no scale in the water heaters and there was less scale apparent in the residential units. The PWCs were treating both cold and hot services whereas before only the hot was treated.

Subsequent installation throughout both towers cost around \$50,000, which is the only expenditure required over the warranted 20-year life of the units. Cost savings compared with the expected expenditure on the softeners in the first year was evaluated at \$168,000, and over three years the anticipated savings are around \$500,000.

These examples show how PWCs can solve most of the issues caused by hard water and scale in large hospitality installations. The installation costs are low and the ongoing maintenance and servicing costs can be eliminated entirely. Most PWCs require minimal space and can be installed in

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The Water Softener Alternative

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existing plant rooms with minimal disturbance. The space normally used by conventional softeners can be released for use for other purposes, increasing rental income and guest facilities.

The objections raised about PWCs are commonly that they are new and untried technology. This may apply to some types of PWCs but not to others which have an exemplary track record of performance in Europe over at least a 20-year period. In the UK now it is difficult to find an engineering consultant that does not regularly specify PWCs. Probably 90 percent of hard water treatment is done by PWCs and softeners on their own are seldom used except for niche water treatment of RO's and steam generating plant.

The move away from softeners in the U.S. is being driven not just by cost savings but also for environmental reasons. Self-regenerating salt softeners waste precious water and discharge chloride contaminated water. In many parts of the country, especially the southwest, water saving is no longer an option, it is mandatory. Worse still, the high chloride content of the waste water from a softener restricts how it can be reused encouraging many water authorities to ban self-regenerating water softeners. The common defense from the softener industry is to say that there are no effective alternatives and that people should switch to more efficient, new softeners. The European experience proves that there are effective alternatives and plumbing engineers should be at the forefront of those demanding that PWCs are used in addition to softeners if not in place of them.

The other major consideration for PWCs is that they are generally significantly less expensive to install than softeners and most importantly many are "fit and forget," requiring no servicing or maintenance. This means that there is no longer the need to ask the questions: Is the water so hard that we need a softener? Can we afford it in the budget? Will the client want to maintain it?

The PWC option doesn't need any decisions like these. If a project is in a hard water area then it makes sense always to install a PWC. The client is bound to recover the initial cost very quickly by saving on plant maintenance and servicing. In the hospitality sector, the improvement in terms of guest satisfaction is also very significant, and savings are made on housekeeping time and engineering backup. In the UK, the building codes require all hard water over 12 grains be treated before it goes into a water heater. This requirement would not be possible without PWCs, which contribute major environmental benefits.

I often get asked why the U.S. is so far behind Europe in embracing PWC technology. The answer is simple. The softener manufacturers can't afford to allow it to succeed. The softener industry embodied in the Water Quality Association still will not accept scientific research placed in front of them and maintain the position that there is no scientific evidence that PWC's actually work. There is plenty of scientific research on the subject. There are still some unknowns but the main piece of evidence has to be the huge level of acceptance in Europe in the actual market place. There is no doubt that there are some pretty poor PWC technologies being offered, but it will be the plumbing engineer's role to recommend the good rather than the indifferent. ■