

PENETRANT WASTEWATER & HOW TO TREAT IT

Anyone involved in liquid penetrant inspection knows that a considerable amount of rinsewater is generated during the inspection process. This wastewater contains the rinsed-off penetrant along with any contaminants that may have been on the parts being inspected.

Today's penetrants typically contain emulsified oil, dye and surfactants (wetting agents). Most companies are concerned about the oil and the dye in the water they discharge. There are also some wastewaters where the rinse contains heavy metals picked up from the parts being inspected.

There are several options available to handle these wastewaters. We'll look at some of the more common methods.

Off-Site Disposal

This is the simplest method since it only involves arranging for a licensed waste facility to haul off the waste. Unfortunately, it's also usually the most expensive way to go. There's also the concern of liability since the generator of the waste has "cradle-to-grave" responsibility for its proper handling and disposal. If you choose to go this route, you should make sure the company you're dealing with has deep pockets and large liability insurance coverage.

Evaporation

This is a pretty straight-forward method for reducing your waste volume – boil off the water and dispose of the small amount of concentrated waste that's left over. Although this method has been around for a long time, rising energy costs have made this a very expensive option. If you calculate the amount of energy it takes to boil off a gallon of water, it becomes readily apparent that this is going to appeal to no one but the utility company. Add to this the burden of air permits and air monitoring and you can see why this option has become less that attractive.

Ozonation

Ozone is an oxidizing agent and can be an effective method of sanitizing water as anyone with an ozonator on their hot tub knows. Given time, ozone can effectively destroy the dye present in the wastewater from penetrant inspection. The problem with ozone is that it works on simpler molecules first and takes longer to break down more complex larger molecules such as the surfactants and emulsifiers. The oils that are emulsified are the most difficult for ozone to break down.





Membrane Filtration

Membrane systems have been used for decades to process many aqueous wastes. In simple terms the process extracts clean water from the wastewater and concentrates the penetrant contaminants. Concentrations of over 95 percent have been achieved with membrane systems, resulting in significant savings in waste disposal costs. If you can reduce your off-site disposal from say 500 gallons per week to less than 25 gallons of concentrated penetrant, the return on investment can be fairly quick.

Early systems often used Ultra-filtration membranes which are commonly used in industry to break oil/water emulsions, but typically allow dyes and surfactants to pass through with the water. More restrictive Nano-filtration membranes are capable of blocking oil, dyes and most of the surfactants. These Nano membranes are also capable of drastically reducing dissolved heavy metals and hardness minerals. The biggest advantage of membrane systems is the low operating costs and minimal labor required to maintain them.

Nano-filtration Operation

The wastewater is pumped from the rinse station into a Process Tank that is supplied with the system. A float switch in the Process Tank triggers the Nano-filtration machine to begin processing when the tank level rises. The machine extracts clean water from the tank, leaving the contaminants in the tank. As parts are being inspected throughout the week, the machine operates automatically to keep processing and removing water based on the level of waste in the tank. No interaction with the machine is needed until you want to concentrate the Process Tank during a

period when inspections are not active (usually on a weekend). By simply resetting the machine to its manual mode, it ignores the float switch and removes as much water as it can, resulting in a very small amount of concentrate in the bottom of the tank.

When you come in Monday morning, all that's needed is to pump out the small amount of concentrate (using the machine's pump) and then flush a cleaning solution through the machine for a one-hour cleaning cycle. After the cleaning, the dirty cleaner is left in the Process Tank to be part of the next week's processing since the cleaning solution is also contains an important anti-foulant that aids in the processing. The system is then restarted for a week of labor-free processing.

Recycling

Although many companies send the processed water to sewer, there is a growing awareness of the limited supply of clean water in the world. This has led to an interest in reusing the water by close-looping the rinsewater in the inspection process. The only difference between processing with Nano-filtration for sewer discharge and recycling the water is the addition of a holding tank for the clean water, an ozonator to maintain the water in a sanitary condition, and a pump to send it back as needed to the rinse station. In this way the water can be reused indefinitely.

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For more information on NDT Products Limited Nano-filtration equipment, visit our website at www.splitter.com or send us an email at sales@ndtproducts.ca

