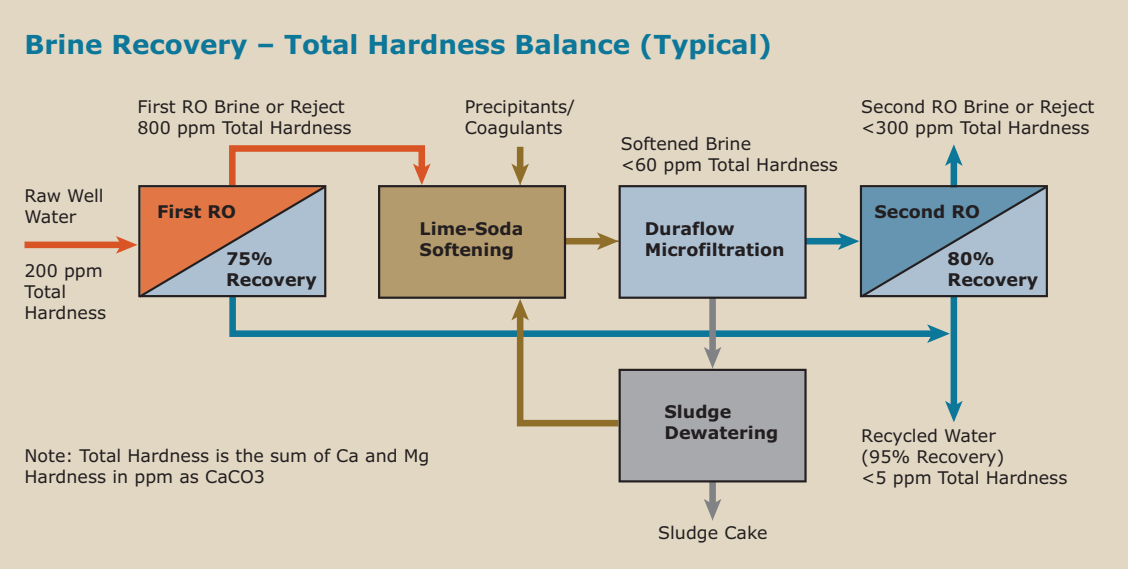
RO Brine Recovery Process Demand is Growing

Duraflow's Tubular Membrane system reduces brine discharge volumes by 80%.



As the demands of the manufacturing sector for clean, filtered water continue to increase, the need for **processes that can purify and recover** a greater amount of water from well, city, brackish, lake or sea water continues to rise. Manufacturing of highly complex technical parts used in everything from computer chips to automobiles, from mobile phones to virtual reality, require purified, clean water as part of the process. Facilities in every industrial segment and sector use a process called Reverse Osmosis (RO) to achieve the needed water purification levels.

But while there are no doubts the process works, the bigger issue is that it doesn't always work well enough.

Traditional RO processes recover an average of 50%-80% of the water with concentrations of things like organic matter, salt or metals at low enough to be useable. To put it in perspective: say 100 gallons comes into the factory for use in the manufacturing process. In a typical RO system, 75 gallons would be usable, but around 25 gallons would be what is considered waste, or brine water.

When most people hear the term "brine" they automatically think of salt water, and while it's true that salt is a big component of many brines, it's not the only substance to consider. Water that comes from wells or rivers, for example, might contain heavy metals, hardness, silica or organic materials. Water from sources near farmland

might have a high concentration of fertilizers and pesticides from runoffs. The location of the factory and the source of their water can vary widely, so while the industry uses the term "brine" for all the wastewater they produce, don't make the mistake of just believing it's salt water and therefore can be discharged to the environment without consequences.

But that's not to say simple salts (such as sodium, potassium, chloride, sulfate and nitrates) aren't a growing problem, as well. Drinking water from most municipal sources is considered safe if it has less than 500 milligrams of salt per liter (measured as ppm TDS). Coming into a factory, it could range anywhere from 200-400 milligrams of salt per liter. Brine, on the other hand, after going through the RO process, can have anywhere from 800-1600 milligrams of salt per liter – which the factory then has to find a way to dispose of.

And disposal of that brine – no matter what the mix of chemicals, metals or salts it might contain – is rapidly becoming the real issue.

Regulatory Drivers

In the past, most factories were built near waterways that had very large volumes of water flow at low TDS because they could just dilute their brine back into the water system. The ocean, after all, is about 20 to 100 times more salty than most brine waste any factory could conceivably produce. However, as more and more agencies take a harder look at the environmental impacts of these brines, the regulations are getting tighter, and the costs of disposal are starting to rise. **See how the Duraflow ROBR brine recovery process works.**

In part, the regulations stem from the realization that while a brine solution won't impact the ocean at all, there is no guarantee it will ever make it there. Many brine solutions were being discharged into lakes, seeping into groundwater, etc., so municipalities and states across the country are starting to see the steady increasing of the TDS concentration in their lakes, rivers and streams. Salt that is being discharge up stream from a drinking water filtration plant is finding its way into the drinking water supply. There is growing pressure and justification for municipalities to pass regulations requiring factories to only discharge brine solutions that meet or exceed the drinking water standards. Which leaves these industries with large volumes of highly concentrated water, which they then need to find methods for disposal.

There are many different opinions on how to dispose of that brine, and time will tell which technologies end up coming out on top. In the meantime, one way to reduce costs is to reduce the volume of brine.

It might seem counter intuitive to say factories can significantly reduce the amount of brine they produce while simultaneously increasing their availability of more clean water, but that is **the problem that Duraflow tackled.**

Engineering a Better Brine

Duraflow has created a treatment process that is fully compatible with RO systems. This process is designed to work on the brine stream coming off a normally operating RO system in any factory. The idea is to use a secondary RO system designed to squeeze more water out of the brine to reduce its volume before having to dispose of the rest.

The reason first stage RO processes can only recover so much is that the water chemistry changes as the water is forced through the membranes. Certain fouling materials such as hardness, silica, iron heavy metals and some organic compounds can only concentrate so much in the brine before the RO membrane flow performance is affected, because it simply can't handle any higher concentrations of these materials. This flow reduction affect is called fouling of the RO membranes. RO manufacturers have studied the RO membrane fouling process for the past 50 years and developed computer models that will predict the best operation conditions for minimizing fouling. All existing RO systems today have been designed with these models. One of the critical factors is predicting the RO % recovery which establishes the expected brine volume for disposal. Think about sifting flour — as you move the flour through the wire filter, lumps and undesirable particles are filtered out. But over time, those particles accumulate, making it difficult to get any additional sifted flour through the mesh. While the RO Brine Recovery is a more complex process than that, it is a good visual for the idea behind it. The systems are designed to push through the maximum amount of material with the minimum amount of fouling.

Duraflow created a system that utilizes the detailed brine water analysis of the types and quantities of substances the brine contains, and uses chemicals that are specifically designed to remove them from the water altogether. That might be through precipitation, absorption, pH adjustments or microbial control, depending on what substances need to be filtered out using the **Duraflow Tubular Membranes**. That treated brine water is then run back through a second-stage RO system, producing more clean water and a smaller volume of brine.

The results? Instead of recovering only 75 gallons of water from the original 100, the factory has now recovered as much as 94 gallons – that reduces brine volume that needs to be disposed of from 25 gallons to 6, a 94% recovery.

The 6 gallons of brine left will be four times more concentrated than the original 25 gallons, but by reducing the volume of brine by a significant amount, factories can reduce disposal costs and increase usable water production with the exact same volume of water they originally had coming through the doors, all while reducing their disposal footprint to more manageable levels.

Another thing to consider – with only 6 gallons out of every 100 becoming waste, it opens the door to the goal of having a zero liquid discharge (ZLD designs) facility, where the remaining liquid is evaporated out, leaving behind nothing but solid, dry powder that in many cases is less toxic and has easier disposal options. There might even be uses for those powders that could allow the factory to sell them off, turning what was once a major cost to a potential profit center. By reducing the volume of waste water produced, factories can open up possibilities that just weren't practical before, and problems today become opportunities tomorrow.

About Us

Duraflow, which is headquartered in Tewksbury, Mass., manufactures Tubular Microfiltration Membrane products specifically designed for the harsh industrial environment. They are used for many industrial filtration applications because they can tolerate high levels of suspended solids, are easy to clean, have amazing chemical resistance and last a very long time. Our global infrastructure and uncompromising commitment to product quality and development has earned Duraflow its reputation for supplying world-class membrane technology around the world. Duraflow is an ISO 9001-2015 Certified Company.

Founded by Joseph Lander and William Matheson in 2003, the filters were created to satisfy the fast-growing global wastewater recycle demand. Duraflow works closely with its customers to provide consultation and support in analyzing project objectives and presenting the most practical, cost-effective solution to meet short- and long-term requirements.

Find out more.

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