PENTAIR

WATERJET CUTTING

WATER TREATMENT SOLUTIONS

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WATERJET CUTTING

NORMS AND REGULATIONS

Waterjet cutting is widely accepted as one of the best methods for precision cutting – especially for materials sensitive to heat. Originally suited for softer materials, the addition of abrasives to the cutting jet means that today's jet cutters can tackle the hardest of metals, glass and stone with accuracy and at speed.

Operating in excess of 6000 bar with a usage of up to 19 liters per minute, these hi-spec machines require a steady supply of pure water. Impurities can do serious damage, quickly wearing out costly nozzles.

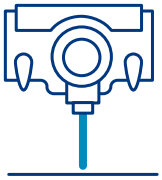
If a water quality test shows excessive minerals or contamination, then filtration, softening and reverse osmosis units may prevent costly maintenance over time. Many waterjet cutting operations choose to pre-treat their water, and for some it is the only option.

Here we examine the treatment possibilities and explain how Pentair solutions can help.

ABOUT WATERJET CUTTING

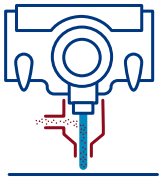
WHAT IS IT?

Water is pressurized up to 6000 bar and passed through a small diameter nozzle at around 1000 meters per second. It is fast and accurate, yet gentle on materials as it generates little heat.



PURE WATERJET CUTTING

Using water only, the nozzle can be relatively small and the jet very fine (as little as 0.1 mm) so this is highly effective for thinner materials. This method creates no dust or toxic gases so is more environmentally friendly.



ABRASIVE WATERJET CUTTING

The addition of an abrasive garnet, drawn in and mixed with the waterjet as it passes through the nozzle, makes possible a more powerful, deeper cut. Advances in pump and nozzle technology mean this method of waterjet cutting is more widely adopted.

BENEFITS OF PRE-TREATING WATER FOR JET CUTTING

- Removing impurities prevents damage to the waterjet nozzle
- Softening reduces calcium and magnesium ions at speed
- Reverse osmosis reduces most dissolved solids for optimum water quality and machine efficiency
- Treatment systems are low maintenance requiring only routine filter replacement
- Pre-treated water results in maximum up-time for jet cutting machines
- Operators report cost savings on nozzle replacements

WATER TREATMENT PROCESS FOR WATERJET CUTTING MACHINES

Before reaching the pump and jet cutting nozzle, mains water can be pre-treated for ultimate machine efficiency. The next page illustrates how Pentair products can be used in that treatment process.

IS WATER TREATMENT NECESSARY FOR WATERJET CUTTING MACHINES?

With most jet cutters consuming in excess of five liters per minute, a guaranteed clean water supply is essential. Impurities in the water can have a dramatic impact on the efficiency and life span of the jet nozzle. A water quality test should always be performed pre-installation and monitored over time as many factors can impact the purity of mains water. For some, tap water will be just fine, but for many filtration, softening, deionization or reverse osmosis may all be options to improve the water quality. Here we outline some of the common treatments available to treat the water used for jet cutting.

1 PREFILTRATION

Conditioning of mains water by prefiltration

While direct mains supply can be used, water pretreatment can significantly improve the performance, lifespan and efficiency of jet cutting machines. Pentair DGD 100% pure polypropylene filters provide three times the dirt holding capacity of similar cartridges and are ideally suited to the high volume demands of jet cutting.

MORE INFO

Pentair Big Blue Filter Housings

2 SOFTENING

Removal of minerals such as calcium and magnesium

A quick test may show significant hardness, even in pure, prefiltered water. Minerals can cause wear to a water jet nozzle. Calcium and magnesium can be easily removed with a softener. Iron and manganese need to be removed by means of an appropriated iron removal system. Pentair Fleck Valves have been developed specifically for such applications with the stringent requirements of industrial users.

MORE INFO

Pentair Fleck 9500 Softener Valve

3 REVERSE OSMOSIS TREATMENT

High-end purification through semi-permeable membrane

In cases where dissolved solids are high, in excess of 250 parts per million, reverse osmosis is the most thorough method of water purification. Pentair reverse osmosis systems filter particles as small as 1/1000 of a micron, at speed, offering ultimate protection for expensive jet cutting nozzles.

MORE INFO

Pentair Modular Pro Reverse Osmosis System

4 DEIONIZATION

Removal of soluble impurities using chemical ion exchange

As many non-particulate water impurities are dissolved salts, deionization quickly produces a highly pure water without scale build-up. Thanks to their glass fiber reinforced ABS construction, Pentair SIATA valves are particularly suitable for deionization, being resistant to regenerants such as sodium hydroxide and hydrochloric acid.

MORE INFO

Pentair SIATA V132 Valve for Deionization

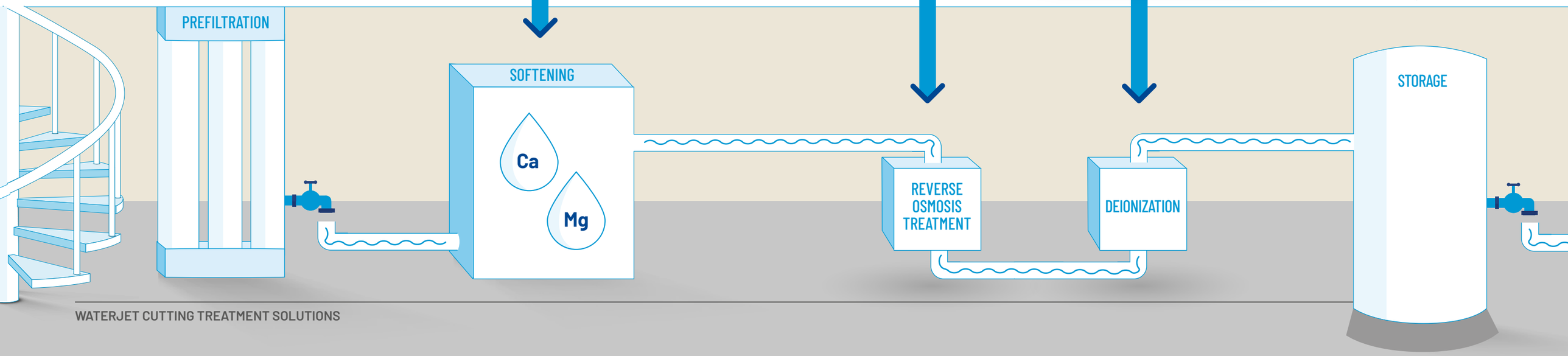
5 STORAGE

Non-corrosive pressure vessels for storing conditioned water

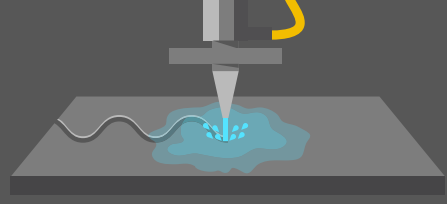
In the jet-cutting environment it may be necessary to create a surplus of treated water to ensure consistency of supply. With capacities up to 1600 gallons and a variety of options, Pentair fiberglass pressure vessels provide a non-corrosive and cost-effective solution.

MORE INFO

Pentair Structural Composite Pressure Vessels



Fact and figures



Precision
0.0025 mm – radius of corner achievable by waterjet cutting

Waterjet Timeline

1920s
Waterjet cutting used in American Gold mines

1930s
700 bar moving waterjet nozzle first used for paper cutting

1960s
3000 bar pressure used at Union Carbide to cut through metals

1970s
First waterjet cutters commercially available

1980s
Adding abrasives revolutionizes waterjet cutting

1990s
Motion control rigs increase complexity of cutting capability

2000s
Waterjet becomes mainstream alternative to laser, plasma and wire EDM cutting

Water use

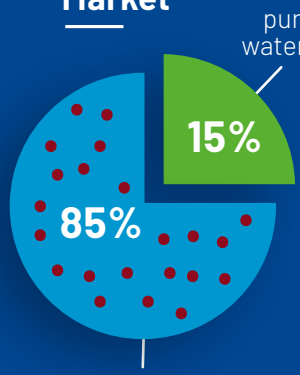
- **5** liters per minute – Average waterjet cutter
- **9** liters per minute – Running tap
- **10** liters per minute – Garden hose
- **8** liters – Toilet flush
- **15** liters – Washing machine

33%
USA share of global waterjet market

x1.6
predicted growth for waterjet cutting machines 1

25%
waterjet cutting market will be in car production

Market



Did you know?

Pure waterjet cutting is perfect for material from 0.2 mm – 25 mm thick:

- Fabrics
- Plastics
- Paper
- Foil
- Sealing materials
- Insulation foam
- Silicon
- Leather
- Food

Abrasive waterjet cutting is better suited for materials 5 mm – 50 mm thick:

- Metals
- Laminates made of materials with different melting points
- Toughened glass
- Ceramics
- Marble
- Wood
- Graphite
- Rocks

About us

At Pentair, we believe the health of our world depends on reliable access to clean water. We deliver a comprehensive range of smart, sustainable water solutions to homes, business and industry around the world. Our industry leading and proven portfolio of solutions enables people, business and industry to access clean, safe water, reduce water consumption, and recover and reuse it. We help ensure water is clean when returned to the environment. Whether it's for fitness and fun, healthier homes, better flood control, safer sky rises, more sustainable ways to farm, or safe drinking water for those who need it most, we won't stop until the world's water is managed the best way possible.

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Sources

Waterjet Cutting Machine Market Forecast, Trend Analysis & Competition Tracking - Global Market Insights 2019 to 2029: Fact. MR, February 2020

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