

# All Mixed Up? **Water Tank Mixing Made Easy** *updated: 05/29/18*

The growing focus on water quality in potable water tanks has many tank owners considering mixing. This chart helps identify the broad categories of mixers, active and passive, as well as specific types. But every tank and distribution system is different, and numerous factors go into selecting the mixing system that is best for you. We hope you find the information helpful, and if you'd like to discuss your specific situation and how it impacts the options below, contact us - we love to talk tanks!



Type	Manufacturer	Estimated Cost <sup>(1)</sup>	Life Expectancy (years)	Estimated Annual O&M Costs	Electrical Requirements	Chemical Injection Option	Drain Tank to Install <sup>(2)</sup>	Description	Comments	Installations
ACTIVE MIXING SYSTEMS	<a href="#">GridBee Submersible Mixer</a>	\$30k	20 - 25	\$200 - 500	120 VAC, 20 amp service	Yes	No	NSF 316 stainless steel unit, 3 feet long, 10 inches round, setting on the tank bottom on feet, or suspended from tank roof. Water circulates by inducting water along the tank floor through the intake ends of the unit, then forcing water out through designed slots on top, producing an upward sheet flow of water. Power cord is run from grade up the sidewall and to the entry near the roof hatch. Includes SS chain for retrieval.	Designed to be lowered through a 12" minimum diameter roof hatch. Can be retrieved via hatch for future maintenance or removal. Does not need to be welded to floor. Tank painters can install during renovation/tank painting, plus provide conduit and wiring to grade to be powered by Owner's electrician.	Thousands throughout the US & Canada, including extreme climate areas.
	<a href="#">PAX Water Mixer</a>	\$40k	10 - 20	\$200 - 500	120/240 VAC, 50/60 Hz, 15 amp circuit, nominal power draw 0.345 kVA (345 watts)	Yes	No	A stainless steel submersible motorized impeller device sets on the tank bottom and circulates water throughout the entire tank from bottom to the top. Power cord is run from grade, up shell, through roof hatch to unit. Unit is connected to chain to access it.	Mixer mounted on tripod stand, does not need to be anchored to floor but is recommended. New monopod mixer for sloped bottom in elevated tanks. Typically fits through 12" roof hatch. Has SCA-DA input/outputs. Option for solar power. Tank painters can install mixer during repainting, and also provide conduit and wiring to ground to be powered by Owner's electrician.	Thousands throughout the US & Canada, various climates, including ambient temps of -40F.
	<a href="#">PHi Hydro-Pulse Mixing System</a>	\$20 - 25k	10 - 20	\$200 - 500	20 amp, 115 volt single phase, 60 Hz service, plus power for air compressor	No	Yes	This mixing system utilizes the injection of compressed air through a piping system from an air compressor, enclosed at the base of the tank, to up above the high water level, then down to specifically spaced bubble forming plates anchored to the tank bottom. The mixing aspect of this system comes from bubbles rising from the bottom to the top of the tank.	Claims to have 50% energy savings compared to other mixing technology. Used for many years in a variety of other applications, like wastewater. Need to support air tubing/piping to tank walls inside and out, may require welding and coating touch-up afterwards. Annual maintenance recommended	Dozens of installs throughout PA.
	<a href="#">Red Valve - Active Tideflex Mixing System (ATMS)</a>	\$45 - 75k	30	\$200 - 500	1/3-1/2 HP centrifugal recirculation pump, 120/240 VAC, 50/60	Yes	Yes	Combines the Passive Tideflex Mixing System (TMS) inside the tank with a centrifugal recirculation pump installed in an enclosure by the tank. Pump is low flow, low head. Recirc pump only turned on when needed which reduces energy cost. When on, it draws water from tank and circulates it back thru the Tideflex Inlet Nozzles of the TMS to mix the tank. For tanks that have little or no turnover, the pump can force the tank to drawdown.	Recirc pumps have been used for decades. Red Valve sizes the pump and provides a Mixing Analysis that provides data on time required for recirculation pump to run to fully mix the tank. The pump, controls, and wiring are typically supplied by the installation contractor.	Dozens.
	<a href="#">SolarBee Tank Mixer</a>	\$30k	20 - 25	\$200 - 1,000	Solar powered	Yes	No	Mixer floats on surface with impeller at top pulling water through a flexible intake hose from the tank bottom to water surface. Solar-powered with panel mounted to tank roof, and power cables through roof hatch. Operates 24 hours/day via battery backup, and is available as grid powered electric only, too.	Smaller units fit through 24" roof hatch; larger ones require 36" roof hatch and crane or manlift to install. Equipped with brushless motor, solar panels, back up battery and digital control system located outside tank. Solar panels are rated for hurricane wind loads. Extra solar panels required in northern latitudes with limited sunlight during winter months. Larger and elevated tanks raise concerns with limited water movement, and lessen the guarantee of ice prevention. Larger units recommend Owner or Manufacturer's rep put inflatable boat inside tank to perform check-ups and field adjust unit, plus clean solar panels regularly.	Thousands of installations across the US, in tanks from 0.25MG to 100MG.
	<a href="#">Tank Shark</a>	\$40 - 50k (mixer only)	10 - 20	\$500 - 1,000	Power for booster pump - varies depending on size and tank height	Yes	No	Stainless steel unit sets on tank bottom with one or more eductor nozzles located 3-5 feet above the base of the tank, causing an upward flow of water equal to approximately five times the nozzle flow. Flow through the nozzles is generated by booster pump outside the tank, pumping water through tubing up shell, through roof, and down to unit. No moving parts or electrical equipment within the tank.	In cold climates, need insulation and heat tracing on source water piping from booster pump to tank roof entry point. Most attractive if additional dosing and mixing of chemicals is desired, typically in million gallon+ tanks or ones in problem areas of a water system. Can set up real-time water sampling, then adjust chemical doses automatically. Added features can be costly, but worth it if no other mixing solutions work.	3 in Coatesville, PA; 1 upcoming in Abington, PA. Numerous installs in CA and TX.
	<a href="#">TAP-APP (Air Pulse Protection) by Caldwell Tanks</a>	\$20 - 25k	10 - 20	\$500 - 1,000	(4) 110 VAC, 15 amp GFI outlets; (1) 230 VAC, single phase, 20.6-22.7 amp supply to air source	Yes	Yes	Uses pulses of air to move water inside tank. Air compressor at base of tank pumps air through tubing up above high water level, then down to tank bottom and out to bubble forming plates. Tubing passes through and under plates, then air forms large bubbles under the plate that rise to the top surface of the water, causing mixing. No moving parts or electrical equipment within the tank.	Mixing cycles can be scheduled according to specific mixing needs and around daily peak energy periods. Similar technology to PHi Pulse Hydraulics system detailed above. Annual maintenance recommended.	More than 100 installs.

**The Fine Print:** (1) Estimated costs are based on system furnished and installed in a 1.0 MG reservoir in the Mid-Atlantic region, including electrical if applicable. We strive to be as accurate as possible, so if you have actual estimates that fall outside of our estimates, please share them with us! (2) For best results, install new mixers in a tank recently cleaned of sediment and biofilms. (3) Our mission is to help our clients make informed decisions; the information provided is not meant to endorse or condemn any products, and is intended to be a factual representation of tank mixing system information, devoid of any opinion or bias.

more mixing options *on next page >>*

# All Mixed Up? Water Tank Mixing Made Easy *(continued)*

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PASSIVE MIXING SYSTEMS	<a href="#">CB&amp;I - FreshMix</a>	\$60 - 70k	60	None	None	No	Yes	System has nozzle on the end of the inlet pipe, and a vertical draft tube. Incoming water flows through the inlet nozzle into the draft tube, where it "drags" stored water with it, resulting in a higher mixing flow rate. When the water stream exits the top of the draft tube, it mixes with the water in the top of the tank before returning to the bottom during withdrawal.	Only mixes during filling cycle. Painted carbon steel piping, NSF approved. Typically only available as part of new tank package, and not as a stand alone system for retrofits. First installation in 1997. Requires more turnover than other passive systems to fully mix.	More than 100 installs.
	<a href="#">DIY - Inlet Pipe Extension or Separation</a>	\$10 - 20k	80	None	None	No	Yes	Basic design that separates inlet and outlet pipes by a greater distance, encouraging mixing. Extend inlet pipe to 60% to 90% of high water level. Can add a tee at end of inlet for more mixing. Must connect to existing pipe via bolted or welded connection, and requires designed pipe supports from shell to pipe.	Only mixes during filling cycle. Various pipe materials can be used (painted carbon steel, PVC, HDPE). Need separate inlet and outlet. Limited mixing potential.	Thousands throughout the US.
	<a href="#">Landmark - Hydrodynamic Mixing Sys. (HMS)</a>	\$40 - 60k	30	None	None	No	Yes	Manifold piping, inlet nozzles with variable orifice valve, and outlet ports with wafer check valves result in mixing during tank filling. Various materials of construction available (steel, ductile iron, PVC, HDPE).	Conducted research, analysis, and testing to maximize mixing efficiency in Composite Elevated Tanks. Each tank is CFD modeled to address geometry, operation cycle and flow magnitude, plus seasonal, emergency and future demand. Requires 10-30% daily turnover in tank to fully mix: varies depending on tank and design. Can install on single inlet/outlet pipe.	More than 200 installs.
	<a href="#">Tideflex Mixing System (TMS)</a>	\$40 - 70k	30	None	None	Yes	Yes	Uses multiple Tideflex variable orifice inlet nozzles and Waterflex outlet check valves on one manifold pipe extending across the bottom in a reservoir, or up the shell in a standpipe. Variable orifice nozzles mix by optimizing jet velocity and discharging an elliptically shaped jet. Check valves at start of piping are located to prevent short-circuiting during draw cycle.	Only mixes during filling cycle. Systems have been CFD and physically scale modeled and field verified. Requires approximately 30% daily turnover in tank to fully mix, and may require system operational changes for best results. Can install on single inlet/outlet pipe, and pipe extension in tank can be carbon or stainless steel, ductile iron, PVC or HDPE. May lose up to 2' of system pressure. New options to add equipment/piping to change to active mixer with constant water flow, and provide chemical injection.	Thousands throughout the US and Canada.
	<a href="#">Universal Tank Mixer (UTM) - UTM Hydro</a>	\$90 - 100k	30	None	None	No	Yes	Stainless steel piping directs water flow to the water surface, with outlet attached to float changing with water level, and larger diameter pipe slipped over smaller diameter pipe slide up and down inside tank. Check valve at tank bottom piping for outflow.	Introduced into market in 2004. Requires approximately 30% daily turnover in tank to fully mix, and may require system operational changes for best results. Total pressure drop within the normal operating range of the system is less than 1 psi. Need 42" square roof hatch to bring into tank.	Few dozen in US: City of Cleveland, OH has 8; Jefferson County W&S, OH; Department of Defense in Guam.
	<a href="#">York Water Co. - Tank Mixer</a>	\$30k	25	None	None	No	Yes	York Water Co. designed and installed their own mixing system, adding it to tanks when they are repainted. It consists of a series of tees on the inlet pipe with check valves that only allow water through on draw cycle, and a flexible hose on top of the inlet pipe that extends up to the high water level with a float and PVC tee to discharge water into the tank.	Only mixes during filling cycle. This system is currently unique to York Water Co., but two tanks are planned in Western, PA. They started using it in 2006. No reported problems with freezing water or ice affecting it. Can install on single inlet/outlet pipe. They do not manufacture system, but will share design information. Has Pennsylvania DEP approval. Annual inspection from roof hatch.	Approximately 15
IN-TANK AERATION	<a href="#">DIY - Spray System</a>	\$20 - 25k	10 - 20	\$1,000	Power required for booster pump - single phase, 115/208-230 VAC	No	No	For Trihalomethane (THM) removal. Consists of a tap off the inlet pipe, a pump at the base of the tank, and small diameter piping running up the shell to several couplings in the roof, that discharge water into the tank through spray nozzles. Acts similar to a stripping tower.	Typically found in systems with operations staff who are mechanically inclined and safety trained to work at heights for installation & maintenance. Accelerated corrosion may occur on interior roof and upper shell, due to air and water mist. More effective with blower through roof for air changes, and additional roof vents as required. Nozzles can clog and need replacement, particularly in hard water regions. Freeze protection may be needed in colder climates in winter, or decommission system.	Known systems in Upper Mohawk Valley, NY; Monroe County Water Authority, NY; Rockville, MD.
	<a href="#">PAX Trihalomethane Removal System (TRS™)</a>	\$50 - 70k	10 - 20	\$1,000	Varies depending on size & components of system	No	No	For THM removal, spray and surface aeration systems available. System has spray nozzles and pumps OR surface aerators which provide water surface area for mass transfer, active head-space ventilation systems which evacuate THM laden air from the headspace of the tank, and mixers which continually refresh the mass transfer zone at the water surface. Systems are sized to treat flow rates from 10K GPD to 50 MGD, and deliver a specific % reduction in TTHMs from 20% to 70%.	Active feedback control systems using an on-line THM analyzer can provide energy savings for larger installations. Systems come with a process guarantee based on achieving the specified % removal. Treatment can be based at a clearwell to treat all water entering distribution, or in storage tanks to target areas with elevated THM levels. Accelerated corrosion may occur on interior roof and upper shell due to air and water mist. Improved ventilation can help.	Rockville, MD; Stanley County, NC; numerous in CA.
	<a href="#">Medora THM &amp; VOC Removal System</a>	\$50 - 70k	20 - 25	\$1,000	240VAC/1PH, 240VAC/3PH or 480VAC/3PH, 60Hz power	No	No	Spray aeration for THM and VOC removal. Spray unit floats on surface, and pulls up water through an adjustable intake hose. Acts similar to a stripping tower. THM removal system also includes ventilation system that prevents volatilized THMs and VOCs from recondensing back into water.	Accelerated corrosion may occur on interior roof and upper shell due to air and water mist. More effective with blower through roof for air changes, and additional roof vents as required. Recommend that Owner has inflatable boat to use inside tank to perform check-ups and field adjustments of unit. Manufacturer has equipment maintenance program available.	Several in south-eastern PA, 300+ throughout the US.

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