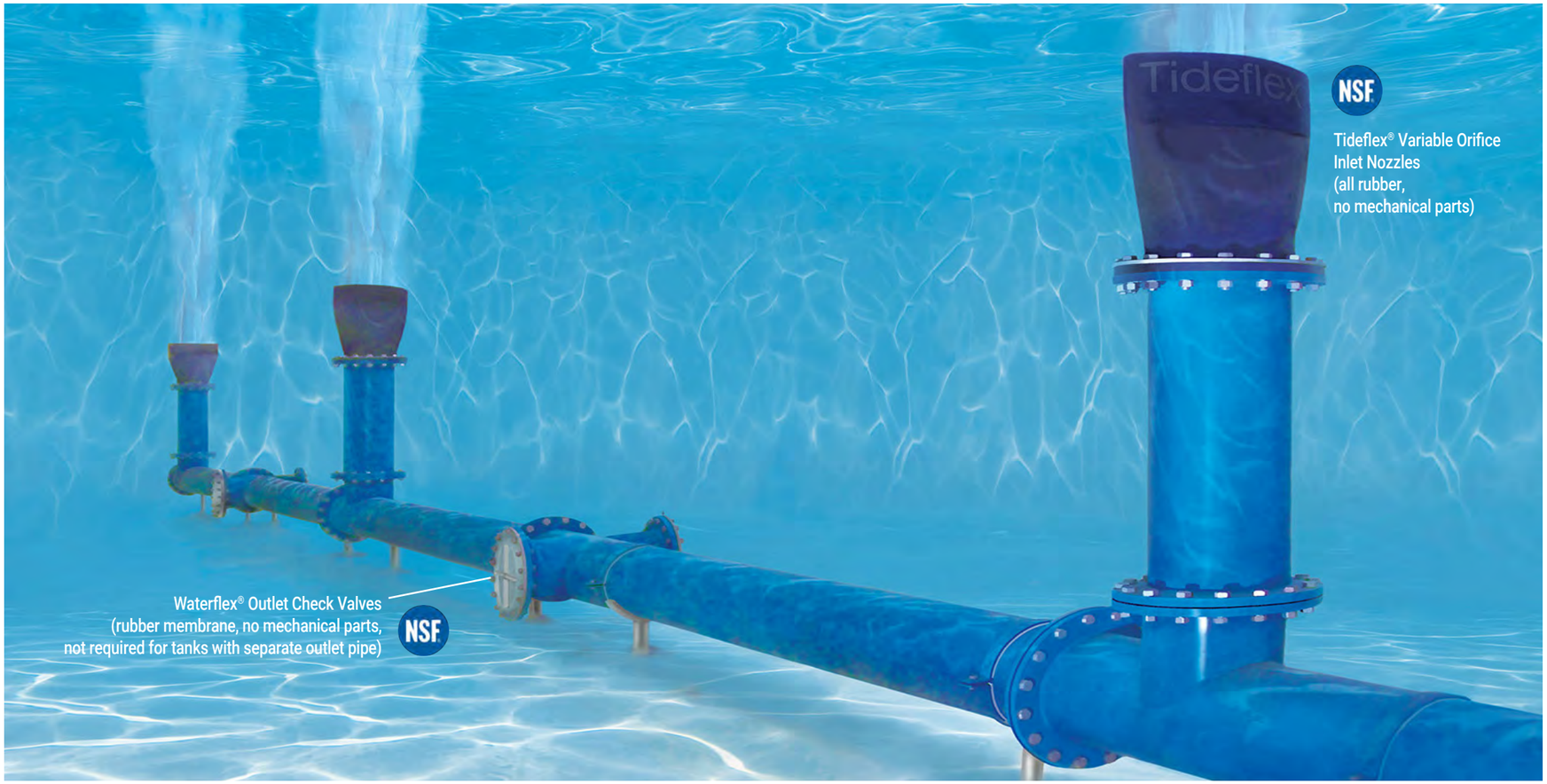
Red Valve

Tideflex® Mixing System: Science, with Simplicity.

The World Leader in Pinch and Check Valve Technology™

Custom Engineered Mixing Systems for Every Tank Style and Volume



Experience and Expertise Ensure Results

Since 1953, Red Valve Company has been the trusted global leader in engineering innovative Pinch and Check Valve Products and Mixing Systems for the most challenging applications. Developed in the 1980's from a United States EPA grant, the legendary Tideflex® Check Valve was created to solve backflow problems in outfall pipes.

Red Valve's engineering team further expanded the use of the Tideflex® Check Valve by developing it into a Variable Orifice Inlet Nozzle that provides superior mixing characteristics when compared to a fixed diameter pipe.

When used in the TMS, the Tideflex® Variable Orifice Nozzles optimize jet velocity at all flow rates and discharge an elliptically shaped jet, which produces rapid and complete mixing that improves water quality. The TMS also separates the inlet and outlet with one manifold pipe so short-circuiting is eliminated.

What's more, TMS is a truly green technology, requiring no outside energy source or maintenance, resulting in major cost savings over a minimum 30-year life.

Custom Designed for Every Tank

Red Valve engineers custom design every TMS based on tank style, material, volume, dimensions, flow rates and volume turnover. A TMS Design Report is provided and includes TMS drawings, specifications, manifold hydraulics and Mixing and Water Age Analyses. The Mixing Analysis shows how much turnover is required to achieve complete mixing. The Water Age Analysis provides the average water age under current or proposed operating conditions. Manifold hydraulics, mixing and water age models are run, as well as a jet trajectory analysis, to determine the quantity, size, orientation, elevation and discharge angles of both the Tideflex® Inlet Nozzles and Waterflex® Outlet Valves.

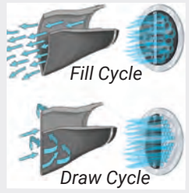
Features and Benefits of TMS:

- Extensive CFD and physical scale modeling
- Field validated for complete mixing of every tank style
- Tideflex® Variable Orifice Nozzles maximize jet velocity for rapid mixing
- No extra energy source required
- No maintenance
- Expected life - 30 years
- Complete system design with Mixing Analysis and Water Age Analysis
- Custom engineered for any tank style and volume
- Requires just one pipe penetration in tank
- Tideflex® Variable Orifice Nozzles and Waterflex® Outlet Check Valves are NSF 61 certified
- Passive and Active TMS available

TMS Solves Many Water Quality Problems Including:

- Loss of disinfectant residual
- Spikes in disinfection by-products (DBP)
- Nitrification in chloraminated systems
- Bacteria and biofilm growth
- Variations in pH and dissolved oxygen
- Aging water
- Thermal stratification
- Taste and odor formation
- Mitigates ice formation

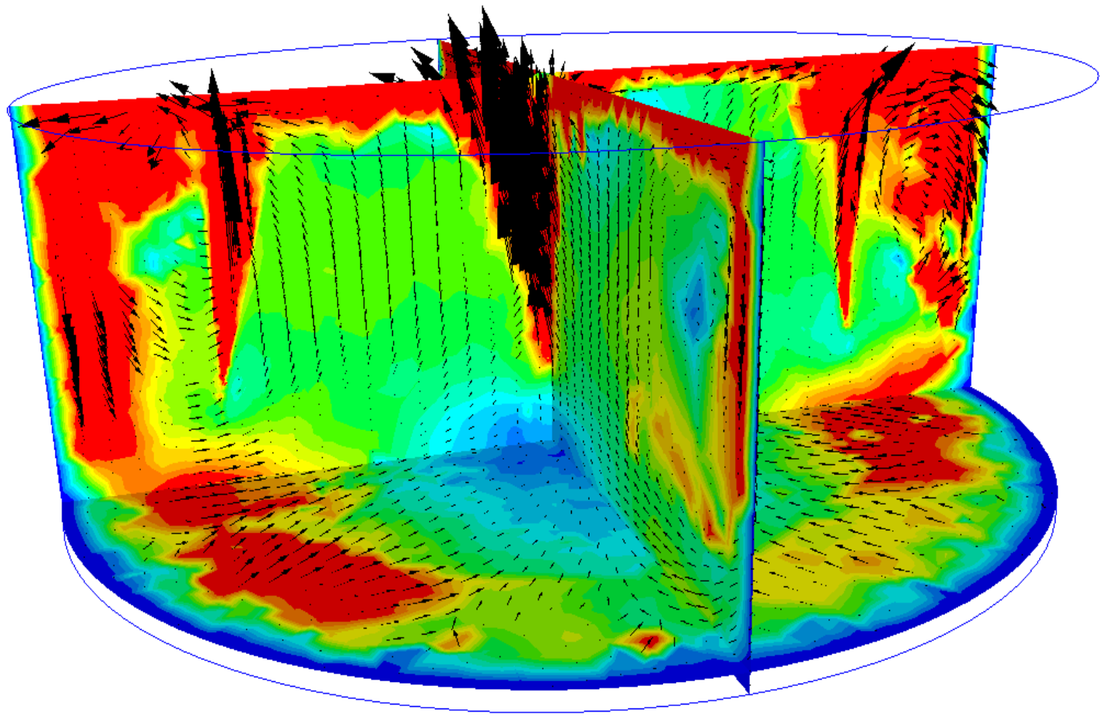
Complete Mixing, No Short-Circuiting



TMS is a multiport manifold system made of Tideflex® Inlet Nozzles and Waterflex® Outlet Check Valves that operate solely on differential pressure. There are no mechanical parts. While the tank is filling, the Waterflex® Valves are closed and the tank fills through the Tideflex® Nozzles, which mix the tank completely. During a draw, the Tideflex® Nozzles are closed and water is drawn from the tank through flow efficient Waterflex® Valves. Unlike a fixed diameter pipe, Tideflex® Nozzles act as a variable orifice, opening and closing with increasing and decreasing flow, maximizing jet velocity at all flow rates, producing rapid mixing with low headloss.

Tideflex®

A Green Solution for Improved Water Quality

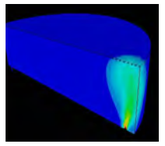


Limitations of Conventional Tank Design

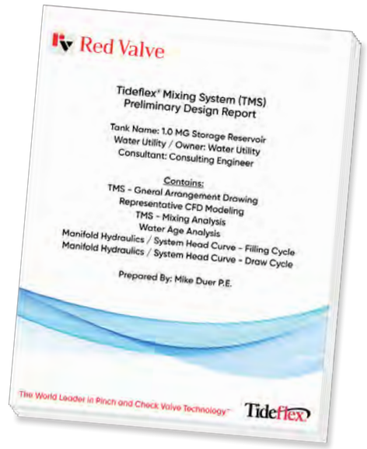
Conventional tank designs typically incorporate single or multiple fixed diameter inlet pipes, which create dead zones, short-circuiting, stratification and incomplete mixing. This piping configuration is extremely poor for mixing because it produces low jet velocity and concentrates all inflow momentum in one area of the tank. Inflow momentum is the energy responsible for mixing. When concentrated all in one place, a single fixed port will not effectively mix a tank. Problems with water quality are compounded in summer months as colder water entering the tank is denser and negatively buoyant, causing it to sink. As a result, water at the bottom of the tank is mixed, but water in the upper part of the tank does not mix, getting hotter and older each consecutive day. This leads to a localized increase in water age inside the tank. Even with an opposing outlet pipe, thermal stratification persists. Contrary to popular belief, a separate outlet pipe does not prevent stratification or prevent short-circuiting.

One of the keys to improving water quality in tanks is to ensure the water is mixed to prevent short-circuiting and dead zones. By design, the distribution system utilizes existing pumps and valves, which then return each tank back to its high water level. During a fill cycle, fresh water passes through multiple Tideflex® Nozzles, which create a circulation pattern throughout the entire water volume. This rapidly and completely mixes new water throughout the tank. Once the tank is mixed during the fill cycle, it does not "unmix" during the draw cycle.

Unlike mechanical mixers, TMS requires no added energy source to mix tank water. Mixers submerged or floating inside the tank also add substantial operation and maintenance costs, as motors must be replaced every few years, usually requiring the tank to be drained.



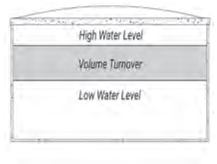
Inlet flow in one location inhibits mixing.



A TMS Design Report is provided for every tank, which includes TMS drawings, specifications, manifold hydraulics and Mixing and Water Age Analyses.

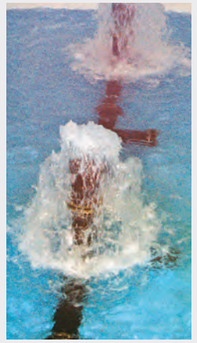
For tanks with minimal or no turnover, mixing 24/7 will not prevent water quality decay, as mechanical mixers just mix continually aging water.

Maximize Turnover, Minimize Water Age



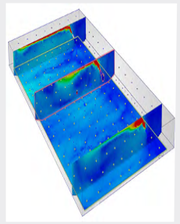
Water tanks are designed to have volume turnover and need turnover to minimize water age. For example, a 5% daily volume turnover = 20 day average water age, 10% turnover = 10 day water age, 20% turnover = 5 day water age, and so on. The AWWA recommends a 20% to 30% turnover for a 3 to 5 day water age. Water utilities should operate their systems to maximize tank volume turnover. This will minimize water age, increase disinfectant residuals, reduce DBPs and significantly improve water quality.

Multiple Variable Orifice Tideflex® Nozzles

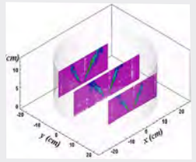


Traditional single inlets, where the flow is concentrated in one location, result in short-circuiting and stratification. This effect is worsened in summer conditions where inlet water is significantly colder than the tank water. TMS solves this problem with rapid and complete mixing due to the multiple Variable Orifice Tideflex® Nozzles, which produce at least 75% faster mixing than a single fixed diameter pipe.

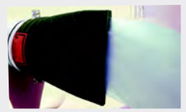
Computational Fluid Dynamics (CFD) Modeling and Physical Scale Modeling



Continuous CFD modeling has allowed Red Valve's engineering team to optimize TMS designs and configurations. Red Valve engineers conducted hundreds of CFD models for virtually every size and style of storage tanks. Partnering with Georgia Institute of Technology on a Water Research Foundation (WRF) project: "Physical Modeling of Mixing in Water Storage Tanks," hundreds of experiments were conducted on single and multiple port manifolds to analyze mixing characteristics. Virtually every size and tank style was modeled under isothermal, negatively buoyant (colder inlet water) and positively buoyant (warmer inlet water) conditions. Today's TMS designs are based on the most efficient manifolds found during the course of this project. The system has also been validated with independent scale modeling.

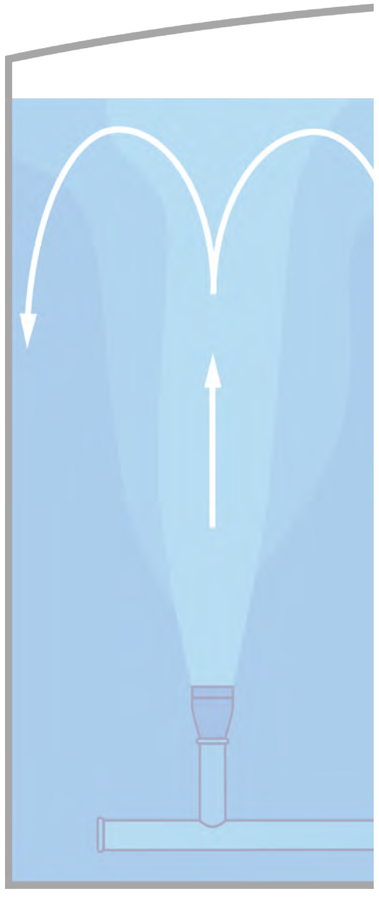


Maximized (Non-Linear) Jet Velocity of Tideflex® Nozzles Provides Rapid Mixing



Unlike pipes with a fixed diameter, Tideflex® Nozzles act as a variable orifice. They open and close with increasing and decreasing flow which maximizes jet velocity at all flow rates, producing rapid mixing with low headloss.

TMS in Circular, Rectangular and Irregular Reservoirs



In circular, rectangular and irregular-shaped reservoirs, the diameter or length is greater than the depth. A single fixed diameter inlet pipe (common or separate from outlet pipe) results in short-circuiting, poor mixing and dead zones in areas away from the inlet because momentum is concentrated in one localized area of the tank.

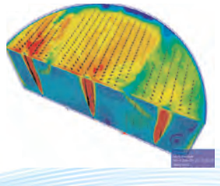
TMS achieves complete mixing through a horizontal manifold with multiple Tideflex® Inlet Nozzles that distribute the momentum across the tank. Manifold hydraulics, mixing and water age models are run, as well as a jet trajectory analysis, to determine the quantity, size, orientation, elevation, and discharge angles of both the Tideflex® Inlet Nozzles and Waterflex® Outlet Valves. Waterflex® Outlet Valves are strategically located on the manifold to eliminate short-circuiting. For tanks with separate inlet and outlet pipes, the TMS is installed on the inlet pipe.

Problem

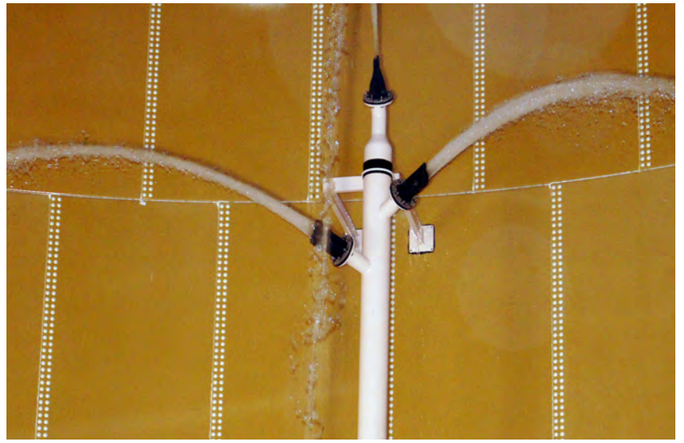
Reservoirs are prone to short-circuiting, as a single fixed diameter inlet pipe cannot distribute inlet flow momentum through the entire water volume.

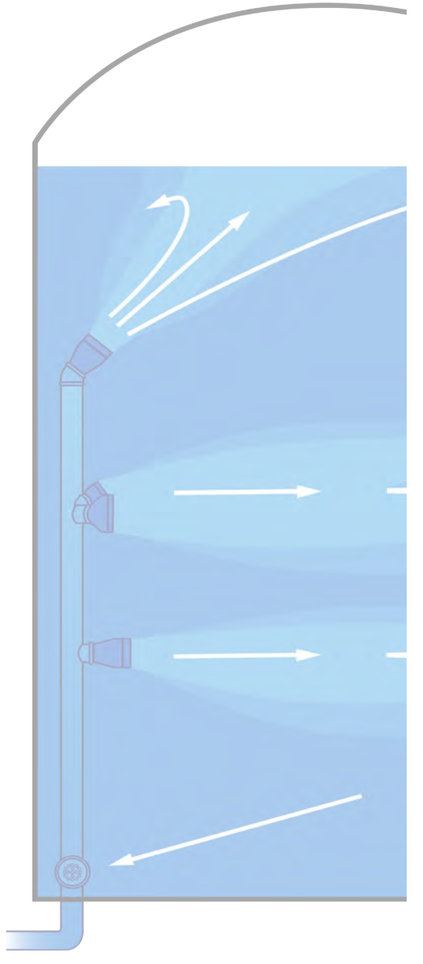
Solution

Multiple Tideflex® Inlet Nozzles circulate water through the entire tank volume and completely mix it with every cycle.



TMS in Standpipes





Standpipes are greater in depth than diameter and can exceed 140 feet (43 m) tall. They are extremely prone to short-circuiting, incomplete mixing and water quality decay, especially in summer when colder inlet water sinks, resulting in temperature stratification and increased water quality issues.

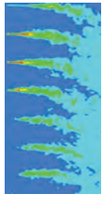
TMS uses a vertical manifold with multiple Tideflex® Inlet Nozzles at various elevations and angles, which distribute momentum throughout the depth of the tank and achieve complete mixing. Manifold hydraulics, mixing and water age models are run, as well as a jet trajectory analysis, to determine the quantity, size, orientation, elevation, and discharge angles of both the Tideflex® Inlet Nozzles and Waterflex® Outlet Valves. Waterflex® Outlet Valves are strategically located on the bottom of the TMS riser to eliminate short-circuiting. For tanks with separate inlet and outlet pipes, TMS is installed on the inlet pipe.

Problem

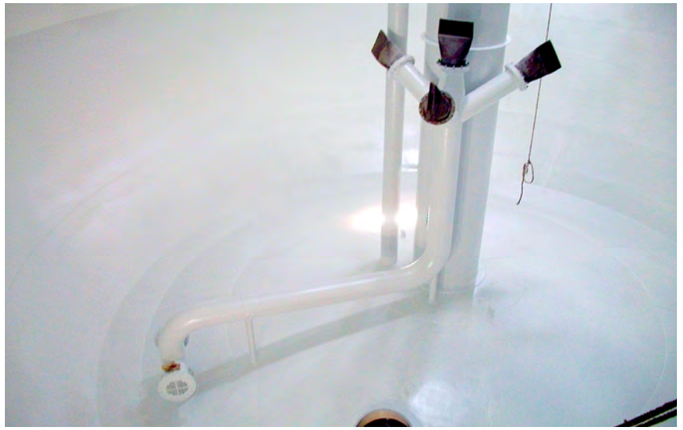
Due to their depth, standpipes are prone to short-circuiting, incomplete mixing and poor water quality.

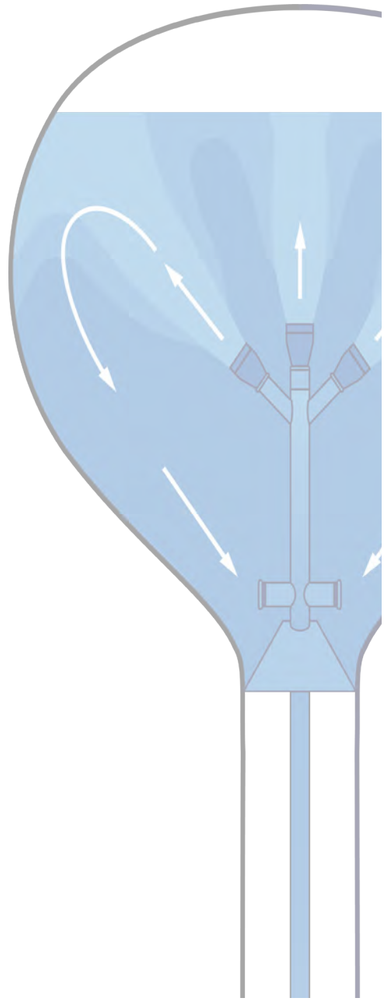
Solution

Complete mixing is achieved by having Tideflex® Inlet Nozzles at various elevations and discharge angles.



TMS in Dry Riser Elevated Tanks



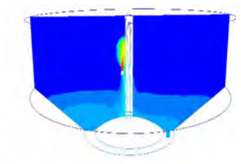


Elevated tanks are prone to poor mixing in summer and icing in winter due to large surface area exposed to the sun and hot and cold temperatures. The inlet-outlet pipe of Sphere-Spheroid, Fluted-Column and Composite Elevated Tanks (CET) runs up the pedestal, or dry riser, and penetrates the bottom of the bowl.

For tanks with common inlet-outlet pipes, TMS is designed as a vertical manifold with Waterflex® Outlet Valves near the bottom of the bowl. This separates the inlet and outlet and eliminates short-circuiting. Multiple Tideflex® Inlet Nozzles are located at various elevations and discharge angles along the vertical riser to achieve complete mixing and mitigate icing. Manifold hydraulics, mixing and water age models are run, as well as a jet trajectory analysis, to determine the quantity, size, orientation, elevation, and discharge angles of both the Tideflex® Inlet Nozzles and Waterflex® Outlet Valves. For tanks with a separate outlet pipe, TMS manifold is installed on the inlet pipe.

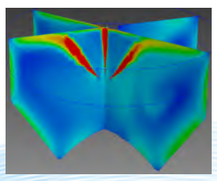
Problem

With their unique bowl geometry, elevated tanks are prone to poor mixing, stratification and water quality degradation.

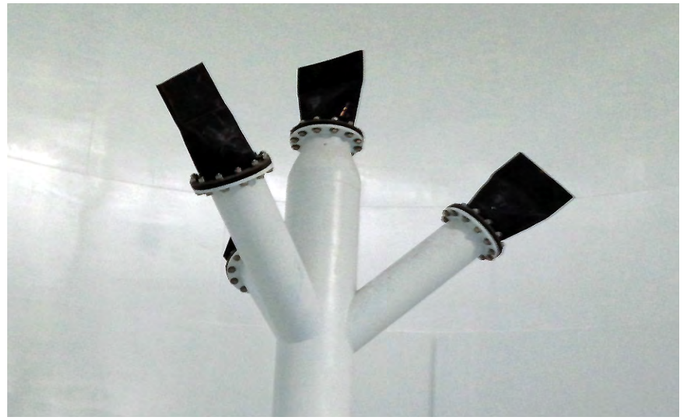


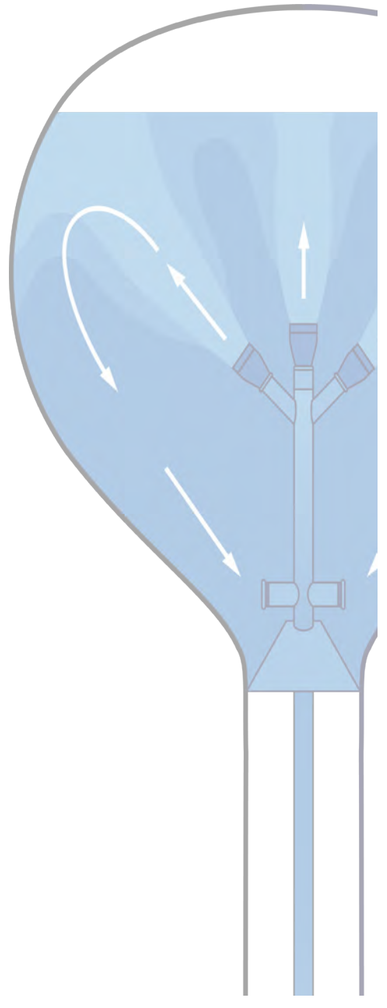
Solution

Multiple Tideflex® Inlet Nozzles at multiple angles and elevations completely mix the tank.



TMS in Wet Riser Elevated Tanks



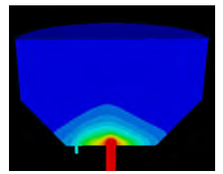


Multi-column or multi-leg tanks are highly prone to water quality issues. The inlet-outlet pipe penetrates the wet riser at ground level and is much smaller than the wet riser that is typically 3-12 feet in diameter and runs from ground level to the bottom of the bowl. When inlet flow discharges from the inlet-outlet pipe into the wet riser, the inlet flow velocity is severely reduced and flow momentum is extremely low when water enters the bowl making these tanks extremely prone to thermal stratification and short-circuiting especially in warmer months when inlet water is colder and negatively buoyant.

To achieve complete mixing, Tideflex® Inlet Nozzles are located up in the bowl at the top of the vertical riser. Manifold hydraulics, mixing and water age models are run, as well as a jet trajectory analysis, to determine the quantity, size, orientation, elevation, and discharge angles of both the Tideflex® Inlet Nozzles and Waterflex® Outlet Valves.

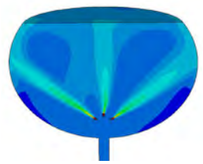
Problem

Wet risers drastically reduce inlet flow momentum, resulting in short-circuiting and stratification as only the bottom of the bowl gets mixed.



Solution

The entire tank is mixing through multiple Tideflex® Inlet Nozzles in the bowl. This configuration improves water quality and also mitigates icing.



Overflow Pipe and Drainpipe Protection

End of Pipe Tideflex®

Municipalities are challenged with protecting water storage tanks against contamination. Tideflex® Check Valves provide a reliable, cost-effective and maintenance-free solution for preventing insects, rodents, birds, and airborne pathogens, which can cause serious health risks, from entering tanks.

Unlike mesh screens and flap gates, the all-rubber construction of Tideflex® Valves will completely drain after an overflow, will not corrode or freeze open or closed in cold climates, will discharge debris during an overflow preventing clogging, and will also prevent airborne pathogens and cold drafts from entering the tank, mitigating icing. Tideflex® Check Valves are either flanged or clamped to the end of the overflow pipe and can be installed at any discharge angle.

In-Line Overflow Security Valve (OSV)

Red Valve's innovative Overflow Security Valve (OSV) incorporates a Tideflex® Check Valve inside the assembly that cannot be seen and is extremely difficult to access, manipulate or damage. The OSV is either welded or flanged within the overflow pipe and can be located at a higher elevation above ground level as an additional deterrent to vandalism. Red Valve engineers will provide a detailed Overflow Pipe Hydraulic Analysis to size and specify location for the Tideflex® Valve, OSV, and/or DOSA, based on tank dimensions, overflow pipe size and material, air gap distance and peak flow rate.

Dechlorinating Overflow Security Assembly (DOSA)

Storage tank overflows are rarely planned, with little time to react. Discharging chlorinated water into a storm water system or land can be harmful or toxic to fish, other aquatic life and plants, and can result in regulatory penalties. Red Valve engineers created the patented DOSA technology that prevents intrusion of birds, insects, and airborne pathogens, increases tank security and automatically removes chlorine residuals during discharge. The innovative DOSA technology is constructed of dual Tideflex® Nozzles and an internal adjustable dechlorination tube for dechlor tablets, completely encased in a non-clog epoxy coated steel or stainless steel body.

The Dechlorinating Overflow Security Assembly (DOSA) is covered under the following patent numbers: US 10,538,438 (US); CA 2,934,752 (Canada).

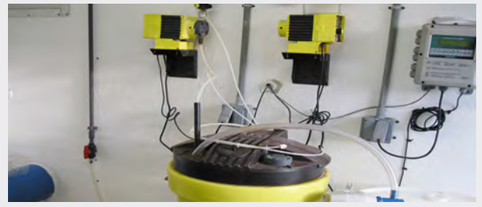
Pass-Active and Stand Alone-Active TMS Applications

The Passive TMS has been proven to mix tanks with as little as 5% volume turnover. For tanks that experience periods of extremely low turnover or extreme cold, the Passive TMS is easily made into an Active TMS using a recirculation pump, creating the Pass-Active TMS. The passive TMS is easily installed in the tank and no maintenance is required. The recirculation pump is installed in the valve vault or an adjacent structure, where mechanical parts are easily inspected and maintained.

The pump is low flow and low head as it pulls water from the tank and puts it back into the tank through TMS or a dedicated Tideflex® Nozzle. The pump only needs turned on when needed. It is the most widely used and proven active mixing technology, and has been in use for decades. Red Valve also designs Stand Alone-Active TMS which provide 24/7 active mixing as an alternate to mechanical mixers. It is a completely separate manifold that is not connected to the inlet or outlet pipes and uses a recirculation pump.

Safer, Easier Chemical Injection

TMS can also be used for chemical injection to boost residuals in storage tanks in free chlorine or chloraminated systems. Chemicals are injected into the inlet pipe during a fill or recirculation cycle and TMS completely mixes them throughout the entire tank volume. Red Valve engineers perform a Mixing Analysis to provide the fill time required for complete mixing. This method results in a homogenous solution in the tank and more consistent water quality leaving the tank, eliminating climbing to the top of the tank to add chemicals.



Red Valve offers a worldwide, world-class custom service network. With corporate offices in Pittsburgh, PA, manufacturing facilities in Gastonia, NC, and 114 sales representatives in 61 countries around the globe, Red Valve has the sales engineering team to help you select the best choice of valves and related products for your applications.

Represented by:

Red Valve®

The World Leader in Pinch Valve Technology™

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