



# UF System - Best Practice Quick Reference Sheet

## Formulas

UF Permeate Rate is estimated using one or more criteria (Rule) listed below:

- 4.5 gal (17 l) permeate used to rinse every 100 SF (9.29 sm) of ware
- Painted through-put x 4.5 gpm/100 SF = permeate rate [ex 22.2 gpm]
- 7640 type UF element is rated at 2.5 gpm (9.5 lpm) permeate, divide permeate requirement by 2.5 gpm/7640 type UF element - round up to get the total number of 7640 type UF elements [22.2 gpm / 2.5 gpm/UF Element = 9 x 7640 type UF elements]
- 7640 type UF element needs 84 gpm (383 lpm) of paint flow at 50 psi

## UF Element Configurations

Polymer type UF elements have to be replaced on a regular basis; several configurations are available:

- **Tube**, original style that is ~1" (25 mm) diameter, many of these tubes are required even for small systems
- **Hollow fiber**, smaller version of the tube type UF where many are bundled together to form a collection or module
- **Spiral**, developed from flat sheet UF membrane, membrane is wound up into a roll and permeate is collected at center
- **Plate & Frame**, uses flat sheet UF membrane to create a series of partitions and permeate is collected at the corner of a partition
- **Ceramic** UF Elements are used for oily water & paint

## Bacteria

Newer generation paints are better for the environment but tend to promote the growth of bacteria. (Lead and solvents in older generation paints also acted as biocides)

- **Sources:** Look for sources of poor quality DI or RO water that already contain high levels of biological growth and resolve the matter upstream. Inspect the carbon filter and recharge it if needed. Add a UV lamp to the DI or RO holding tank as part of a recirculation loop.
- **Approved biocides:** Use approved biocides in the rinse tank(s). Keep the side walls of the rinse tanks free and clear of bacterial growth.

## Operator Checklist

Create an Operator Checklist for all normal and abnormal operating conditions that are typical for the Ecoat machine -

- Include a laminated valve tag ID drawing of all the valves & controls
- Permeate valve is the first one opened and the last one closed
- When starting paint flow, open the exit valve first
- When stopping flow, close the entry valve first
- The supply manifold valve should never be throttled
- Use electronic spreadsheets to log permeate rates and system data, these logs are required if you plan to submit a warranty claim
- Use the Operator Checklist to train & orient new employees

## Glossary of Terms

- **Painted Through-Put:** Maximum painted production rate (area/min)
- **7640 Element:** 7.6" diameter (nominal) x 40" long - Industrial standard 8" UF element
- **7940 Element:** 7.9" diameter x 40" long, about 15% more UF membrane area, produces 2.85 gpm (10.8 lpm) of permeate and requires 112 gpm (424 lpm) of paint flow
- **MWCO:** Molecular weight cutoff, used to describe a particle's size
- **Pre-filter:** 25 micron bag or cartridge filter ahead of the UF system, for a #2 bag limit max flow rate to 105 gpm paint
- **Feed & Bleed:** Paint is circulated through UF elements and a side feed stream is introduced [at 20 x permeate rate] while an equal amount is returned back to the paint tank
- **Single Pass:** Paint travels only once through UF and returns
- **UF Membrane:** Polymer UF membranes are cast on a non-woven substrate

## Preventive Maintenance

Several PM activities performed during the year will pay benefits, reduce surprises, & lessen down-time:

- Do not mix new and old UF Elements in order to preserve good hydraulic balance among all UF Elements in the system
- Establish a monthly permeate flushing regimen and stick to it
- Clean UF Elements once they are 80% of baseline (permeate basis)
- Each day, utilize the operator checklist attached to the UF machine
- Close off permeate valve if a leak occurs and no spare is available
- Single bag vessels can be grouped together at lower cost than multi-bag vessels to create a duplex filtration system for pre-filtration ahead of a spiral UF system
- Use a dedicated UF feed pump with a soft start or VFD
- Use 25 micron glazed (i.e. sintered) filter bags with plastic collars
- Change bag filters when you lose 3% flow or Delta P of 5 psi (.3 bar)
- Train personnel on Lockout/Tag out, General Maintenance

## Baseline Data

Every system will change as it is operated and ages. When trouble occurs, baseline data provides a valuable basis for comparison:

- **Paint flow:** Use a magnetic paint flow meter to monitor (If using a VFD, the flow meter can control the pump to maintain flow)
- **Permeate flow:** Record the flow rate after 4 hours of operation
- **Return pressure:** Maintain at 15 psi (1 bar)
- **Permeate pressure:** 60% of return manifold, max
- **Paint temperature:** Decreasing temperature will suppress permeate and rising temperature will increase permeate rates
- **Paint pH & %NV:** Hold as steady as possible

## Web Sources

Web links for more information:

- <http://ufsc.com/download.php> - then click on UF
- Email service questions to - [Service@ufsc.com](mailto:Service@ufsc.com)
- Electrocoat Association - [www.electrocoat.org](http://www.electrocoat.org)
- Instrumentation products - [www.jptechinc.com](http://www.jptechinc.com)

- HMI/SCADA software - [www.iconics.com](http://www.iconics.com)
- Paint company, water treatment & other chemicals websites
- Equipment supplier websites
- UF membrane supplier websites



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- HMI/SCADA software - [www.iconics.com](http://www.iconics.com)
- Paint company, water treatment & other chemicals websites
- Equipment supplier websites
- UF membrane supplier websites