Cut Costs With Automated Tank Cleaning

Automated tank-cleaning systems typically consist of a motorized tank washer, pump and process-control package that make efficient use of resources.

Chances are, tank cleaning in your facility is a simple procedure. Workers physically rinse, wash and sanitize them. Or the tanks are rinsed, filled with cleaning solution and water, drained and rinsed again. These manual methods, however, may be costing you thousands of dollars or more per tank.

An alternate method, automated tank cleaning, can cut these costs. Often, the investment in automated equipment can be quickly recouped. Before automation can be considered, though, determine cleaning objectives by setting times for each of four cleaning-cycle stages. These are:

1. Rinsing. Water is used to remove up to 90% of product residue.

2. Cleaning. Water temperature, spray and chemicals loosen dirt and remove traces of the previous product.

3. Post-Rinse. Suspended residue and cleaning agents are removed.

4. Sanitizing. Sanitizing agents cover all surfaces, eliminating microorganisms to industry-acceptable levels.

Other factors to consider are:

• Flow rate. Tank wash nozzles provide a specific flow rate at a given pressure. Use the lowest flow rate possible to minimize water and chemical usage and wastewater. When impact is needed, increase the flow rate rather than increase pressure. For example, doubling the flow rate will increase impact up to 100% while doubling the pressure will only create approximately 40% more impact.

• Coverage. Try to limit coverage to only what you need, but don't overlook shadows. These can occur when the spray cannot reach part of the vessel due to

internal obstructions such as mixers, agitators or filling tubes. Multiple nozzles may be required.

• Spray impact. Spray coming from the nozzle should extend long enough to reach tank walls. Be sure that the cleaning liquid will be sprayed with enough impact to clean the surface. Also, spray pattern must be factored in when evaluating impact. Under equal operating conditions, solid-stream sprays provide the greatest impact, followed by flat sprays and full-cone sprays.

• Water supply. Check that your water supply is clean and does not contain dissolved solids or suspended particulates that may interfere with the cleaning process. Use a filter or strainer to keep these particles away from the nozzle.

With the above conditions checked, there are several ways to automate a tank-cleaning application. For small and medium-size tanks, clean-in-place (CIP) systems are often implemented. These use spray balls or tank-wash nozzles mounted to a pipe. The nozzles either remain fixed in place or are fluid-driven and rotate in the tank.

In medium to large tanks, encrusted with more stubborn residues, two types of tank washers can be used. High-pressure motor-driven units feature a motor to drive the nozzle and operate at pressures ranging from 100 psi to 1,000 psi. Both the liquid pressure and rotational speed are independent, which enables optimization of the pressure and time needed to complete cleaning.

Fluid-driven (turbine) tank washers utilize fluid to spin a turbine, which, in turn, powers a gear set. Two solid stream sprays rotate as the hub revolves around the central axis to provide complete coverage. The high impact provided by these washers makes them well-suited for large vessels or tank cars.

Both high-pressure motor-driven and fluid-driven tank washers can be permanently installed for CIP systems or easily moved from tank to tank. Fully automated systems consist of a tank-wash nozzle or motorized tank washer, a control panel, a pump, and a process-control package. These systems offer total automation, precise control and optimal efficiency. Cleaning cycles, chemical injection and recirculation can all be automated. The result is minimal operator intervention, reduced maintenance time and efficient use of consumables. These systems can be installed permanently or mounted on a skid for mobility from tank to tank.

Automated tank cleaning is possible in a range of applications, including: Ethanol tanks. In ethanol applications, tank-cleaning facilitates heat transfer and removes potential pockets of infection. For example, a beer manufacturer was cleaning by pressure-hosing the vessel and then filling it with hot water or a hot caustic soda solution. The vessel was drained overnight, then pressure-hosed again before use.

To improve efficiency, the company installed a CIP system using a fluid-driven (turbine) tank washer. After cleaning from a hose connection to the water supply, a caustic solution is used for cleaning, pre-rinsing and flushing. Equipment sanitation is accomplished using a chlorine solution. The CIP system proved so effective in the

fermentation tank, other systems were quickly installed in the beer well and yeast tank.

Automotive paint tanks. For years, maintenance personnel at a large automotive manufacturing plant cleaned the facility's 20 tanks by hand. The process took hours and exposed workers to toxic Toluene fumes.

By modifying the shaft of a standard motorized tank washer, the low-ceiling obstacle was eliminated and an automated tank washing unit was installed. The tank washer rotates in a spherical pattern to clean all tank surfaces with a powerful solid steam jet.

The result? More paint residue is removed and product quality has improved. The tank washer paid for itself in just two months and ongoing annual maintenance savings are estimated at $40,000. Use of the motorized tank washer has also eliminated worker exposure to toxic fumes.

Process Tanks. A specialty chemical manufacturer faced several challenges in developing a CIP procedure to replace manual tank cleaning. These included different size tanks to be cleaned; the system had to withstand the corrosive effects of heated deionized water; and the residue required high-impact cleaning and maximum coverage to clean around obstructions.

The manufacturer elected to build its system and a cleaning validation procedure around a compact, rotary tank wash nozzle. The nozzle, available in several corrosion-resistant, high-temperature materials, provides a high-impact flat fan-spray pattern and complete spray coverage. In addition to reliable, repeatable cleaning, less deionized water is required. This lowered energy costs because less water is heated. Maintenance time is reduced because the nozzles have no internal wear parts. The CIP system is now being used in this manufacturer's blending tanks, reactor tanks and transfer/storage tanks.

Cold rooms. Complete removal of product residue is critical in the food and beverage industry. One manufacturer chose fluid-driven rotary tank-washing nozzles to clean a 30-by-50-ft. cold room. Complete spray coverage was essential to eliminate bacterial growth. The CIP system consists of an array of 36 nozzles based on a 5-ft. radius per nozzle. Some nozzles are spaced more closely for coverage of sidewalls and overhead ductwork and equipment. The cleaning nozzle has three high-impact sprays mounted in a rotating spray head driven by the flow of liquid through the nozzle. Nozzles are positioned to provide complete orbital coverage of tanks up to 8-ft. in diameter.

Although each application is different, all automatic tank-cleaning systems involve removing solids on vessel walls. And the benefits are the same: cleaner tanks at a lower cost.

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