



# Cascade<sup>3</sup>

Improve water injectivity, recovery and well life

Tendeka's Cascade<sup>3</sup> valve is designed to significantly improve long-term performance of water injection wells.

In conventional reservoirs, a significant portion of oil production is driven by water injection into sand prone reservoirs. Waterflooding, whether applied at field start-up or as a secondary recovery technique, can increase production rates and boost oil recovery by maintaining pressure and ensuring a more effective sweep of the reservoir.

In heterogeneous reservoirs and unconsolidated formations with fine or poorly sorted sands, loss of injectivity is commonly associated with sand fill in the wellbore. These premature failures of water injection wells result in lower reservoir pressure, higher gas/oil ratio (GOR), less production and increased volumes of oil left in place.

In water injection wells, sand production occurs in the periods immediately following injection shut-down because of backflow, crossflow between zones or wells, and water hammer effects. Conventional sand control techniques which perform well in steady state production are not designed to control transient sand production and cannot always be effective in water injection applications.

Cascade<sup>3</sup> technology provides a unique solution to these problems by isolating fluid in the completion annulus and locking injection water into the formation to eliminate the transport mechanism for sand production entirely. The result is increased injection reliability providing ongoing waterflooding without costly re-drills or frequent well clean-outs.

## Features

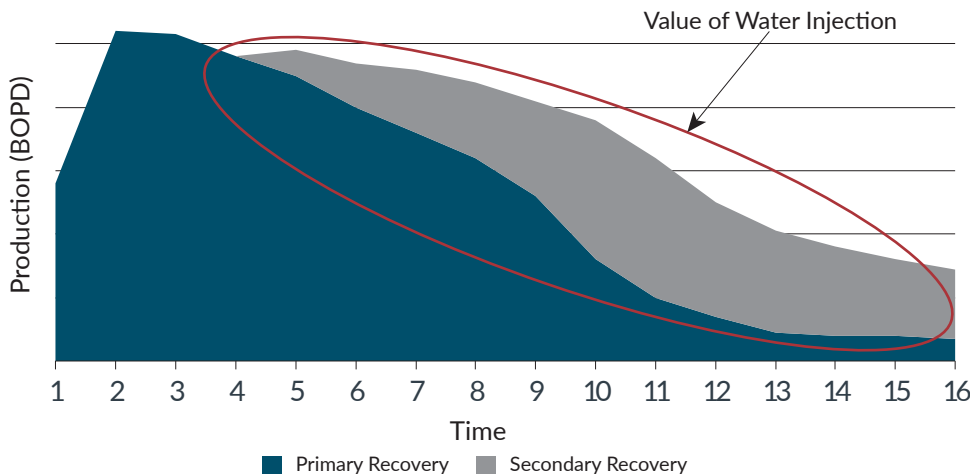
- Simple design and installation
- Radially mounted in screen base pipe with no effect on OD / ID
- 10,000BWPD injection per joint
- Compatible with gravel pack and standalone screen completions

## Benefits

- Eliminates crossflow reducing screen erosion
- Eliminates backflow and fines movement into the wellbore
- Prevents water hammer effects
- Improves injectivity and reservoir sweep
- Extends water injector life

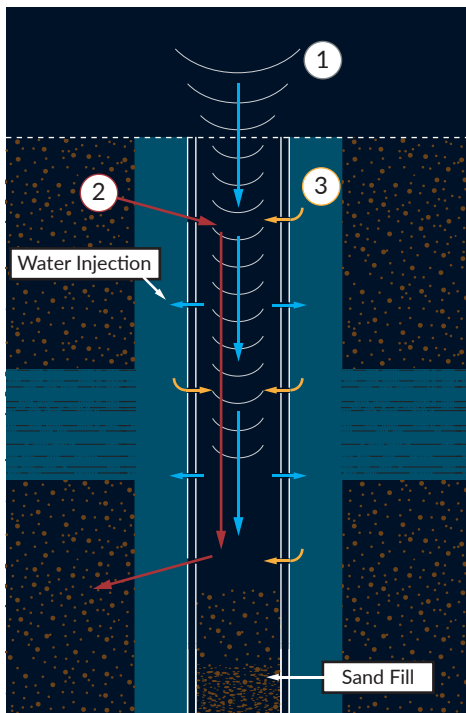


Production Decline



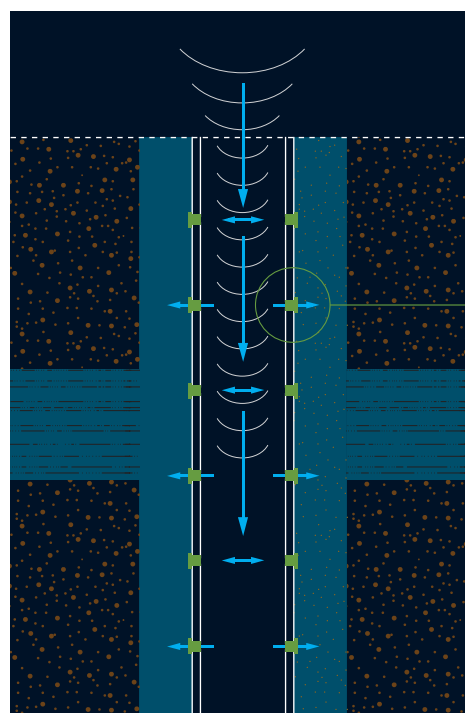


Failure mechanisms can result in a number of negative outcomes, limiting production, and ultimately reducing well life. Cascade<sup>3</sup> eliminates these failure mechanisms.



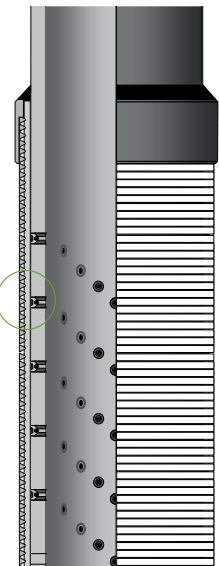
**Conventional Sand Control Challenges**

- 1 - Water Hammer
- 2 - Crossflow
- 3 - Backflow



**Cascade<sup>3</sup> Solution**

By preventing sand production, Cascade<sup>3</sup> extends injection well life resulting in more oil production and greater recovery



**Cascade<sup>3</sup> Technology**

High density of flow control valves mounted within conventional sand screens allows high water injection rates while increasing sand control reliability and maintaining injectivity over time.

Technical Specification	4.500"	5.500"	6.625"
Maximum OD	5.465"	6.465"	7.590"
Minimum ID	15.1#	20.0#	24.0#
Tensile Strength (85% of body yield based on L80)	300,050lbf	396,100lbf	471,750lbf
Screen Burst Pressure	4150psi	2785psi	2785psi
Screen Collapse Pressure	5400psi	3600psi	3600psi
Temperature Rating	400°F		
Injection dP at 40bpd/device	16psi		
Rate per foot	720 BPD		
Connections	As per customer requirements		
Metallurgy	Cascade <sup>3</sup> body 17-4PH SS, Insert Inconel 718, Ball Tungsten Carbide		
Service Life	15 years		