All Mixed Up? **Water Tank Mixing Made Easy** *last updated: 3.15.17*

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!

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Type	Manufacturer	Estimated Cost [1]	Life Expectancy (years)	Estimated Annual O&M Costs	Electrical Requirements	Chemical Injection Option?	Drain Tank to Install? [2]	Description	Comments	Installations
ACTIVE MIXING SYSTEMS	**GridBee Submersible Mixer**	$30k	10 - 20	$200 - 500	120 VAC, 20 amp service	Yes	No	316 stainless steel unit, approximately 3 feet long and 10 inches round, setting a few inches above the tank bottom on feet, or suspended from the tank roof. Circulates water by inducting from along the tank floor through the ends, then sending it upward and out across the water surface in layers causing direct and induced mixing effects. Power cord is run from grade, up shell, through roof hatch to unit. Unit is connected to chain to access it.	Drop in through roof hatch (~75 pounds) powered, then turned on. Fits through 12" 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 mixer during repainting, and also providing conduit and wiring to ground to be powered by Owner's electrician.	Thousands throughout the US.
	PAX Water Mixer	$40k	10 - 20	$200 - 500	120/240 VAC, 50/60 Hz, 15 amp circuit, nominal power draw 0.345 kVA (345 watts)	Yes	Maybe	A stainless steel submersible motorized impeller device sets on the tank bottom in a flat bottom tank, or is secured to the riser in an elevated tank, 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, and mounting is required in elevated tanks with a sloped bottom, so tank must be drained first. Typically fits through 24" roof hatch. Has SCADA 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.
	PHi Hydro-Pulse Mixing System	$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 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 the 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.	Dozens of installs throughout PA.
	SolarBee Submersible Mixer	$30k	10 - 20	$500 - 1,000	solar powered	Yes	No	System is basically a flexible tube, weighted on one end to the tank bottom, and floated to the top on the other with a solar powered motor spinning an impeller near the top of the water, drawing water up from the tank bottom, pushing it out the top end at the surface. Solar panel is fixed in place on tank roof near hatch, and cables run through hatch to supply power.	Brushless motor, solar modules, and digital control system outside of the tank. Solar mounts are hurricane rated for wind loads, typically welded to tank roof. Larger and elevated tanks raise concerns with limited water turnover, and lessen the guarantee of ice prevention. Can function, even in low light conditions, as power is stored in a battery. Add second solar panel for back-up in case of snow covering panels. Larger units need a bigger roof hatch (3'x3') for installation, along with crane or manlift to hoist it up and in. Larger units also recommend Owner has inflatable boat to use inside tank to perform check-ups and field adjustments of unit. Also need to keep solar panels clean.	Installations across the US, with large concentration in CA. Numerous PA installs in tank sizes ranging from 0.3MG to 10MG.
	Tank Shark	$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.
	TAP-APP (Air Pulse Protection) by Caldwell Tanks	$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.	More than 100 installs.

In-tank aeration *systems can be coupled with active mixers to remove Trihalomethanes (THMs)*

IN-TANK AERATION	**DIY - Spray System**	$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 as 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. 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.
	PAX Trihalomethane Removal System (TRS™)	$50 - 70k	10 - 20	$1,000	Varies depending on size & components of system	No	No	For THM removal, 3 options for various tank sizes and styles. Water is pumped into a piping system that extends up above the high water level in the tank, then sprayed through nozzles as a mist, releasing THMs into the air. Acts as a stripping tower. Can combine with a PAX mixer.	More commonly found in states with strict mixing requirements (NM, AZ, etc.). 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.	Rockville, MD; Stanley County, NC; numerous in CA.
	GridBee THM & VOC Removal System	$50 - 70k	10 - 20	$1,000	240VAC/1PH, 240VAC/3PH or 480VAC/3PH, 60Hz power	No	No	For THM removal, various options for various tank sizes and styles. Water is drawn through hose from tank bottom up to top of tank and sprayed out through nozzle as a mist, releasing THMs into the air. Acts as a stripping tower.	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.	Several in southeastern PA.

more mixing options *on next page >>*

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

Type	Manufacturer	Estimated Cost [1]	Life Expectancy (years)	Estimated Annual O&M Costs	Electrical Requirements	Chemical Injection Option?	Drain Tank to Install? [2]	Description	Comments	Installations
PASSIVE MIXING SYSTEMS	**CB&I - FreshMix**	$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.	More than 100 installs.
	DIY - Inlet Pipe Extension or Separation	$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.
	Landmark - Hydrodynamic Mixing Syst. (HMS)	$70 - 80k	30	None	None	No	Yes	Similar to the Tideflex system. Low inlet velocity required. Outlet ports have wafer check valves between ports and nozzles to maintain circulation.	Only mixes during filling cycle. 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.	More than 200 installs.
	Tideflex Mixing System (TMS)	$60 - 70k	30	None	None	Yes	Yes	Separates the inlet and outlet with 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 valve at base of piping system pulls water out of tank during draw cycle.	Only mixes during filling cycle. 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, PVC or HDPE. May lose some system pressure. New options to add equipment/piping to change to active mixer with constant water flow, and provide chemical injection.	More than 2,000 installs.
	Universal Tank Mixer (UTM)	$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 one 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.
	York Water Co. - Tank Mixer	$30k	25	None	None	No	Yes	York Water Co. designed their own mixing system, and had their painter put it in most of their tanks when they were repainted. It consists of a tee on the inlet pipe, and one side has a valve that only opens when draining, and the other side has flexible hosing extending to the top water surface supported by a float, separating the inlet and outlet.	Only mixes during filling cycle. This system seems to be unique to York Water Co., and 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.	More than 10.

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.*

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