



Red Valve

Tideflex® Hydraulic Recirculation  
Mixing Systems (HRMS)



# Hydrodynamic Mixing Design



## Variable Orifice Nozzle Technology

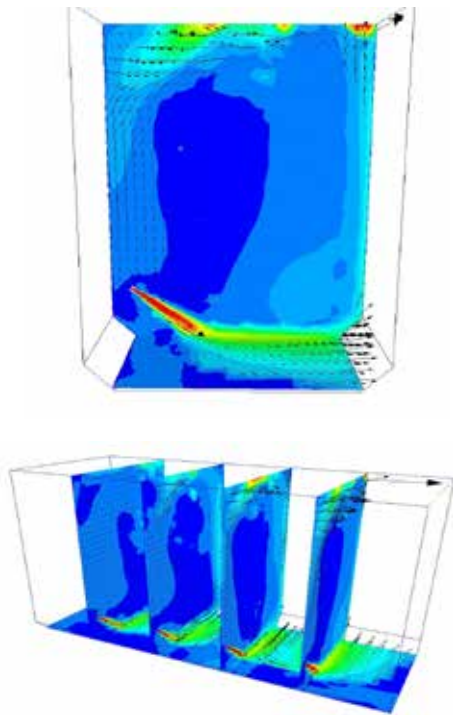
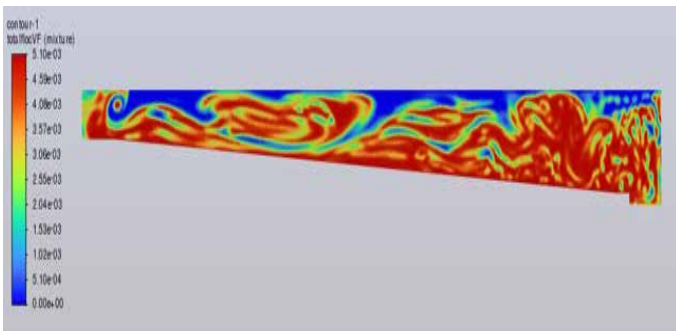
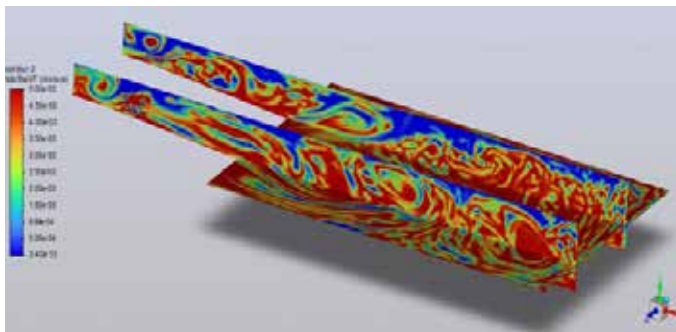
Hydraulic Recirculation and Mixing Systems pull fluid through a pumping system and re-inject it at high discharge velocities. This increase in energy results in mixing of the entire fluid body as well as maintaining suspension of solids contained within the fluid. These systems are ideal for applications where mixing with oxygen transfer is detrimental to the biological or physical treatment process.

Tideflex® Hydraulic Recirculation Mixing System (HRMS) nozzles will only open enough to discharge the fluid relative to the mass flow. Therefore, the effective open area of the discharge varies as the flow varies. The construction of the nozzles will vary in applied rigidity (sidewall thickness) so that they produce the required discharge velocity. This

provides maximum velocity at any discharge rate; fixed port nozzles cannot achieve this feature. In a Tideflex® system, any solids of large diameter recirculated through the system will pass through the discharge nozzles as they will expand to release the solid, then return to optimal discharge velocity.

Red Valve has hydraulically tested all the Tideflex® Mixing nozzle sizes and constructions for confirmation of the discharge velocities produced at various nozzle constructions. These tests were conducted by independent laboratories.

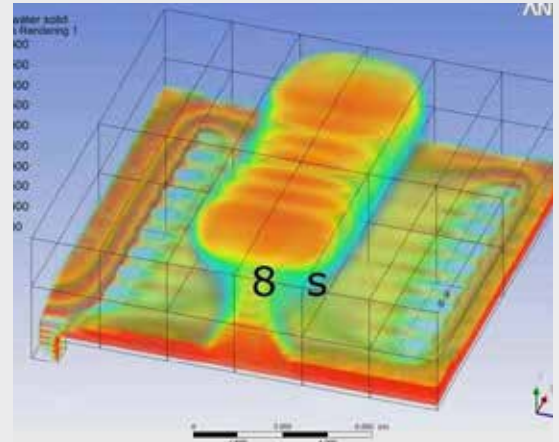
*US Patent No. 6,016,839 / 6,193,220 / 6,372,140 / 6,702,263*



Applications with high solids or high settling rates require that the initial discharge energy from the nozzle be directed at these solids to put them back into suspension. Computational Fluid Dynamic (CFD) Models show the high-velocity discharge near the floor and the resulting momentum mixing loop produced.

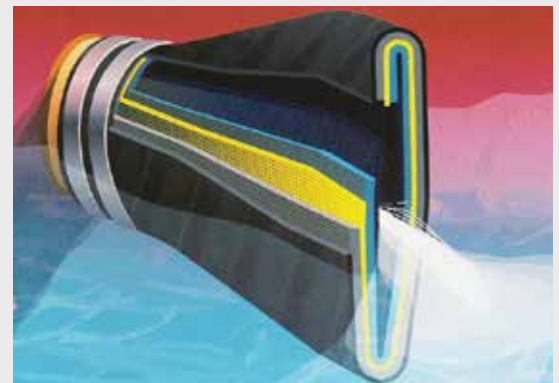
Red Valve engineers employ CFD Modeling to confirm arrangement designs and ensure optimal system performance.

## Engineered Mixing Systems



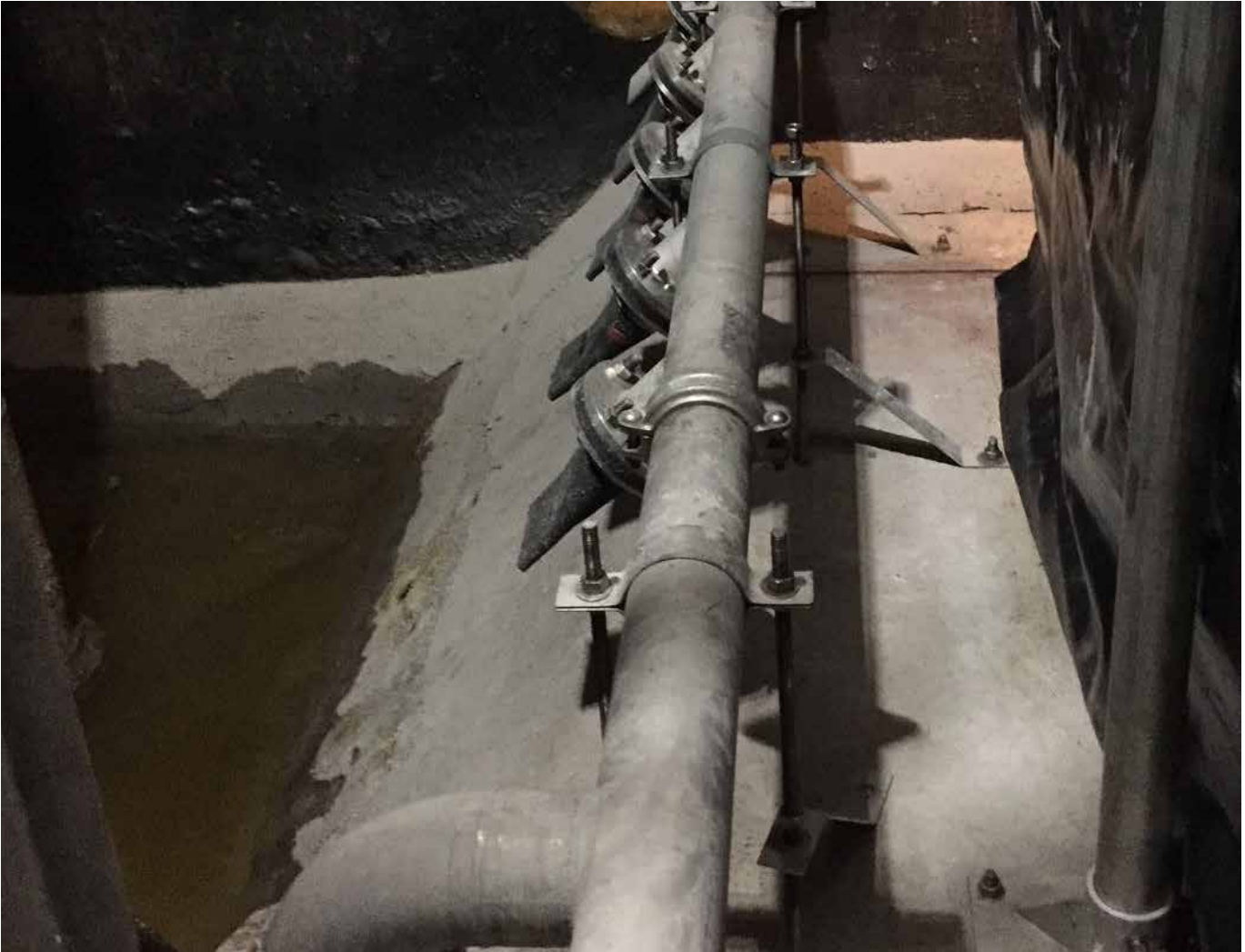
Tidflex® Hydraulic Mixing Systems are designed using CFD modeling of the geometric fluid body, hydraulic analysis of discharge plumes, and mathematical modeling of applied mixing energies. Multiport mixing systems provide better mixing coverage across the fluid body. These systems are designed to keep the settled solids in suspension and generate a homogeneous fluid state. Red Valve engineering can provide the design of the system and associated modeling, along with the mixing equipment installed within the tank.

## Nozzle Construction



Tidflex® hydrodynamic mixing nozzles are fabricated from built-up layers of elastomer and reinforcing fabrics. The structural rigidity of the nozzles dictates the resulting discharge velocity. This construction thickness can vary with every nominal size nozzle, providing numerous possible discharge velocities for each mixing nozzle.

# Process Applications



## Anoxic Zone Mixing

The primary application for Hydraulic Recirculation and Mixing Systems is anoxic mixing processes. These mixing systems operate in anoxic conditions where oxygen transfer can be detrimental to the process. Nutrient removal processes require large volumes of wastewater to be recirculated to the head of the process. This large recirculation volume is accompanied by large storage cell areas which require anoxic mixing.

## Anaerobic Sludge Storage Mixing

Anaerobic sludge storage tanks can be effectively mixed with hydraulic recirculation and mixing. The mixing requirement for anaerobic processes is significantly less than aerobic processes. Mixing systems in these applications are typically operated on a cycling or periodic basis.





## Flexible Discharge Nozzles

Multi-port nozzle systems provide optimal mixing across the entire tank floor, eliminating potential for solids accumulation. Variable orifice nozzles provide optimal discharge velocity during operation. The flexible discharge nozzle will also allow large diameter solids to pass through the nozzle and prevent clogging.



## Grit Resuspension



Grit can accumulate in many locations throughout the treatment facility, especially in the headworks area where primary removal of grit is conducted. For concentrated grit areas, hydraulic nozzles can be directed into these zones to resuspend particles for removal.

## Sump and Wet Well Mixing



Wastewater transfer sumps and wet wells will accumulate grit and large solids. The discharge pumps can be utilized to provide recirculated flow for mixing of the wet well during pump initialization. Hydraulic mixing systems provide excellent resuspension of settled solids. If floating debris is present (fats, oils, grease build-up), then a Tideflex® Aeration Mixing System should be applied to break up this material and mix it with the fluid.

# Construction Material and Installation



## HRMS Comes Ready for Easy Installation

The Tideflex® Hydraulic Recirculation Mixing System is supplied ready for installation. All pipe and equipment connections are either flanged, coupled, or threaded. There are no requirements for field welding, field fabrication, or any field modifications – the system is supplied as a kit, ready for easy installation. The type of recirculation pump is selected and provided by the customer; the pump sizing requirements are provided by Red Valve.

All tank internal pipe supports are provided for the piping system, as well as detailed installation instructions. These supports are anchored with seismic grade epoxy adhesive, which is provided by Red Valve.

The hydrodynamic mixing nozzles are connected via a flanged joint to ensure the nozzles remain anchored during the system operation when dynamic loads are being applied to the system.





## Manifold Construction

Tidflex® Hydraulic Mixing Systems are fabricated using schedule 10 (304L or 316L) stainless steel pipe. This material can be used to fabricate specialty configurations and nozzle orientations. The material is strong enough to withstand the turbulent mixing environment and is resistant to corrosion and deterioration typically associated with wastewater processes.

## Nozzle Construction



Tidflex® Nozzles are constructed with elastomeric flanges, designed to perform in high-velocity applications and each nozzle is securely attached to the manifold.

Tidflex® Hydraulic Mixing Nozzles are fabricated from various elastomers, in combination with internal fabric reinforcement, wrapped throughout the nozzle. The nozzle rigidity is determined during the design process to achieve the required discharge velocities. As result, each Tidflex® Hydraulic Nozzle is uniquely designed and constructed for its specific application, with no generic nozzles being used.

## Nozzle Identification



Given that each nozzle is unique and tailored to its specific application, the construction designation is clearly marked on every nozzle.



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