

SEWER

STREET

WAST

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Jetting Techniques and Proper Nozzle Selection

Presented By James Long

An Introduction to SWS Equipment....

- Established in 1990...
- SWS Covers ID, MT, WA & OR with 72 Employees / 25 mechanics
- Markets: Solid Waste, Sewer & Stormwater, Street Sweepers, Snow Blowers, Private & Municipal
- New Boise Location and Service Manager Eric Kroeger



Question?

You just paid \$650,000 for a new combo truck – 80GPM 2500 PSI 1" x 1,000' hose, water tanks that hold 2,000 Gallon, 15 yard debris tank, biggest blower—

Are you ready to Jet and Vac anything???

But are you <u>really</u> ready??...

What's missing???



The "NOZZLE"

This is what helps the truck move and remove material in the pipe.

(Like purchasing an Air Compressor without tools)



Agenda

- Pipe Cleaning Basics & Safety
- Nozzle Basics
 - Construction
 - Jets
- How to Select the Proper Nozzle
 - Applications
 - Types of Nozzles
- Cleaning Power Examples
- Demo Nozzles Outside at Vac Truck



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Pipe Cleaning Basics & Safety

Pipe Cleaning Basics

- Survey the pipe before cleaning
 - Inspect upstream and entry manhole before jetting the line
 - Is there flow at both manholes?
 - The use of a pole Camera, camera nozzle or CCTV system is recommended for blocked lines
 - Information is power (what material is the blockage, is the pipe in good shape, what nozzle should we select, etc.)
- Avoid starting in a charged (Flooded) manhole if possible
 - You must be positive you can get the nozzle into the inlet before applying pressure
- Best practice to jet lines against the flow
 - Jetting with the flow obstructs water from flowing down the line
 - Lower water pressure when pulling back to avoid flooding houses



Safety Tips

- Never operate nozzles and other tools outside of the pipe
- Never climb down into the manhole when the Nozzle is in operation
- Avoid Using Jet Hose that the Outer Cover is Cut Cut off Section of Damaged Hose & Repair or Replace Hose
- Never use a tool in the wrong application
 - Example: The pipe diameter to large for the nozzle the nozzle can turn around in the pipe and come back to the manhole
- A standard nozzle (10lbs) gets a draw-force of about 100lbs with 80 GPM and 2000 PSI
 - Imagine what would happen if you were in front of this tool.....
 - Water is under severe Pressure and can cause injury



Proper Set – Up in Pipe (Protect the Hose from Being Cut)





Flow of Pipe – Jet Against the Flow

Pipe Diameter: 8" Debris Amount: 0.63 cu yds

Debris Level: 1/2 Full

Water Required: 480 gal

Pipe Length: 100 Feet

Time Required: 8 mins (clean only)

Nozzle Capacity: .60 cu yds Steps Required: 2 60 gpm

Pipe Diameter: 12" Debris Amount: 1.48 cu yds

Debris Level: 1/2 Full

Water Required: 1200 gal

Pipe Length: 100 Feet

Time Required: 20 mins (clean only)

Nozzle Capacity: .60 cu yds Steps Required: 3 60 gpm

Pipe Diameter: 24" Debris Amount: 5.74 cu yds

Debris Level: 1/2 Full

Water Required: 6080 gal

Pipe Length: 100 Feet

Time Required: 1.27 hrs (clean only)

Nozzle Capacity: .75 cu yds Steps Required: 8 80 gpm

Pipe Diameter: 48" Debris Amount: 24.07 cu yds

Debris Level: 1/2 Full

Water Required: 33,800 gal

Pipe Length: 100 Feet

Time Required: 5.63 hrs (clean only)

Nozzle Capacity: 1 cu yds 100 gpm Steps Required: 25

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Nozzle Basics

Nozzle Efficiency

• The deflection of water once it enters the nozzle controls its power



*Optimal water deflection depicted above



Nozzle Jets

- The angle of the jets control:
 - The nozzles ability to pull itself up the line
 - How well the nozzle cleans the pipe's side walls
- Less angle (Example: 10°-15°)
 - Better thrust, moves debris better, Less Cleaning
- More angle (Example: 30°-45°)
 - Less thrust, cleans side walls better
- Nozzles with dual degree jets (Example: 10° and 30°) thrust and clean side walls!





Drilled vs. Replaceable Jets

- Drilled Nozzles
 - Less expensive
 - Wear out faster (6 months of life with continuous use)
 - Must replace entire nozzle when drilled jet wears out
- Replaceable Jet Nozzles
 - More costly
 - Increased life expectancy
 - Replace only inserts when jets wear out
 - Set up for recycled water
 - Carbide vs Ceramic



Flow Straightening Jets



Steel insert without flow straightening

Poor Flow

With Flow Straighteners





Concentrated water jet direction, but impeded flow

Average Flow

Without Flow Straighteners





With ceramic straightening inserts

Optimal Flow



Required Information for Jetting a Nozzle

- Application
- Capacity of pump [GPM]
- Pump pressure [PSI]
- Length of hose [Feet]
- Inside-diameter of hose [Inches ³/₄" or 1" Most Common]
- Nozzles are jetted for individual truck specifications!



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How to Select the Proper Nozzle

Applications





Applications



Pipe Shapes and Sizes









Flounder or Channel Nozzle – Square Pipe



European Style Pipe – Not Common in N.W.









Nozzle Tiers



Types of Nozzles

- Standard Nozzles (Single Degree / Dual Degree)
 - Removal of loose and soft deposits
- Rotating Nozzles (Understand Speed of Rotation)
 - Removal of medium deposits and light roots
- Chain Scrapers
 - Removal of hard incrustations, roots, and concrete residuals
- Cutters
 - Removal of hard deposits, roots/wood, and full concrete



Standard Nozzles

- Used for general maintenance & cleaning
- Best for flushing loose debris on the bottom of the pipe
- Opens up blockages
- Clean pipes up to 100"
- Flush fully surcharged lines













Ejector Style Nozzle for High Flow Pipes – Multiplies water pump 5x





Rotating Nozzles



- Cleans 360° around the pipe wall and penetrates blockages
- Great for cutting grease and medium roots and breaking up light deposits
- Different angle rotating and thrust jets clean and flush the pipe
- Controlled rotation with built in braking system keeps RPMs between 1000 and 1400 allowing for longer impact time on pipe walls







Prevent Toilet Blowouts!

Anti-Blast or Equalizer Nozzles

- Designed to reduce airflow in pipes
- Scientifically designed to greatly reduce pressure and air speed in pipes
- No pressure equalization through P-traps or toilets









Rotating Chain Scrapers

- Used to completely remove roots, hard deposits, and concrete residue
- Adjustable chains and skids for different pipe sizes
- Flush line to remove loose debris before using chain scrapers
- Wire rope Link chain Bike chain with steel plates (aggressiveness)





Cutters

- Used as a last resort option to remove hard deposits before digging up pipe such as concrete
- Highly recommend a TV inspection prior to use
- Pipes must be in solid condition (use with caution in clay and PVC pipes)





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Cleaning Power Examples

Cleaning Examples – Rotator Removing Grease / Mineral Deposits









Cleaning Examples

Rotator Removing Grease Deposits



Chain Cutter Removing Root Mass





Cleaning Examples

Impact milling cutters Removing Lime Scale (Last Resort – Not Recommended)



Vibrating Nozzle Removing Lime Scale



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Thank You!