BY MARK EVANS

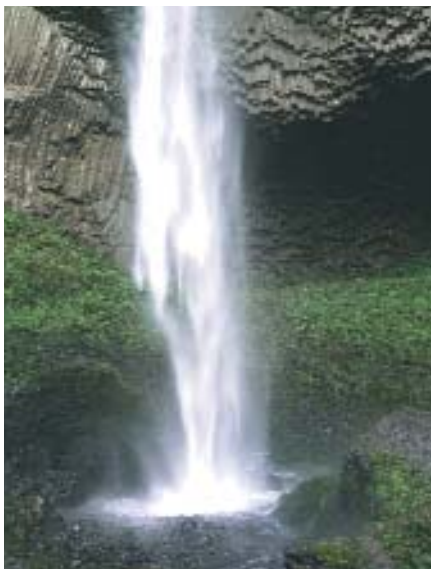
WASTE NOT WANT NOT

One of the latest design trends in Europe is the "passive house" concept. A simple analogy is the camper who leaves little or no evidence of having been a visitor to the forest. In North America we have coined the term sustainable design to describe the emergence of such practices.

An internet search for "sustainable design" produced 1.2 million references; as such it is fair to say a lot of interest exists in this concept. But how much of this technology is real and what kind of business potential does it represent for the plumbing industry?

Water and water related systems are literally the lifeblood of our industry. Given this fact, how much do we really know about the acquisition, treatment, distribution, consumption and disposal of water products? Could the plumbing industry derive more economic benefit from this cycle?

Let's look at residential water use and the delivery systems that serve us in an effort to answer these questions.



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GRADES OF WATER

The two major sources of raw water that are processed into water products are surface water and groundwater. Surface water comes from lakes, reservoirs and rivers. Groundwater comes from wells drilled into aquifers, an underground geologic formation through which water flows slowly. Once acquired, the raw water is processed to a level suitable for the intended use.

Generally accepted levels of treatment include:

- raw grade water – typically used for irrigation;
- industrial grade water requiring tertiary treatment – typically used in cooling towers, fire protection where distribution is separated from potable mains and other non-potable applications;
- potable or drinking grade water; and
- instrument grade water produced at point-of-use for processing or production in controlled/sensitive environments. This typically involves treatment by reverse-osmosis or distillation.

WASTEWATER

The two major classifications of residential wastewater are black water and grey water. Black water is defined as raw sanitary wastewater that contains high levels of solids and other contaminants (both organic and inorganic). Sewage flow resulting from toilet flushing would be the greatest source of residential black water.

For our purposes grey water is defined as untreated single-family wastewater from all sources, excluding the toilet, kitchen sink with a waste disposer and dishwasher. It contains lower levels of solid waste than black water. In the residential context the greatest sources would be from the bathtub, shower and bathroom sinks.

POTABLE WATER

Local authorities are responsible for the production of potable water. Most large cities and municipalities in Canada use surface water, while some smaller towns use groundwater. Water from either source is acquired, treated and distributed to the end user.

Drinking water quality is governed by the Guidelines for Canadian Drinking Water Quality. These guidelines specify limits for substances and describe conditions that affect drinking water quality. "This document is published by Health Canada on behalf of the Federal Provincial Territorial Committee on Drinking Water," explains Duncan Ellison, executive director of the Canadian Water and Wastewater Association. "Health Canada performs most of the health-risk assessment of drinking water contaminants, and the provincial and territorial governments are largely responsible for putting the guidelines into effect through drinking water regulatory programs."

Environment Canada also plays a role in maintaining a sustainable supply of useable water in Canada. Its responsibilities stem from legislation concerning the quality of wastewater discharged into the environment. "As with drinking water, the provincial and territorial governments are directly responsible for regulating the installation and operation of

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municipal and other wastewater treatment plants, and have the responsibility to do so arising from environmental protection legislation and water resource management legislation," said Ellison.

He goes on to say, "Almost without exception, our existing water infrastructure systems are based on this central treatment and delivery model. This system requires that all water being delivered to end-users be treated to a minimum acceptable level of potability."

EFFICIENT UTILIZATION

A position paper from the Canadian Water Quality Association (CWQA) on point-of-use/point-of-entry water treatment, offers the following insight: "Water used for human consumption accounts for only one-half of one per cent of the total community water use of 175 gallons per capita per day. Ninety-nine and one half percent of water supplied by public water systems is used for purposes such as sprinkling lawns, flushing toilets, irrigation, fighting fires, cleaning streets, washing cars, laundry, bathing and industrial use."

Could we look at shifting some treatment requirements from a central treatment model to a decentralized treatment model? Probably not, however there are means available to augment the current treatment infrastructure. CWQA supports federal inclusion of point-of-use/point-of-entry water treatment as an alternative to central treatment to drinking water quality standards and contends that "treatment at the central level is not the only way."

CWQA maintains, "There is no logical or economic basis for a requirement that 100 per cent of water from public water systems be treated to drinking water quality unless a significant health risk can be demonstrated to emanate from dermal or inhalation exposure. In such cases, CWQA recommends the utilization of point-of-entry devices. Point-of-use/point-of-entry water treatment technology exists right now in amounts needed for the particular requirements."

QUALITY AND USAGE

Consumer trends seem to support this as it is common for people to buy water and water related products (largely due to non-health related issues such as taste). Growth in the sale of bulk bottled water, point-of-use water filters, coolers and other equipment speaks volumes. So, it seems that many consumers have accepted delineation of both quality and usage.

Whether we change from the central treatment and delivery model or not, there are alternatives to current sources for non-potable use. These alternatives, some old and some new, include the reclamation of wastewater from sewage treatment plants and residential grey water re-use (neither of which are currently permitted by the National Plumbing Code) and residential rainwa-

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ter utilization (which is limited solely to external uses such as irrigation).

It was, however, recently announced that a stakeholder review would be conducted to review possible guidelines for use of residential grey water and other non-traditional supplies of water for non-potable use. With this possibility, these sources could represent realistic alternatives for non-potable applications.

WATER RECLAMATION

Reclaimed water is water that is reclaimed from black water and grey water introduced to the city sewer system and re-used following secondary or tertiary treatment. In 1977 Vernon, BC became one of the first communities in Canada to implement a full-scale water reclamation/reuse program.

"In Vernon, reclaimed water receives secondary treatment followed by long term storage of over 60 days. Tertiary level treatment is not required. The important things are low turbidity, low coliform levels and a 0.5 mg/l chlorine residual prior to use," reports Dale Danallanko, a technician in the City of Vernon's utilities division, department of community services.

"Provinces have different quality requirements depending on where the reclaimed water is used. Reclaimed water used on golf courses and playing fields needs to be of a higher quality than water used on agricultural areas with restricted access," said Danallanko. "Currently we use reclaimed water for irrigation purposes on approximately 2,400 acres of agricultural, silvicultural and recreational land."

It is interesting to note that Vernon is constructing a $29.1-million facility to replace the existing one. The treatment process chosen for the new plant is biological nutrient removal followed by filtration and ultraviolet (UV) disinfection. "This provides a very high level of treatment and will produce an extremely high quality effluent," said Danallanko. "It will give the City of Vernon flexibility in dealing with the volumes of reclaimed water produced."

There are many schools of thought regarding water reclamation. Another concept is that of dual distribution, which describes a circumstance where reclaimed water for non-potable applications is distributed through a dedicated system, separate from the potable supply.

In the abstract from his paper Distributing Reclaimed Water Through Dual Systems, author Daniel A. Okun states, "Dual systems are particularly appropriate for urban development now being planned, but they can prove cost effective even for systems that must be retrofitted. The economies of scale arise from savings in the acquisition and development of new water sources and facilities and in wastewater treatment and disposal.

"Because the public health risk from non-potable re-use is minimal," adds Okun, "public acceptance is high and even enthusiastic. Non-potable urban re-use is an option worth consideration by municipalities seeking additional water supply to meet future demands."

"Whether we change from the central treatment and delivery model or not, there are alternatives to current sources for non-potable use."

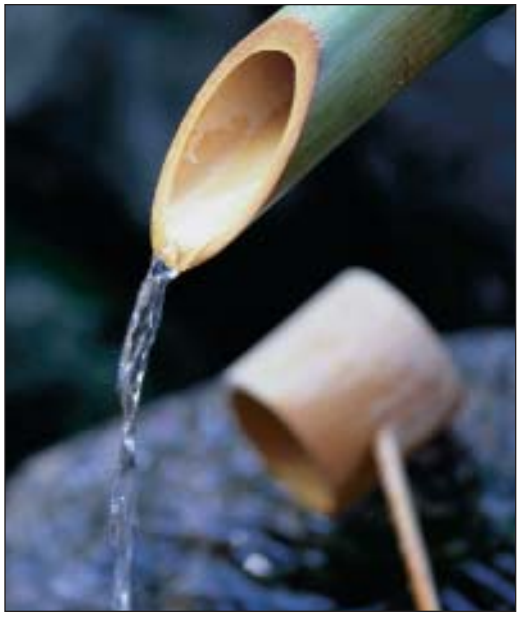
GREY WATER RE-USE

Estimates of residential supply of grey water range from 20 to 40 gallons per capita per day. This makes grey water a vastly under-utilized resource developed in immediate proximity to its potential point of re-use. California is a world leader in this area. Guidelines for use were developed and as a result, residential grey water recycling was legalized in 1994. Commercial recycling was legalized in 1997. Small-scale installations and testing have taken place in other parts of the U.S., Canada, U.K. and Australia.

To date, most of these have been custom built, stand-alone systems installed as test models in single family homes. In Japan, larger scale grey water re-use is more common, and a commercial market exists there for products designed for this application. An example is toilets with an integral lavatory basin built into the tank to directly employ water from hand washing to flush the toilet. In most cases, where legislation exists to facilitate residential grey water re-use, it is limited in application to sub-surface irrigation.

Arizona's Casa del Agua is a model home study project located in Tucson that includes a grey water recycling system. The system was installed at a cost of about $1,500 US and supplies approximately 31 per cent of the homes total water budget, based on actual usage.

In its research report Technical Series 01-141, the Canada Mortgage and Housing Corporation (CMHC) discusses the installation of what they called the Sustainable Home Water System (SHWS) in the Alberta Sustainable Home/Office project in Calgary. Three sub-systems were installed to affect treatment of the grey water. A slow sand filtration bed, a sub-surface soil irrigation bed and a grey water garden wall operated in series within the homes' greenhouse to emulate natural water purification processes. The treated grey water was then stored and subsequently treated with UV when needed as re-use water for non-potable purposes.



RAINWATER UTILIZATION

Rainwater collection is not a new concept, as it predates Roman civilization and has been in widespread use for many centuries in Europe and the Middle East. In North America, rainwater use is primarily seen as a means to augment other existing resources. Depending on the level of treatment given to the harvested water and depending on whether a storage cistern is employed, the uses for rainwater can vary greatly.

The City of Vancouver and the City of Toronto both have rain barrel programs available to encourage residents to disconnect roof gutter downspouts from the storm sewer connection. The stored water does not receive any treatment and is suitable only for lawn and garden use.

In the Alberta project, the SHWS contained a rainwater harvesting system and a storage system. This water was treated for potable use and supplied for use throughout the home. Testing at the kitchen faucet showed that the water conformed to the Canadian Drinking Water Guidelines (1996) for all parameters except temperature, which was elevated from storage in the cistern.

The decision on whether or not to employ a cistern or how big it should be would depend on these factors:

1. The annual rainfall in a given locale.
2. The percentage of the total water budget to be supplied by rain harvesting.
3. The cost of water relative to the payback to be gained from water use reduction efforts.

IN THE FUTURE

In summarizing its report, CMHC offered the following insight, "The authors conclude that the SHWS offers a feasible alternative to expensive and inefficient, large-scale centralized water and wastewater treatment systems." They suggest, "If SHWS design principles were incorporated into common practice in Calgary, for example, residential potable water consumption could be reduced by 78 per cent by using conservation practices and common sense, and up to 97 per cent if re-use water was utilized to supply non-potable demands."

In the Greater Vancouver Regional District, it was recently announced that water rates would rise by as much as 72 per cent over the next five years. With other Canadian jurisdictions contemplating increases, these reductions are significant.

The CMHC report indicates, "The SHWS could be especially beneficial for remote or rural areas; acreage with septic systems; agricultural applications; environmentally sensitive locations; climatic zones with scarce fresh water resources; areas with contaminated water sources; and autonomous or sustainable communities as well as environmentally conscious individuals."

MARKETING THE CONCEPT

So how do we package and market these concepts? In Canada, the lack of universal guidelines for use of grey water is a limiting factor, especially in urban settings. Until regulations exist, individual jurisdictions will respond to the economic and environmental stewardship issues of their constituents and this will provide opportunity for our industry.

Imagine that a typical subdivision in your area has every home serviced with raw water and grey water and employs point-of-entry and point-of-use treatment augmentation. Imagine homes with rainwater harvesting and treatment systems.

Will our desire to embrace sustainable design and development practices provide economic benefit to our industry? It seems very likely that it can and will.

■ *Mark Evans is a 20-year veteran of the plumbing and heating industry, with sales and management experience in the wholesale distribution, rep agency and manufacturing sectors. He can be reached by e-mail at writemarkevans@hotmail.com.*