TECH TIPS FROM NASSCO

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# UNDERSTANDING THE SCIENCE OF JETTING SEWERS

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Cleaning (jetting) sewers has evolved significantly since the late 1970's. With a variety of equipment, operating at a wide range of pressures and flows, sewer cleaning is quickly becoming a science. To continually train, inform and keep crews safe, NASSCO offers the *Jetter Code of Practice*. The latest version (#2) was published in 2006, and recently NASSCO's O&M Committee has been tasked with a review and update in an effort to keep up with the evolving technologies. That process should be complete by the NASSCO Annual Conference in February, 2017. For now, let's take a quick look from a high level view at some of the factors involved in jetting sewers.

The first step is to know what the job at hand entails, including:

- The sewer classification (storm, sanitary or industrial)
- Pipe diameter
- Length of the pipe
- Structural condition of the pipe
- Pipe material
- Type of debris present (grease, sand, gravel, blockages, roots)

From that point, one can select what type of jetting equipment is needed to complete the task.

There is a useful chart in the *Jetter Code of Practice* which should always be referenced for appropriate pressure and flow, but generally speaking:

- Low flow machines are used on small diameter pipes
- High flow machines are used on large diameter pipes
- Low flow machines operate at a higher PSI
- High flow machines operate at a lower PSI
- High pressure for knocking out blockages
- High flow for moving material

Lower flow machines tend to be trailer jets with a smaller water capacity and ½" to ¾" hose. To put this in perspective, a 15 gpm machine will use 300 gallons of water in 20 minutes. High flow machines, however, are usually truck-mounted units with a larger water capacity and 1" to 1 ¼" hose. In this case, an 80 gpm machine will consume 1,500 gallons of water in 19 minutes. Using the correct machine for each job is critical to a safe and successful cleaning process.

Once the appropriate machine is identified, it is then time to select the safest and most efficient cleaning tool (nozzle) necessary to clean the pipe. The first step is to calculate the operating pressure at the end of the hose (the formula is also found in the *Jetter Code of Practice*). In order to calculate pressure, you must know the gpm and psi of the water pump, as well as the diameter and length of the rodder hose. Once you have this information, you can calculate the pressure drop at the end of the hose. For example, an 80 gpm 2500 psi pump with 500 feet of 1"hose will lose 870 psi at the end of the hose. In this case, the true operating pressure would be 1630 psi. After the analysis, the most appropriate nozzle can be matched to the equipment.

Nozzles come in a wide variety of configurations with different efficiency ratings, from tier 1 to tier 3. These ratings of efficiency have to do with the method of manufacture and design of the internal passages and jets. Higher tier ratings are more efficient then lower tier ratings (usually at a higher cost). Nozzles are also specifically designed for many different tasks, including cutting grease, moving sand, penetrating blockages and cutting roots, to name a few.

Generally speaking, the wider the nozzle's jet pattern (30 to 35 degrees), the more effective the cleaning. The narrower the jet pattern (15 to 20 degrees), the better the thrust. Rotary nozzles are good for cleaning grease. Wedge shaped nozzles with a forward jet are good for penetrating blockages. These are just two examples of many configurations to meet specific needs.

Now consider the method of cleaning. A very full pipe needs to be cleaned in stages with multiple passes, or dams will be created and the hose may get stuck. An older deteriorated pipe might require lower pressure, or damage to the pipe may occur. Smaller, shallow sewers with laterals at 3 and 9 o'clock should use lower pressure (1,000 psi) and flow (30 gpm) while cleaning to avoid the risk of "blowing a toilet". Finesse and patience separate the amateurs from the pros.

While selecting the most appropriate machinery and nozzles is critical to an effective result, safety is the number consideration. Pay attention to and be aware of:

- Operator training on the specific machinery being used
- Machinery should be in good working order
- Appropriate traffic control and work zone definition
- Properly rated rodder hose matched to the pump output
- Hose condition (inspect for cuts and abrasions)
- Tiger tail hose guard (to prevent cuts and abrasions)
- Proper fittings matched to the hose
- Eye protection
- Face protection
- Noise protection

The bottom line: By following some simple guidelines, you will operate more efficiently, do a better job for your customer and keep your personnel safe. Before sending a crew out to a job, do your homework and pay attention to the details. The NASSCO *Jetter Code of Practice* is a resource at your disposal, along with a video titled "Introduction to Sewer Cleaning with Jetter Equipment" which provides practical guidelines and real-life examples of best practices in safe jetter cleaning. These resources are available at nassco.org.