The Finishing Edge

Issue #1

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An informational bulletin with suggestions, tips & recommendations for surface treatment processes

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Water Quality for Surface Treatment

Plant Water Quality & When To Treat It Before Use.

What level of water quality should be used for a pretreatment system? Well, it depends on many factors, such as the quality of pretreatment needed and the costs of attaining it. It also depends on which stage we are considering and the quality of the water coming into the plant

What kinds of water are available? Lets first consider **city water**. It will normally have ions in it, such as calcium, magnesium, chloride and sulfate. These ions in high amounts are detrimental to pretreatment because they can cause scale on the equipment, reduce the effectiveness of cleaners and cause blistering under paint. The amounts of these ions is easily approximated by measuring the conductivity of the water. If it is less than 100 µS/cm, the water can probably be used just about anywhere in the line with good results, except possibly for the final seal and final rinse. If the water is above 500 µS/cm, treatment is generally recommended. The middle ground between 100 and 500 µS/cm requires a decision, which this discussion should help in making. One common method

Water quality can be measured in many different units. The most common are:

- Total Dissolved Solids in parts per million (ppm TDS)
- MicroSiemens per centimeter (µS/cm)
- Grains per Gallon (gpg)
- Conversions:

100 ppm TDS ~ 150 µS/cm
100 ppm TDS = 5.84 gpg

Treatments for Water

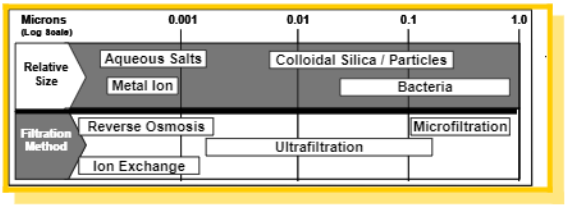
of treating water to remove ions is through **deionization (DI)**. To make DI water, incoming water is passed through a bed of resins which absorb the ions. The water quality is excellent, normally between 1 and 10 µS/cm, however, the resin must be regenerated with hydrochloric acid and caustic soda, normally several times per week or more.

Another similar method is **softening**. This also uses a resin, but salt solution is used for regeneration. Softening removes calcium and magnesium and replaces them with sodium, but it does not remove chloride and sulfate. The conductivity will normally be the same or even higher than the incoming water. Softening is sometimes used prior to other water purification methods.

Another common method is **reverse osmosis (RO)**. This is a membrane process which literally filters out ions. Water that goes through the membrane, called permeate, typically has a conductivity of 10 – 25 µS/cm. The retentate, the water which does not go through the membrane, has a higher conductivity and is normally discharged as waste. Depending on many factors, somewhere on the order of one half of the incoming water becomes permeate (RO) and the other half becomes retentate (waste). This equipment normally needs a chemical cleaning one or more times per year, but otherwise there is no chemical waste to treat.

Now with an understanding of the types of water available, what kind of water should be used?

What Kind of Water Should be Used ?



Alkaline Cleaner: City water is normally acceptable for most alkaline cleaners if the conductivity is less than 500 µS/cm. However, silicated cleaners might produce more sludge and scale, and surfactants are rendered less effective due to hardness. The use of DI or RO water therefore has the advantage of somewhat better cleaning, sometimes evidenced as increased foam since the surfactants are more effective. Some customers who use DI or RO water in their plants, but have limited treatment capacity, initially charge their cleaner tanks with city water and then replenish drag-out and evaporative losses with treated water. Another method is to pump over the used cleaner rinse solution, assuming its DI or RO water, and use that for make-up of the fresh cleaner bath.

Rinses: City water is normally acceptable for use, again, if the conductivity is less than 500 µS/cm. DI or RO however, has the advantage of better performance, lower usage, and less scale. On the other hand, if the rinse bath conductivity is too low, say less than 100 µS/cm some rust may occur. Proper control of the overflow rate, allowing a small amount of cleaner or phosphate to build up, can prevent this. Because DI and RO water are corrosive, mild steel equipment is not recommended.

Activator for Zinc phosphate: City water is normally acceptable for use if the conductivity is less than 500 µS/cm, however treated water is preferred for best performance and bath life. DI or RO are acceptable. The use of a high performance liquid activator normally requires water with a conductivity of less than 100 µS/cm.

Zinc or Iron phosphate: City water is normally acceptable for use if the conductivity is less than 500 µS/cm. However, for longer bath life, especially important with a zinc phosphate, DI or RO water is recommended for replenishment. The use of DI or RO water also has the advantage of slightly better paint performance, especially since chloride is eliminated. If there is limited water treatment capacity, like the cleaner bath, city water can be used for initial charge and then treated water used for replenishment, or the used phosphate rinse bath can be used for initial charge.

Final Seal: City water can be used if the conductivity is less than 500 µS/cm but will result in reduced pretreatment quality. Hard water salts, chloride and sulfate all degrade paint performance and reduce bath life. The use of DI or RO water is best, especially if a final DI or RO water rinse is needed afterwards, such as with e-coat paint. The use of softened water is not recommended for this stage since the sodium ion, which is more soluble than the calcium ion it replaces, creates greater osmotic pressure, which can lead to paint blistering.

General Recommendations for Water Usage

> " If hardness is more than 350 ppm TDS, then consider treating your water."

RO System: Since softening is used prior to many RO systems, an economical scheme where there is limited RO capacity would be as follows:

Stage	Initial Make-Up	Replenishment
Cleaner	RO, previous rinse, or softened	Previous rinse
Rinse	RO or softened	RO exit riser
Activate	RO or softened	RO
Phosphate	RO, previous rinse, or softened	Previous rinse
Rinse	RO or softened	RO exit riser
Seal	RO	RO
Final Rinse	RO	RO exit riser

DI System: Normally, city water is used for the cleaner and cleaner rinse stages, and DI for the rest of the line.

Economics: The use of DI or RO water can result in some operating cost savings, such as possibly being able to use a cleaner at a lower concentration, longer bath life, reduced scaling on tanks and heaters and the associated labor costs. However, other factors such as the water quality of the in-coming water, and the capital and operating expenses of the DI or RO equipment must be considered when making an economic justification. In cases where there is a combination of very hard water and demanding paint performance requirements the use of DI or RO is easy to justify. In other cases, all of these factors should be carefully considered before making

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