“Inexpensive Insurance for Water Treatment Systems-Resin Traps”

by Ronald Madden

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Summary:

A simple resin trap, long favored by experienced operators of water treatment equipment, is an inexpensive form of insurance being used more frequently in today's risk adverse water treatment marketplace. Should an internal lateral break or otherwise fail, resin traps eliminate the possibility of ion exchange resin or other filtration media leaving water treatment equipment where it belongs, and prevent it from traveling downstream where it doesn't belong. Install a resin trap. Like insurance, do not wait until catastrophe strikes to see the value.

Why do I need a resin trap?

"An ounce of prevention is worth a pound of cure"– so wrote Benjamin Franklin in the 18th century from his home in Philadelphia. The same logic holds true today when it comes to resin traps. Resin traps offer an inexpensive way to avoid the expensive problems that develop when ion exchange resin or other media unintentionally reaches process areas or downstream process equipment.

Unfortunately, this is a problem that is occurring with greater frequency as cost conscious purchasers of water treatment equipment and services ask manufacturers of water equipment to reduce costs. Switching from stainless steel laterals, to less expensive laterals made of PVC or other plastic materials, can substantially reduce the cost of the equipment or service. Blame it on the law of unintended consequences, but if your water treatment system has plastic laterals, you are at risk.

What is a resin trap?

A resin trap is a very simple filtering device using a stainless steel wedge-wire filter. The slots are small enough to retain any upstream ion exchange resins or other filtration media. At the same time, the number and size of the openings must be sufficient to keep the pressure drop to a minimum. A clear sleeve will visually indicate whether there is an upstream problem. A small ball valve allows for removal of resin or media after the problem has been repaired.

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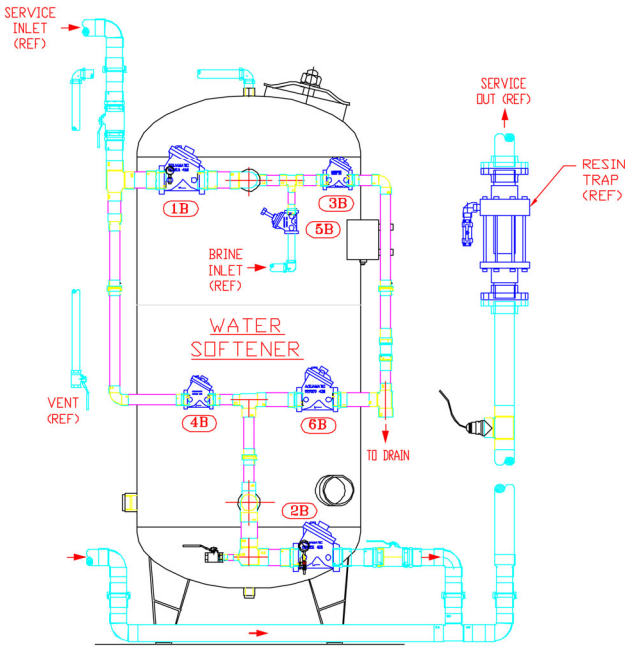
Where should I install a resin trap?



If one doesn't already exist, you should put a resin trap in your discharge piping of your ion exchange of media based water treatment equipment. This is particularly true if your facility leases skid mounted, offsite regenerated DI tanks from a local DI water service provider. None of these type service companies presently use stainless steel bottom distributors in their exchange tanks. They have all switched over to plastic assemblies, everyone one of them.

Why you need a resin trap in three examples:

In order to highlight the danger of not including a resin trap in the discharge piping of an industrial water treatment system, let's look at a few instances where they were not used. In all the cases, the affected end users would have avoided significant expenditures had they installed a resin trap. In the first two cases, resin traps were installed after the fact. Unfortunately, the damage had already been done and the consequential costs were staggering! In the third case, a refinery wisely understood the value of installing a resin trap before a problem occurred.

1. Automotive Assembly Plant

Prior to painting automobiles in a modern assembly plant, deionized water is used in the preliminary degreasing and phosphating stages. Water quality is critical because the purity of the rinse water ultimately determines the cleanliness of the surface, which in turn assures a blemish free topcoat of paint. In a separate part of the plant, high purity water is also used for make up to the electro-coat bath used in the prime and finish coat paint lines. More often than not, a common demineralizer feeds both processes.

The demineralization system in this particular example did feed both process areas and consisted of a separate bed ion exchange system followed by mixed bed polishers. All pressure vessels were made of epoxy lined carbon steel, ASME code constructed and stamped for 100 psig. Separately each vessel had a

treated water collector and backwash water distributor constructed of schedule 80 PVC. The diameter of both separate bed vessels was 72" with the cation and anion units containing 95 ft³ and 104 ft³ of resin respectively. The mixed bed vessel was 42" diameter and held 49 ft³ of resin. There was no resin trap downstream of the water treatment equipment.

The treated water collector at the bottom of each demineralizer was fabricated in a hub and lateral design, standard for the application. Unfortunately, one of the laterals in the mixed bed broke allowing resin to exit the vessel along with the demineralized water. Without the protection of a resin trap, the resin traveled through the distribution piping, downstream to the degreasing & phosphating areas, and into the E-coat paint line. As a result all downstream lines had to be tapped, purged, and cleaned. Also, the spray nozzles and the affected downstream process equipment had to be meticulously cleaned.

Since a finished car is normally completed every 90 seconds, the consequential costs of lost production are staggering! The direct, out of pocket repair costs exceeded $50,000. All of this could have been easily avoided had the facility installed a simple resin trap after the last piece of water treatment equipment.

2. Poultry Processing Plant

There is a concentration of poultry processing plants in the area of the US known as the Delmarva Peninsula. Bordered by the Chesapeake Bay on the west and the Atlantic Ocean on the east the peninsula extends from the state of Delaware down through Maryland and into Virginia. Unfortunately, the ground water in some areas of the peninsula has a high level of dissolved iron causing problems for residents and commercial establishments alike. The traditional and most cost effective way to condition the water for drinking and process applications has been with the use of a simple water softener using sodium cycle ion exchange resins.

Water is used in a poultry processing plant for both scalding and washing of the birds. Scalding is sometimes more commonly recognized as part of the de-feathering process. Washing is a later step in the process and exactly as described. In this example, the processing plant uses a 600 gpm water softener to condition the water prior to the scalding and washing steps. The water softening vessels were fabricated with lined carbon steel vessels and PVC bottom distributors and laterals. Over many years, the vessel liners failed and in the process of doing so, lifted up and cracked two of the discharge laterals. Shortly thereafter, ion exchange resin was carried out along with the softened water and traveled downstream to the scalding and washing areas. Since the FDA regulates poultry processing with full time inspectors on site, one can see the gravity of this problem.

Once it was discovered that ion exchange resin had come into physical contact with the birds, the FDA inspectors decided to shut the plant down. All poultry in process was quarantined and no finished poultry could be shipped pending receipt of detailed information on the nature of the contaminating substance. While the resin could be physically washed off, what wasn't known was the extent of any lingering ill effects on the food in question. After days of quarantine and shutdown, the inspectors were shown that the ion exchange resin used in the water softener was NSF/ANSI Standard 61 certified for use in drinking water systems. While it did have to be physically removed from the scalding and washing equipment, no small job in and of itself, it was deemed non-contaminating relative to harmful byproducts associated with physical contact with poultry products. Rest assured that this was not a quick determination. Nor was the physical cleaning and removal of many thousand small resin beads from the process areas.

The magnitude of the problem was huge! At this processing plant over a million pounds of poultry are processed every day. The plant was shut down for three days!

This example has two lessons. The first lesson to be learned is that tank liners can fail and laterals can break. Unfortunately, the second lesson was learned after the fact. This very expensive problem could have been totally avoided with the expenditure of a few thousand dollars for a properly sized resin trap system.

3. Resin traps in refinery used by local service provider

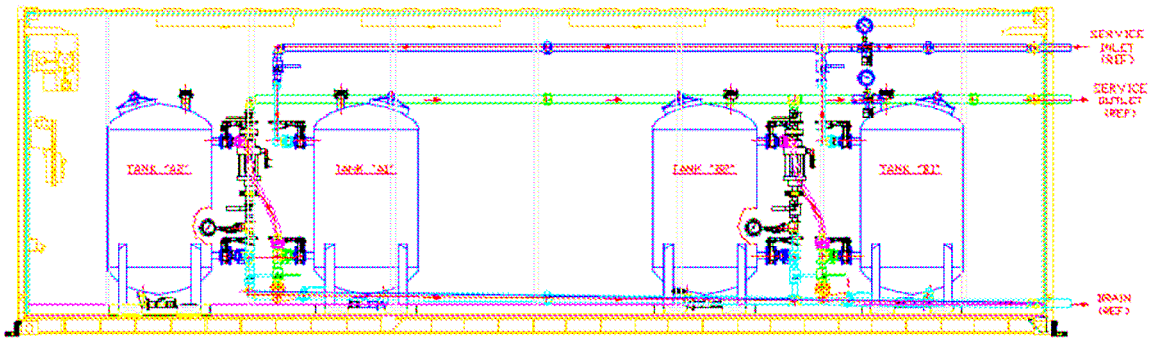
When a major east coast refinery needed a continuous 15 GPM supply of softened water for their planned alkylate water wash system the decision was made to contract with a local service deionization company. While the output from an existing 800 GPM water softener was distributed throughout the refinery on a network of overhead racks, there was no distribution piping within the general area proposed for the alkylate wash system. Given the huge cost to design and construct additional pipe racking for what in refinery terms is a very low flow requirement, the cost effective solution was to outsource the water requirement to a DI water service provider. Ultimately, a local company already approved to work within the refinery was chosen to provide the water on an ongoing basis. With the absence of an available building to house their system, the service company dropped in place a fully climate controlled container constructed in accordance with all applicable refinery design standards.

Inside the container are four 30 ft^3 exchange tanks. Two of the vessels operate in parallel at a time. The other two are in standby service. The tanks were constructed of 316 stainless steel and ASME code certified for 100 psig service. Leased by the local service company, the tanks are exchanged as required and regenerated off site at the service provider's bulk regeneration facility.

During the regeneration process, the ion exchange resin inside the tanks is removed, chemically treated, and then put back into the exchange tanks. A process review by refinery process engineers determined resin traps needed to be installed in the treated water lines before the water exited the container. The cost of the downstream refinery process equipment was measured in millions of dollars and in no way was anything that contained thousands of tiny resin beads going to be used without a fail safe backup protection - regardless of the materials of construction.

The good manufacturing lesson to be learned here is that if the potential of a serious problem can be avoided with a simple preventative measure, it should be employed. While universally true in 90% of all water treatment applications, it is 100% applicable in a refinery where unplanned work stoppages are catastrophic relative to lost revenue.

Here's a sketch of the containerized system final design.



Here's a picture of the containerized system along with a close up picture showing one of the two Res-Kem resin traps that were installed.

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What experience does Res-Kem have with these problems?

For background purposes, it should be pointed out that along with manufacturing resin traps, Res-Kem is also a full service provider of water treatment equipment, design services, and after market supplies. After the fact, Res-Kem is often called in to fix a problem. Imbedded within the aftermarket portion of the Res-Kem product line are two teams of service professionals trained as media rebed specialists. Both teams are product trained on a variety of water treatment equipment along with being OSHA trained and certified for confined space entry.

Utilizing these crews, Res-Kem does resin and carbon change outs for a variety of end users in a variety of industries. For the most part, their customer base consists of end users without the in-house expertise to efficiently remove media from treatment vessels, safely inspect vessel internals, and confidently install new replacement media. Ninety five percent of Res-Kem's work in this area comes from end users who contract for media replacement during a planned maintenance outage. The other five percent are the unlucky ones. They typically find their way to Res-Kem in the midst of an operating emergency while experiencing an unplanned shut down.

What is the lesson?

The largest number of customers who contact Res-Kem for emergency rebed services have lost media from their water treatment system as a result of a component failure inside their treatment vessel. Usually it's a lateral or internal distributor that fails and if they don't have a resin trap the internal failure is typically only the beginning of their problems. While resins and other media do a wonderful job conditioning and treating water, they cause havoc downstream if a plant must unexpectedly go without water or products and processes are damaged.

Please do not learn the expensive and hard way. Please consider Res-Kem's inexpensive water treatment system insurance; resin traps.

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