Decentralized wastewater reuse goes mainstream

The future outlook is promising for decentralized recycling projects as the demand for recycled water increases. Geoff Salthouse, Bill Hensley, and Brian Cohen of Orenco explain the reasons for the recent surge in its acceptance as a mainstream solution and present four case histories to illustrate its benefits in a wide range of non-potable applications.

Decentralized wastewater management, when coupled with reuse or recycling of treated sanitary sewage, increases treatment options, creates even greater value than when employed alone, and allows solutions to serve a larger audience and customer base. As the demand for water recycling continues to grow, and an increasing number of successful water reuse projects prove that recycling can be done safely at smaller scales, the future looks bright for decentralized recycling projects to become mainstream.

Since the term “reuse” can apply to a wide range of applications with different treatment requirements, it’s important to clearly define the input parameters and desired outcomes of any recycling system, so as to match the treatment level with the intended use. Non-potable reuse applications range from sub-surface landscape irrigation, where risks to human health and the environment are very low, to washing vehicles or firefighting with recycled water, where full contact is expected and should be planned for. While treatment of recycled wastewater to potable, drinking-water quality is technically achievable, it is not within the scope of this article.

The range of typical reuse applications can be visualized through the use of a tiered structure, or ladder (Figure 1), where each rung represents a different level of treatment required to meet increasingly rigorous risk mitigation standards. In general, lower rungs on the ladder require less advanced treatment, as the potential for human contact is low. Higher rungs represent uses where human contact is much more likely, so additional treatment is required to reduce the potential for adverse health effects.

Higher levels of treatment can also include redundant systems, such as pairing two different methods of disinfection to reduce risks from pathogens in case of sub-optimal performance at this critical treatment stage. Greater complexities and operational oversight needs are associated with these higher levels and additional stages of treatment. As one proceeds higher up the reuse ladder, systems require more knowledgeable and available operators as well as more robust monitoring systems in order to minimize response times in case of treatment equipment or process faults.

Reasons for reuse expansion
The level of acceptance and implementation of wastewater reuse and recycling strategies varies dramatically across geographic regions. Several drivers affect the perceived necessity for regulatory structures that allow – or sometimes encourage – the treatment of sewage to levels for reuse.

**Key Terms in Decentralized Recycling**

**Decentralized Wastewater Management:**
The collection, treatment, and disposal/reuse of wastewater from individual homes, clusters of homes, isolated communities, industries, or institutional facilities, as well as from portions of existing communities at or near the point of wastewater generation.

**Recycled Water:** Treated domestic wastewater that is used more than once before it passes back into the water cycle. The terms “reused” and “recycled” are often used interchangeably depending on geographic location. Reclaimed water is not considered reused or recycled until it is put to some purpose.

**Non-potable Reuse:** Reclaimed water that is not suitable for drinking but is safe to use for irrigation, industrial uses, or other non-drinking water purposes.

*Source: https://watereuse.org/water-reuse-101/glossary/*

Figure 1. Typical reuse applications are presented in the above tiered structure in terms of level of treatment required to meet risk mitigation standards. Graphic provided by Orenco
Decentralized Reuse

34 Decentralized Reuse

Water scarcity is one of the primary reasons that local or regional populations recycle wastewater. Even when regulations and enforcement may not be present, creative ad hoc reuse plans may be put in place to meet needs that are not addressed by formal water supply systems. In some regions, regulations are stringently enforced to reduce wastewater usage, which encourages both treatment and recycling of treated water. For example, the Blue Mountains Borough Council in South West, Australia, requires all new homes to be designed and built to achieve a 40 percent reduction in wastewater production in their pre-BASINS home.

The World Bank also estimates that 70 percent of water use today could be achieved via decentralized wastewater treatment. The Bank estimates that the packaged/containerized treatment plants market is expected to reach revenues of $6.08 billion in 2025, approximately doubling the dollar volume of the market in just over a decade. For example, SCADA-related technology—now allowing ongoing control of Water and Irrigation, identifies enforcement of environmental laws and technical standards to “expand the safe reuse of treated effluent” as the primary incentive for moving toward decentralized systems. Decentralized wastewater treatment solutions have also gained acceptance because it is a simple to operate and expand, and provides exceptional advanced treatment levels. With a daily design flow of 57,000 m³/day, the system’s high-quality effluent is suitable for non-potable reuse throughout the community, reducing the demand on potable water.

Solutions: Orrico’s AdveTrix technology was selected in 2006 as the secondary system, including AX100 treatment units with a pre-existing return line, followed by tertiary treatment consisting of an advanced ozone disinfection. In 2008, the developers were awarded the 2008 United Utilities Environmentally Sustainable Property Real Estate Federation for the “World’s Best Environmental Development.” As of June 2017, the project had been completed and will serve 110 residences at full buildout.

Decentralized Reuse

35 Decentralized Reuse

Problem: Developers of the Costas Apartments in the US state of Florida whose wastewater treatment systems are an important part of an overall development strategy that includes more than forty residential and commercial buildings in and around Los Angeles. For this reason, owners wanted an advanced treatment method for treating wastewater from residents’ bathrooms, spas, tubs, and showers for non-potable reuse.

Solution: Biobrains, an ecologically focused design firm, recommended an advanced wastewater treatment to produce high-quality effluent that would be suitable for reuse. After a comprehensive evaluation of the various technologies available, the system was determined to be the best solution. The system was designed to incorporate additional treatment to reuse grades, which are used to irrigate community landscapes. The design’s effectiveness is realized in terms of water reuse, where recycling can be viewed as a resource, rather than a pollutant.

Sustainable city

4. The potential for human contact with the content inherent in wastewater. And only mid-sized municipalities – is now in use large municipal treatment plants – is now in use large municipal treatment plants – is now in use.