Aging Infrastructure – Impact on Water Loss Webinar Q&A

Q: We have asbestos cement pipe. Any idea on the life span on this? The pieces I've seen look great. Installed in the 50's -60's

A: A recent study by the Water Research Foundation (Project 4093) investigated asbestos cement pipe. They determined that the breakage rate of this pipe type was much lower in general than cast iron or ductile iron pipes. They studied AC pipe at several utilities and determined that the remaining useful life varied substantially from system to system. They found some pipe that needed replaced immediately and other pipe that could last anywhere from 50 to 150 years. The differences in remaining life have a lot to do with the conditions under which the pipe operates and to which it is exposed (e.g., the water inside the pipe and the water and soil outside the pipe.) If you have favorable conditions, you may see significant life left in your pipe.

The Chrysotile Institute (a non-profit organization that addresses asbestos issues) indicates a pipe life of approximately 70 years. This may be a good average estimate across all utilities, but it is best to go with your own experience. If you aren't having any problems with your pipe, then it may have significant useful life left.

Q: What is the difference between "age" and "vintage" on physical factors of pipe deterioration?

A: Age refers to the number of years since installation. Vintage refers to the practices that were in place at the time the pipe was manufactured. A pipe may be from the vintage of the 1930s (meaning it was manufactured in the 1930s using the practices in place at the time) but installed in 1940 for example. So it may be newer than the vintage. Different parts of the country or different manufacturing facilities may have also been using different processes, such that pipe that is the same physical age may have different vintages. This characteristic is important because some manufacturing techniques or materials used during a specific time period or by a manufacturer may cause a pipe to have significantly different performance. For example, some of the metallic pipe that was manufactured after WW II was inferior and this pipe fails sooner than pipe that was installed prior to that time period.

Q: What is an acceptable breaks/mile or breaks per segment?

A: There is no "right answer" to this question. This is a system-specific decision that comes down to what the system is willing to accept. Customers are inconvenienced by having frequent pipe breaks and damage may occur to other assets such as roads, buildings, or personal property which argues for a lower break rate. Repairs are generally much, much cheaper than pipe replacement which argues for a higher break rate. There is a point at which the number of breaks will make repairing the pipe more expensive than replacing the pipe. This value is different for each community because it greatly depends on the cost of repairs in that area as well as the cost of replacement. Clearly, pipe breaks should not be allowed to reach, or even closely approach this point because it is economically inefficient. There is a "sweet spot" in which the number of breaks is acceptable to the community and is lower than the economic inefficiency point. This is the number of breaks that the community would find acceptable.

That said, the rate that is acceptable can be different based on the criticality of pipes. Pipes serving residential areas that are smaller diameter and relatively lower pressure can have higher acceptable

break rates than transmission mains that are higher pressure, higher diameter and serving industries, commercial properties, or large sections of the community. Larger mains will cost more to repair and cause more problems than smaller mains.

A study by the Water Research Foundation found the average break rate to be about 0.21 to 027 breaks per mile, while another study put the rate at 0.25 breaks per mile. A prior study showed a "good" break rate to be 0.1 to 0.2 breaks per mile. In my work in asset management, I have found that utilities in other countries often operate at a higher break rate than US utilities. Using asset management principles, they determined that it was more efficient for them to operate at higher break rates and pay for repairs rather than replacement.

Q: We have a pressure zone that runs around 130psi. Could this increase our leaks in this area?
A: There are leaks that are called "unavoidable" real losses. These are the leaks that are not caused by degradation of the pipe or splits, cracks or holes, but rather separations at joints that occur over time and because of external factors, such as loads above the pipe and vibrations around the pipe due to underground work. The higher the pressure the greater these "unavoidable" losses will be. Because 130 psi is a fairly high pressure and above what the average household needs, it may be unnecessarily increasing your losses. If there is a way to reduce this pressure zone – **WITHOUT CAUSING ANY ISSUES WITH OPERATION BASED ON THE WAY THE SYSTEM WAS DESIGNED –** it may be a good idea to investigate this possibility. Prior to doing this, it would be worthwhile to measure, to the extent possible, the losses in this zone before adjusting the pressure and after adjusting the pressure to see whether the losses decreased and by how much.

Q: What is the national average (percentage) of water system unaccounted for water loss (lost water)?
A: The EPA reports that national studies estimate the average real water loss for systems nationwide is 14%.

As a note, we are trying to get away from using the term "unaccounted for water" and instead using the term "non-revenue water." We want to account for all of our water and the portion for which we are not receiving revenue is the non-revenue water (NRW). This includes real water loss. The NRW is expected to be a higher number than real water loss. The 14% represents a real water loss average.

Q: How useful is the installation of water meters in determining if leaks are occurring compared to the costs it takes to install the meters.
A: It is virtually impossible to determine water losses with any kind of detail without water meters. At best, without meters, you can only estimate losses based on the number of known leaks you have and if you do a survey (actively looking for hidden water leaks) the number of hidden leaks you find. With meters, you can have a more accurate accounting of the water that is delivered to customers.

The decision regarding whether to install meters comes down to how important it is to have detailed information regarding water usage. If you are in a water scarce area or in the midst of a drought, water usage information is critical. It helps promote conservation and wise use by customers and it provides information that can be used to determine real water losses. If water use is highly variable between customers, which occurs in areas with heavy outside watering by some customers compared to others, or where there are great income disparities (high income customers tend to use more water than lower income), the lack of meters becomes an equity issue because all customers are paying the same rate. In this case, lower water users are subsidizing higher water users. If water is cheap on a per gallon basis, plentiful, and usage is relatively even (i.e., mostly indoor water use), this is less of an issue.

The bottom line, as with most things, is whether or not the benefits of having the ability to determine real losses, sending conservation signals to customers, and having rate equity outweigh the cost of installing and maintaining water meters.

One final consideration is that some funding sources in some states require the installation of meters as a condition of funding. In these cases, it may be necessary to install meters whether or not you believe the benefits outweigh the costs.

Q: What is considered acceptable loss?
A: "Acceptable water loss" varies from state to state and system to system. There is no single value of "acceptable losses" and organizations such as the American Water Works Association, purposely avoid publishing this type of standard because there is no one right answer. However, some states set guideline values. It was pointed out by a comment during the webinar that Illinois DNR accepts only 7% real losses. Some states consider 10% acceptable and others consider 15% acceptable. This number represents "real" water losses meaning water that is leaking from the system, not apparent losses – losses caused by inaccurate metering, water theft or unmetered use (such as fire flow, watering parks and the like.) What a system considers acceptable will be dependent on such factors as: scarcity of water, cost of water, cost of energy, cost to reduce losses, and ability to reduce losses. Each system should determine for itself the level it thinks is acceptable.

Q: How would I know if I have a water loss?
A: No system is completely water tight, even if it is a relatively new system. There is always going to be at least a little bit of water loss through joints and fittings and over time, you will have hidden leaks as well as visible leaks. There may also be pin hole leaks in the pipe, depending on pipe type.

The best way to find out what your actual loss is would be to perform a water audit. The AWWA's water audit software is available for free on their website at the following link.
http://www.awwa.org/resources-tools/water-knowledge/water-loss-control.aspx
You will need to register with them to download it, but registration is free. The water audit will allow you to enter information you know about your system to determine the extent of your water loss problem.

Before performing the audit, to get some vague idea of water loss and whether you have a big problem or not, you can assess the current number and frequency of breaks in your system. For example, how many breaks do you fix each month or what's the average number of breaks per month or per year. You can assume that there are leaks you don't know about (i.e., hidden leaks) that would raise the number of leaks, perhaps by 50% to 150%. If you are having any breaks at all, you do have water loss. If it's a low number, such as less than 1 per month, you probably have a relatively low amount of water loss. If it's several per month, you probably have a higher water loss. Another consideration is your average operating pressure. If you operate at a higher pressure, you probably have a higher water loss. As a reminder, this would only provide some vague idea of losses, you really need to perform an audit to figure out what your losses are.

Q: We don't have a system in place to replace pipes. We just fix main breaks with clamps. Our pipes are 60 years old. When should we get worried or started?
A: It is perfectly reasonable to fix pipes with clamps when they break as long as the pipe has some structural integrity left and you aren't repairing the same piece of pipe over and over again in the same

location. With 60 year old pipe, depending on the pipe type, your environmental conditions (weather, soils, etc.) you may have another 20 to 60 years or so left in terms of pipe type. That said, it is extremely important to start planning for pipe replacement now. If you wait until you have a major problem it will be too late. You could determine approximately how much money it would take to replace your piping, determine when you think you will need to start replacing it (i.e, the 20 to 60 year time frame stated above) and then start putting money into a reserve account for pipe replacement so that it's available when you need it. It is never too early to start planning for pipe replacement as this will be a major expense for you.

Response to Comments:
Comment: Illinois DNR will not tolerate any loss greater than 7%.
Response: Thank you for that information.

Comment: Yes, some water loss will be reduced through active pressure management. But leaks and breaks should be fixed.
Response: No question that pipe holes and breaks should be fixed. When I referred to pressure management as a strategy, I was talking about unavoidable real losses. These are the type of losses that result from minor leakage at joints and fittings, not from degradation of pipes, holes, or cracks. These types of losses are generally considered to be those for which a utility will not repair. If they became great enough in one location they might, but they are usually very slow leaks. These leaks will increase with pressure or decrease as pressure is decreased. Therefore, one way to cut water loss is to reduce pressure to reduce these losses. It will also potentially reduce leaks from cracks, breaks, and holes, but that is not the primary purpose. It is definitely the best strategy to repair a pipe any time that a leak occurs due to a hole, break, crack or similar circumstance.