Orenco®

Orenco® Effluent Sewers FAQ

Overview & Economics

Are effluent sewers an experimental technology?

No. About 600 Orenco Effluent Sewers have been installed for municipal and commercial applications throughout the U.S. and Canada. The first effluent sewers were installed in the early 1980's and Orenco has designed effluent sewer equipment and tracked many of its effluent sewer communities for more than 30 years.

How do effluent sewer costs compare to those of other collection systems?

The following tables provide a cost summary of capital, installation, and operational costs for effluent, grinder, gravity, and vacuum sewers, according to *WERF's Wastewater Planning Model, Version 1.0,* www.werf.org/:/c/DecentralizedCost/Decentralized_Cost.aspx. Model output is based on a 200-unit example.

Table 1. WERF Wastewater Planning Model: Effluent and Grinder Sewers

Cost Description	Effluent Sewer			Grinder Sewer		
Cost of Collection Network	$516,179	to	$774,268	$525,950	to	$788,925
Installation Cost of On-Lot	$2,625	to	$3,938	$4,291	to	$6,436
Total Installation Cost	$1,041,232	to	$1,561,848	$1,384,090	to	$2,076,135
Total System Cost / Connection	**$5,206**	**to**	**$7,809**	$6,920	to	$10,381
Annual On-Lot O&M	$63	to	$78	$224	to	$336

Table 2. WERF Wastewater Planning Model: Vacuum and Gravity Sewers

Cost Description	Vacuum Collection			Gravity Sewer		
Cost of Collection Network	$2,120,188	to	$3,180,283	$3,092,330	to	$4,638,494
Installation Cost of On-Lot	$3,761	to	$5,641	$726	to	$1,088
Total Installation Cost	$2,120,188	to	$3,180,283	$4,638,494	to	$5,001,322
Total System Cost / Connection	$10,601	to	$15,901	$23,192	to	$25,007
Annual On-Lot O&M	Maintained by Utility			$16	to	$24

Do effluent sewers require mandatory connections?

Not if the funding agency doesn't require it. Residents with approved onsite systems can defer connection because up to 85% of the total cost of Orenco Effluent Sewers is associated with the on-lot equipment packages, not the sewer lines.

Can effluent sewers be upsized affordably?

Yes. Orenco Effluent Sewers are easily oversized to accommodate future connections, at relatively low up-front and ongoing costs. This is not only because 85% of the costs is for the on-lot equipment packages, as noted above, but also because the lack of solids in the mainlines allows the use of low-cost, small-diameter PVC or polyethylene pipe for the mains. The cost to oversize such an inexpensive conveyance system is minimal. Gravity sewers, on the other hand, require expensive, large-diameter mains that comprise most of the costs of the system and are costly to oversize and maintain. Grinder sewer mainlines are difficult to oversize due to scouring velocity requirements.

Can effluent sewers be integrated into existing municipal infrastructure?

Yes. Countless effluent sewers convey primary treated effluent to existing gravity collection systems, lagoons, package plants, and other secondary treatment processes. (Note: When discharging wastewater into gravity mains from either effluent or grinder pressure sewer mains, engineers must design for control of odor and corrosion.)

Are lift stations required?

Generally not, even when the point of discharge is miles away from the point of wastewater generation. Regardless of the point of discharge, mainlines are normally sized to allow communities to standardize on a single high-head effluent pump for their on-lot STEP systems … typically 10 gpm and ½ hp, throughout.

What are typical user rates?

User rates depend on system configuration and financing. Here's a sampling of 2013 user rates from a number of the Orenco Effluent Sewer communities that we track:

$35/month or less for Bethel Heights, AR; South Alabama Utilities, AL; Amesville, OH; Diamond Lake, WA; Elkton, OR; and Glide, OR.

$43/month for Yelm, WA and for Victoria, PEI.

Septic Tanks & Components

Can existing septic tanks be re-used for the effluent sewer system?

Not typically. Existing septic tanks require thorough evaluation to confirm watertightness and structural integrity before they can be used as interceptor tanks in a new STEP/STEG sewer system. That's because most U.S. septic tanks that are already in the ground are structurally unsound and almost never watertight. While recently installed tanks are sometimes acceptable, we've seen tank failure rates in older communities as high as 95%. This leads to increased infiltration, less efficient solids digestion, compromised secondary treatment processes, and higher maintenance costs.

Does every lot require a STEP (Septic Tank Effluent Pumping) system?

Not necessarily. Depending on elevations and mainline pressures, some connections can gravity-flow into the mainlines. (These are referred to as STEG systems: Septic Tank Effluent Gravity.) Systems can be all STEP, all STEG, or a combination. Simple hydraulic analyses can determine what is required.

How often does the tank need to be pumped out?

Assuming a 1000 gallon watertight tank and 3 people per residence, the pump-out interval is about 11 years calculated at a 95% confidence level. That's because the tank digests more than 80% of the solids. Average pump-out intervals are even longer.[3]

How often do the pumps need to be repaired/replaced?

Orenco's high-head effluent pumps typically last 20 years or more.

What happens during a power outage? How much emergency storage is in a tank?

The reserve storage in the on-lot tanks is normally about 150 gallons. This allows for 24 hours of normal water usage during a power outage, although during an outage, most residents reduce their water usage dramatically. That's because they are not washing dishes and clothes or taking baths and showers. In addition, most power disruptions last no longer than a couple of hours; power outages of 9-12 hours are infrequent and generally considered the worst condition to allow for. In regions of the country with extended power outages, 1,500-gallon tanks can be substituted for the standard 1,000-gallon tanks and a generator receptacle can be incorporated into the control panel.

What happens with system abusers?

All residents need to know what can and can't go down their sewer, regardless of sewer technology. Dangerous and damaging substances such as chemicals, pharmaceuticals, grease, oil, non biodegradable "flushable" wipes, diapers, and condoms should not go down any sewer drain. One of the benefits of effluent sewers is that system abuses can be identified and controlled. Effluent sewers trap most harmful discharges at the source, in the property owner's on-lot tank. This gives operators the ability to provide homeowner education at the first offense and to charge for excessive service calls and/or pumping, with subsequent offenses.

Design & Installation

Can you serve commercial properties or commercial areas, as well as residential areas?

Yes.

Does the system smell?

No, not if properly designed, installed, and operated. That's because on-lot tanks vent naturally through building stacks, and mainlines are completely enclosed and watertight. However, when discharging an effluent sewer line into an existing gravity sewer, hydrogen sulfide can be generated and odor control measures may be necessary. These include aeration, carbon filtration, or chemical addition. Orenco's Sales Department can provide guidance.

Do you design with I/I allowances?

The tanks and collection lines in effluent sewer systems are designed to be watertight and largely immune to I/I.

Are there any cold weather design considerations?

Collection lines are buried below the frost line. Lids are insulated, and hose and valve assemblies are provided with pitless adapters.

Are road closures common during installation?

No. Orenco Effluent Sewer mains are small diameter and are generally installed in the right-of-way next to the road, at shallow burial depths below the frost level, much like water lines. Open trench installation and directional boring reduces the trauma and costs of removal, replacement, and closures of roads, as well as damage to utilities and driveways.

Operation & Maintenance

Do effluent sewers require full-time operation and maintenance?

Not for smaller systems. According to engineer Mike Saunders, an expert in asset management of wastewater systems, "a single technician with a pick-up truck" can maintain 2,000 STEP connections in an effluent sewer system, as long as the system was correctly installed with high-quality products.

Do Effluent Sewers have higher O&M costs compared to gravity sewers?

No. Fact Sheets developed by the Water Environment Research Foundation show that O&M for effluent sewers is slightly less than for gravity sewers.[4] A 20-year life cycle analysis of an Orenco Effluent Sewer system for Lacey, Washington, which was presented at WEFTEC 2013, concluded that, "… a well-managed program for STEP O&M has annualized costs that run closely in line with typical annualized costs for gravity sewer O&M."[5]

Although gravity sewers have a low initial O&M cost, as they age, substantial costs accrue from I&I (inflow and infiltration), SSO's (sanitary sewer overflows), expensive R&R (renewal and replacement), expensive system failures, and replacement of on-site laterals. Growing communities can offset these O&M costs with new low-maintenance gravity connections. However, small communities with aging systems generally lack the new connections that help fund these capital improvements.

[1] *WERF Fact Sheets C1, C2, C3, "Performance & Cost of Decentralized Unit Processes," 2010.*

[2] *"Orenco Effluent Sewer Systems: Operational Cost-On-Lot Components," 2013.*

[3] *ibid.*

[4] *op cit.*

[5] *Cagle, Bill; Cargil, Terry; Dickinson, Roger, "20-Year Life Cycle Analysis of an Effluent Sewer (STEP) System — City of Lacey, Washington," 2013.*