

Tube benders experience more challenges when it comes to cleaning their product than most other metal formers. Tubes present a challenge for cleaning, due to the viscosity of the lubricant used to protect the metal during the bends as well as the variations in shapes, tube diameters and orifice orientation. By using antiquated aqueous dip tanks or fixtured spray impingement systems, production will be slowed to a crawl by the inability to clean tubes in a standard aqueous wash process. Solvent cleaning systems are able to solve these problems in a quick and cost effective manner.

A closed-circuit, hermetically sealed, industrial washing system that uses solvent, is the ideal technology for applications where the aim is to achieve the highest possible, repeatable cleaning and drying results together with inexpensive operation. The thickest, hardest contaminants can be successfully removed during treatment in these systems. By utilizing a sequence of heated sprays, immersions, the application of ultrasonic during submersion and vapor rinsing sealed solvent systems clean tough parts effectively and efficiently. In addition, through the application of heated blowing cycles and vacuum drying, the parts leave the process chamber absolutely bone dry to the touch regardless of orientation within the system.

Washing with solvents such as Perchloroethylene is ideal for tube applications because perc is able to break the surface tension between soil and metal up to 6 times more effectively than heated water and alkaline soap. This allows the ultrasonic action applied to the solvent while in submersion to break that surface tension of contaminant on the part even more effectively and allow it to be rinsed away. Each cycle in the cleaning process takes place inside the same sealed chamber, where one or more baskets of tubes, loaded in any orientation that is convenient, have been loaded.

When the cycle begins, the door is closed and a spray impingement washing process is performed using hot solvent. The solvent is applied through moderate pressure spray jets directly onto the parts. This stage removes up to 90% of the soil from the parts. The soil laden solvent is drained from the process area while the continued spraying takes place and is delivered to a distilling device within the system, which boils the solvent into a vapor. The soil remains in the still for subsequent removal while the vapor is directed to a chiller which condenses the clean solvent into liquid for subsequent use. This distillation process continues to occur throughout the entire operation of the equipment.

The second cycle involves complete submersion of tubes within the process chamber, during which ultrasonic mechanical action favors the detachment of the remaining contaminant from both the interior and exterior diameter of the tubes.

In the final stage of the cleaning cycle, direct vaporization is performed on the parts using solvent vapors inside the chamber. These vapors come from the still, but rather than being sent to the chiller for immediate condensation, they are directed to the process chamber for a final rinsing where they condense on the parts and cause removal of any remaining pollutants. Then the parts move to the drying stage, which allows for virtually total recovery of the solvent from the parts. Charcoal filters are necessary in some machines to ensure compliance with environmental regulations.

Heater cores, refrigeration tubes, cooling system tubing, exhaust manifolds or any other types of tubes can be more effectively cleaned and dried using a sealed solvent system than those systems that use soap and water. This is true mainly because soap and water systems cannot clean interior diameters adequately, but it is also a reality due to the inefficiencies of water based systems.

In sealed solvent systems the solvent comes to the process chamber therefore the parts do not need to be transported from one bath to the next for submersion. By effectively bringing the same, yet freshly cleaned solvent to the parts for each cycle, there is no concern of bath contamination nor is there any carryover from one bath to the next.

In fixtured indexing conveyor systems where nests hold each part in a particular orientation so the spray impingement can be directed down the throat of the tube, fixtures need to be made for each specific tube. Different tube designs require different nests to hold each individual tube in the proper orientation. This is necessary to allow not only for proper spray cleaning, but also for proper draining to facilitate adequate drying.

When submersion is used, the surfactant package in the alkaline cleaner needs to be intense enough to release the lubricant that it can harm the tubes made of softer metals. There the issue becomes how to drain the water from inside the tubes prior to basket of tubes move from one bath to the next for cleaning, rinsing and drying. When single piece flow is attempted, the differing fixture nests create change over time that fails to allow production rates to be maintained. In addition

As demonstrated in these cases, solvent closed circuit cleaning systems are versatile and effective. They can be employed in many applications, including tube cleaning, with excellent results.