

Nozzles

1. Use correctly sized nozzle for pump pressure, hose size and flow-rate.
2. Do not operate the Vortex Jet nozzle above its pressure rating.
3. Only use nozzles that are clearly marked with their pressure rating.
4. Confirm nozzle is free of debris prior to installation.
5. Only use the wrench flats provided on the nozzle for installation or removal.
6. A clogged nozzle can produce excessive pressure or a pressure spike. Clean any clogged orifices immediately.
7. Do not use nozzle if it: has excessive wear, poor threads, questionable integrity, or is damaged.



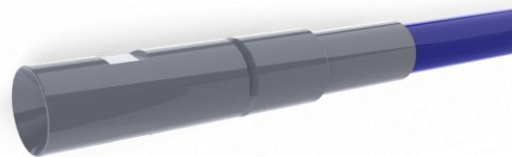
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Nozzle Dynamics Safety Guidelines

Caution!

High Pressure Waterblast Equipment Can Be Hazardous If Used Incorrectly



Always follow the guidelines in the Industry Best Practices for the Use of High Pressure Waterjetting Equipment by the Waterjet Technology Association while operating High Pressure Waterblast Equipment. The guidelines cover a broad range of waterblast topics, helping to ensure safe operating conditions while maximizing productivity.



General

1. Only thoroughly trained personnel should operate this equipment.
2. Operators must clearly understand the dangers associated with high-pressure waterjets and the harm they may cause.
3. All operators should wear proper personal safety equipment (PPE). This should include protective clothing, eye protection and hearing protection.
4. Setup a suitable barrier around the work area.
5. Observe all manufacturers' recommendations for safe and proper operation of the equipment.
6. Only use components with pressure ratings clearly marked and do not exceed the lowest pressure rated component.
7. Inspect all equipment for wear, damage, and proper assembly.
8. Before use, check and confirm that all tool functions are normal.
9. Check the orifices of nozzles for debris prior to installation. If clogged, clean or replace.
10. Purge debris from the system before connecting nozzles. Loose debris in the system can clog orifices causing abrupt pressure changes that may exceed ratings of equipment.
11. Properly tighten fittings. Use wrench flats when provided and avoid using gripping tools that create gouges which can weaken components.
12. Slowly increase and adjust pressure until operating pressure is reached.
13. At all times when under pressure, flexible and rigid lances need to be securely held because sudden or unexpected movements are possible.
14. Stop operation immediately if any equipment malfunction occurs.

Tube Cleaning – Flex Lancing

1. When cleaning with flex lances, use Vortex Jets with both forward and rearward jets. The jets should provide pull on the lance.
2. Flex lances must be free of defects and be properly rated for the pressures used. Replace as necessary. Do not attempt repair.
3. Use safety devices, like back-out preventers, where applicable to protect the operator.
4. Confirm sufficient clearance between the tube and lance, to allow debris to be flushed out of the tube.
5. Use a stinger on a flex lance to provide an indication of the tool's location in the tube.
6. If an orifice becomes plugged it may cause unbalanced forces. Ensure the lance is adequately held to resist unintended movement of the lance.

Rigid Lancing

1. When cleaning with rigid lances, Vortex Jets with forward/rearward jets or forward-only jets can be used.
2. The work area should be properly marked off, especially the nozzle exiting end of the bundle.
3. Pressure on/off control needs to be controlled by operator nearest to the bundle being cleaned.
4. Only use rigid lances that are free of defects and have proper rating for pressures used.
5. Ensure there is sufficient clearance between the tube and lance to allow debris to be flushed out of the tube.
6. Rigid lances should be supported at multiple points along their length while in use to avoid bending stresses on end fittings or lance threads.
7. A mechanical stop may be used to prevent the lance from extending too far beyond the end of the bundle.
8. Use care and caution with blockages in tubes. Adjust federate and pressure to avoid direct contact with blockage.