

Choices Abound for Sewer Rehab

By David Branham, Wastewater Technician

The time has come to take a look at what type of choices a wastewater system has when it comes to rehabilitating the collection system.

Trends have recently changed as far as lending institutions and regulatory agencies are concerned. In times past, it was common practice for wastewater facilities to be “overbuilt”. That is, engineers would design the treatment plant to accommodate any and all infiltration and inflow.

In today’s climate when a system applies for assistance from governmental lending agencies about the best the system can expect is a 70% loan and 30% grant. Gone are the days of mostly grant money. Thus not only the lending agencies, but the applicant is looking for the most “bang for the buck”. With that said, let’s take a look at sewer rehabilitation.

As communities grow and develop, new sewers are installed in outlying areas while the municipality’s core system ages. Many pipes are now upwards of 100 years old, and unfortunately have developed leakage problems. Root intrusion, cracks, grease and corrosion are but some of the problems in the collection system.

Collection rehabilitation options have mushroomed over the years. Besides the traditional cut-and-cover pipe replacement, new methods and procedures are now being used. Complete system replacement rarely is financially viable, and thus some communities are taking the rehabilitation path when it comes time to repair and or replace.

Money, often times, is the biggest factor in determining which replacement option is best to use. As I have mentioned in previous articles in this publication, infrastructure repair sometimes isn’t the highest priority, because it’s underground and out of sight. With this in mind it is no surprise that because of the age of the infrastructure, many municipalities have major problems. So let’s take a look at several different types of options that are available, such as the following mentioned in the March 2004 edition of the *Water Environment Federation*.

❖ Cut-and-Cover

The traditional sewer replacement method, cut-and-cover involves replacing portions of old pipes with new pipes. It is one of the only ways to correct sags and humps in the pipeline due to differential soil settlement or seismic activity. However, cut-and-cover replacement is very disruptive at the surface. Utilities crossing and the vicinity of the trench lines need to be carefully protected, and traffic needs to be controlled around the construction. One thing to consider is that the costs of cut-and-cover replacement are equal to new sewer construction.

❖ Pipe Bursting

Pipe bursting has made large gains in sewer replacement over the last several years, allowing pipe replacement without having to remove existing pipes. This method involves inserting a cone-shaped bursting tool into the existing pipe, pulling it through the host pipe using a static pull cable or actuated tool, and breaking the pipe as the tool moves forward. In the static cable version, a pull cable is strung through the pipe and connected to the other end to a winch or backhoe, which pulls the cable and bursting tool through the pipe. In the actuated tool version, a pneumatically driven hammer mechanism pounds the tool through the pipe while a cable winch pulls the tool lightly to keep it stable.

Afterward, a length of replacement pipe usually made of high-density polyethylene (HDPE) is assembled by butt-welds aboveground to the appropriate length, attached to the bursting tool, and then pulled into the newly fractured host pipe, thereby replacing it.

Generally, pipe bursting works best with clay, cast-iron, or unreinforced concrete sewers, because the bursting tool can easily fracture such materials.

Pipe bursting is not always appropriate even if the soil is appropriate for the procedure. It can heave the soil, lifting the surface, which can damage utilities. Depth is another consideration.

Pipe bursting typically requires at least three feet of depth and the depth should be approximately 10 times to change in pipe size, if the size increases. The amount of space available also should be considered before embarking on a replacement.

Pipe bursting may be ideal for many situations, however, don't expect pipe bursting to perform miracles. Such things as sags and horizontal jogs will still exist after the procedure.

❖ **Pipe Lining**

Pipe lining is another method in which the existing pipe does not have to be removed. This procedure involves inserting a liner into the existing pipe, which renews the interior integrity of the surface and can increase the structural capacity of the old pipeline. The three most common types of lining are: thermoplastic (fold and form) liners, thermoset (cure in place) liners, and slip liners.

❖ **Thermoplastic (fold and form) liners.**

Thermoplastic polyvinyl chloride (PVC) or HDPE liners have been deformed to fit easily within the existing pipe. The liner is then heated with hot water or steam to soften it and then it is inserted into the existing line through a manhole. Once the liner is in place, the line then is cooled to retain its shape, fitting snugly inside the pipe without adhering to the surface.

❖ **Thermoset (cure in place) liners.**

Thermoset liners are cloth-like fiber shells filled with thermosetting resin, usually polyester. Liner installation is a three-step process, beginning with "wetting out," in which resin is applied to the inside of the fiber shell liner tube and forced to go deep within the fibers.

Then the liner is placed into the pipe via a manhole. Next the material is filled with water to invert the tube into the pipeline. Finally, curing begins.

Curing the pipe involves heating the water used in the second step and circulating it in the pipe for a certain period of time. When this step is complete, the liner is mechanically bonded to the interior of the existing pipe. The results are a ridged and corrosion resistant lining.

❖ **Slip liners.**

Slip lining involves inserting a new pipe usually made of HDPE, PVC, or a fiberglass-reinforced liner into an old pipe via an insertion pit.

The process leaves an annular space between the host pipe and liner, which can be sealed at the ends or filled with grout along the length. Slip lining is not as flexible as other pipe lining options, but on the whole, this lining is a good option for many replacement problems.

Pipe liners, particularly thermoform and thermoset liners, can eliminate the need for excavation. It has been estimated that this type of process can save 50% to 80% of cut and cover replacement cost, depending on the installation conditions.

❖ **Point Repairs**

Often, a sewer problem is limited to one or two areas, so point repairs are more economical than a total pipe replacement. Many point repairs do not require excavation, and the method ----cut-and-cover replacement of short segments, internal repair fittings, or chemical grouting ---- depends on the nature of the problem.

The mechanical method involves a sheet-metal sleeve that is placed over the repair area and expanded into place. The sleeve has locking tabs to prevent collapse once installed, and the portion of the sleeve in contact with the pipe is often coated with a hydrophilic chemical to seal leaks.

The cure-in-place method involves an ambient temperature-cured resin, much like the cure-in-place liners. A clamp is placed over the repair and expanded into place with an air-filled bladder, which is left in place for a certain amount of time to allow the resin to cure.

Chemical grout usually is made up of hydrophilic polymers that are injected into cracks and leaking joints. Specially designed remote-control devices, called packers, force the grout into crack and joint.

❖ **Emerging Technologies**

The pipe rehabilitation industry shows no signs of slowing. Pipe rehabilitation is becoming the preferred solution for most municipalities. Dig and replace used to be the only method, but cost effectiveness and acceptance of rehabilitation technologies have really just allowed it to grow. I think most municipalities, regardless of which technology used, have found that pipe rehabilitation does have value and have chosen to use these technologies as long-term economical solutions.

As time goes on, more and more companies are involved in this process and prices seem to be coming down.

So there you are, sounds like cure in place technology may be the way to go. Hope to see a lot of you as the Seaside conference. We have a very excellent speaker that will give a presentation on new and improve small wastewater systems. See ya down the road.
Dave