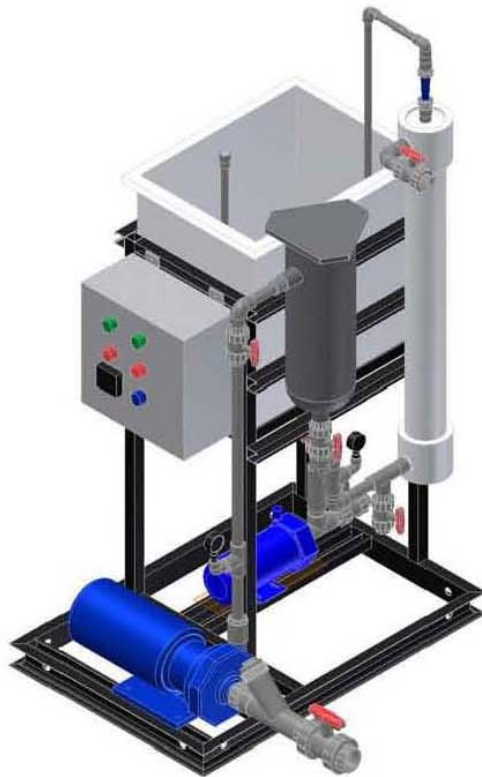


# Mini Flux UF Getting Started Guide



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## Mini Flux UF System Getting Started Guide

Please read this manual as it relates to your product as this manual covers ALL Mini Flux UF Machines.

Some items in this manual may or may not apply to the product you have purchased.

All end users & installers are strongly encouraged to review this entire manual. Do not take short cuts or skip steps as this will likely lead to a poor installation and poor customer acceptance. Insure that all components (ie. Valves, gaskets, o-rings, etc) used to complete the installation of this UF Machine are 'silicone-free'.

### Keys to Success:

Make sure there has been no damage during the shipment.

Make sure that the horizontal manifolds have not slipped, or fallen down and they are parallel to the ground.

Make sure that the piping into and out of the UF Modules are horizontal and square with respect to each other.

Attach the items that have been shipped loose except the UF Elements, flush out the piping to remove dust and dirt from shipment and construction, perform a leak check with DI water at 60 psi to make sure that all joints are tight and working properly.

Send a sample of the flush water to your E-coat paint supplier and check for contaminants.

Once the rinse water sample has been approved, you can connect the UF machine to the E-coat paint piping and get ready to commission the unit.

Install the UF Elements, use the CIP system to gently flush each one (one at a time) with buffered DI water (to the same pH as the E-coat paint). Repeat the gentle flush for each Element a second time. This will remove any preservatives from the UF Element as well as gently remove trapped air from inside the UF Element.

When you are ready to start the UF Machine gently (take 60 full seconds to slowly open the supply butterfly valve, the outlet valve should be already open). DO NOT OPEN THE VALVE QUICKLY AS THIS WILL DAMAGE THE UF ELEMENTS.

After about 3 or 4 hours of operation, record the permeate flow rate for each Module and this will be defined as the Base Line valve.

Flush each UF Module at least once a month with permeate for 10 or 15 minutes using the CIP pump. Rest the UF module over the weekend and then bring it back on line the following Monday. The purpose of permeate flushing is to delay the need for chemical cleaning.

Never close off both permeate isolation valves unless the inlet & outlet to the UF Module are also closed (these are to be closed first). If the inlet and outlet is open (for normal or CIP operation) and you close off both of the permeate isolation valves you will damage the UF Element.

You should have received the following items: (please contact our Customer Service if you have questions at 219.464.2027 Ext. 28)

- One or more crates containing Mini Flux UF Machine.
  - One or more crates containing loose items.
- Mini Flux UF System Getting Started Guide (this manual) (CD & Hard Copy).
  - Mini Flux UF System Operator Checklist. (in a 1" notebook binder)
  - Mini UF System pipe match mark drawing attached to machine.
- Tru Flux UF System Installation Video (DVD, VHS or Windows Media File)
  - Mini Flux UF System Spare Parts list

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## General Information

Ultrafiltration (UF) is a pressure driven process for separating and concentrating suspended solids and high molecular weight materials from water and low molecular weight solutes.

The heart of the system is a molecular selective, semi-permeable UF membrane. Unlike conventional filtration, the feed stream flows *across* the UF membrane surface, not perpendicular to it as in cartridge or bag filtration. Additionally, the UF membrane typically does not become plugged because the retained material cannot enter the UF membrane pores. Over time, the membrane becomes coated with paint solids and permeate flow will decrease.

The material to be processed is called the *feed*, material rejected by the UF membrane is called the *concentrate*, and the material passing through the UF membrane is referred to as the *permeate*, or *flux*. The permeate rate is usually expressed in gallons per minute when discussing a specific module or system. When referring to a particular UF membrane in its relationship to a specific process, the terminology most frequently used is *gfd* or gallons per square foot of membrane per day. The use of gfd measurements allows small laboratory module with a known area to be used for pilot testing and then scaled up to production size equipment.

*Example:* Using a laboratory UF module with 0.186 sm (2 SF) of UF membrane surface area testing a sample liquid produces a permeate rate of 0.003785 cubic meters/hour (1 gallon/hour).

Therefore:

Metric:  $0.003785 \text{ cm}^3/\text{hr} \times 24 \text{ hrs}/\text{day} = 0.0908 \text{ cm}^3/\text{day}$

$0.0908 \text{ cm}^3/\text{day} / 0.186 \text{ sm UF membrane surface area} = 0.488 \text{ cm}^3/\text{sm day}$

English:  $1 \text{ g}/\text{hr} \times 24 \text{ hr}/\text{day} = 24 \text{ g}/\text{day}$

$24 \text{ gpd} / 2 \text{ SF UF membrane surface area} = 12 \text{ gal}/\text{SF day}$

If a full scale production unit would require a permeate rate of 2.271 cm<sup>3</sup>/hr (10 gpm) based on a 16 hour work day, the system would require:

Metric:  $2.271 \text{ cm}^3/\text{hr} \times 16 \text{ hrs} = 36.336 \text{ cm}^3/\text{day}$

$36.336 \text{ cm}^3/\text{day} / 0.488 \text{ cm}^3/\text{sm day} = 74.459 \text{ sm of UF membrane surface area.}$

English:  $10 \text{ gpm} \times 60 \text{ min}/\text{hr} = 600 \text{ gal}/\text{hr} \times 16 \text{ hr}/\text{day} = 9,600 \text{ gal}/\text{day}$

$9,600 \text{ gpd} / 12 \text{ gfd} = 800 \text{ sq. ft. of membrane area.}$

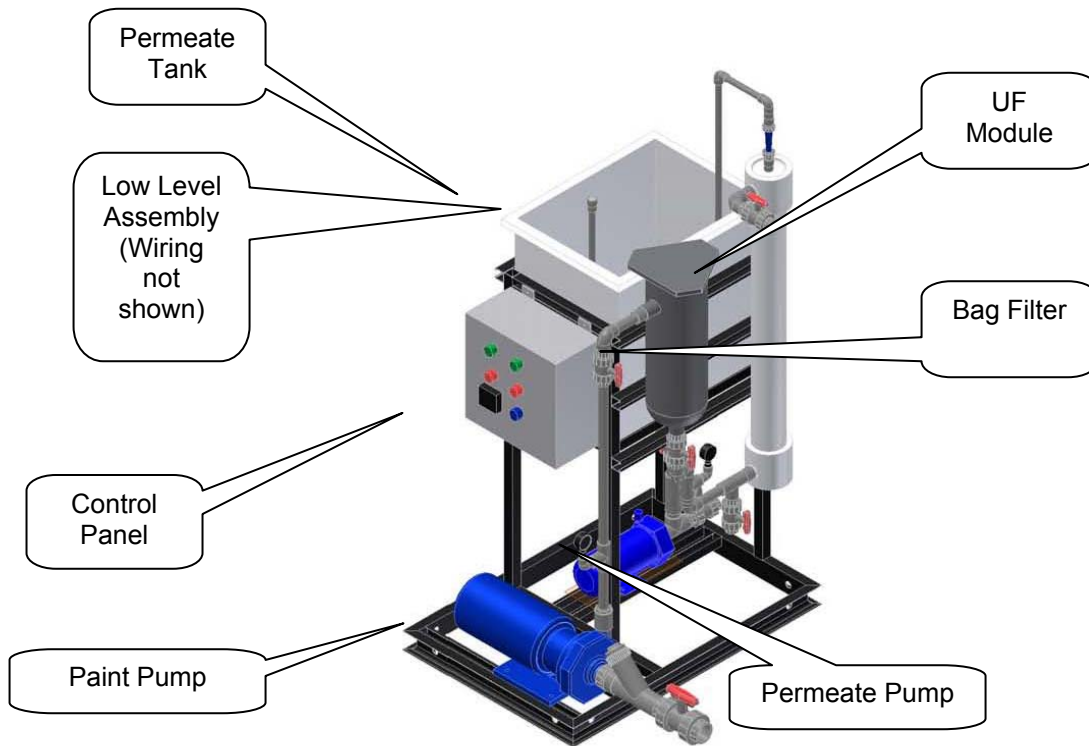
A typical 8" diameter (nominal is 7.6 inches) x 40" long UF Element will contain *approximately* 25.5 sm (275 SF) of *active* membrane surface area. Therefore, in the example above, the system would require a *minimum* of (3) x 8" UF Elements.

$74.459 \text{ sm (800 SF)} / 25.5 \text{ sm}/\text{UF Element (275 SF}/\text{UF Element)} = 2.91$ , or Round up to 3 UF Elements.

## Description of Components

There are two basic type of Mini Flux UF Systems. The first one includes a pump for the paint, and the second does not include a paint pump. The Mini Flux UF System is built around an industry standard 4040 type UF Element. It includes a bag filter vessel, permeate storage tank, pump motor control panel, and steel skid frame.

## Mini Flux UF System Getting Started Guide



Typical Mini Flux UF System.

### ***Maintain Proper Flow Velocity***

It is absolutely necessary to design the E-coat paint feed piping to insure that the velocity of the E-coat paint is always about 2.5 to 3.7 meters/second (about 8 to 12 feet/second)

The size of the manifold is sized according to the number of UF Modules. In a case where required flow rate calculation falls in between 2 different pipe sizes, the smaller (i.e. faster velocity) will always be selected as long as the piping run is not too long.

### ***Mini Flux™ UF Module Information***

The Mini Flux UF Module assembly includes the following components:

#### **UF Element**

The Mini Flux UF System will accept any industrial standard 4040 type UF element. The nominal paint flow per UF element is 75 - 95 lpm (20 -25 gpm) and inlet/outlet connection is 1" Pipe. The UF membrane is wound up on the permeate pipe and is generally referred to as a spiral wound design. The industry standard 4040 UF Module is generally about 1015 mm (40 in) long. The 4040 UF Element will have female permeate connections on each end.

One or more ends of the UF Element have an anti-telescoping device (ATD) and a hard fiberglass outer wrap. The paint outlet end will have one E-coat paint seals. Sometimes these E-coat paint seals are called U-cup, Lip seals, square cut, etc. Sometimes two paint seals are furnished. Use of the UF Module is furnished, it should be installed with the open end down (facing the flow of the E-coat paint). The prevailing flow will expand the seal outward into the housing body, typically on the top end of the 4040 Element.

In any event these E-coat paint seals must be installed at the top of the UF Element. If they are installed on the bottom then E-coat paint solids can fill in above this seal and make the removal of the UF Element very

## Mini Flux UF System Getting Started Guide

difficult, if not impossible.

### ***Permeate Flow Meters***

Each Mini Flux UF Module has an individual flow meter with a range of 0 – 7.6 lpm (0.2 – 2.0 gpm). Do not use a tool to tighten or remove these fragile flow meters. Only use your hand to tighten and loosen.

## **Mini Flux™ UF Systems Options**

### ***Bag Filter Vessels***

Important Note – you must always specify Bag Filters bags that are glazed or heat treated to eliminate lint. Use bag material that is approved by your paint supplier. Use UFS PN 205xxx, as shown in your Mini Flux UF System spare parts listing.

The E-coat paint must be prefiltered before it enters the UF Modules. The spiral wound UF Element has narrow passage ways that can be blocked by dirt bits and other large particles. Use a 25 micron rated bag (maximum) that is approved by your E-coat paint supplier. Use at least 2 separate filter vessels (i.e. duplex) so that E-coat paint flow is ALWAYS going to the UF System and change only one filter vessel at a time. If just one prefilter vessel is used, the longevity of the UF Modules may be reduced.

Plan on only 397 lpm (105 gpm) or less per Bag Filter vessel.

### ***UF Supply Pump***

Magnetic drive or double Mechanical Seal with Seal Flush is always required on horizontal pumps which pump paint or permeate.

### ***E-coat Paint Flow Meter***

Proper knowledge of the actual E-coat Paint flow is important in troubleshooting UF performance. UFS Corporation offers the TigerMag EP flow meter contact UFS Corporation for more information on this option.

Click here to see more information <http://www.sparlinginstruments.com/magmeters-ep.htm>.

### ***Clean In Place (CIP), Optional***

CIP cleaning system consists of a cleaning tank, circulation pump capable of cleaning one UF Element at time, 5 Hp 460 V AC 3 ph 60 Hz motor control station for the CIP system, cooling heat exchanger, and dual temperature controller. Motor disconnect is not included.

### ***Total System Cleaning, Optional***

Total System Cleaning requires an additional pump rated with the same rating as the paint supply pump so all the UF modules can be cleaned at one time. The holding tank also needs to be enlarged according to the number of UF Modules in operation.

### ***Permeate Storage Tank***

Included is a nominal 45 gal permeate storage tank, which is used to rinse off excess paint from the parts.

### ***Permeate Pump***

A ½ HP magnetic drive permeate supply pump is also required to supply fresh permeate to the rinse system.

## Mini Flux UF System Getting Started Guide

No piping on the discharge side is included and to be provided by the customer.

### ***Turbidity Sensor, Optional***

Turbidity is the measure of how clear the fluid is. Generally permeate has a very low turbidity reading which means that it's very clear. If there is a leak in one of the UF modules then the turbidity will be a higher value and it will be more opaque. Contact UFS Corporation for more information on this sensor. Turbidity sensor must be placed properly to avoid false alarms from air bubbles.

### ***Permeate Flow Monitor System, Optional***

UFS Corporation offers a permeate flow monitoring system that provides remote monitoring of the permeate flow from each individual UF module. This system can be integrated with your PLC system to provide trend charts, alarms, and reports. Contact UFS Corporation for more information.

## **UF Flow Schematic (Drawing 997312)**

The flow of E-coat paint through the UF System typically begins as E-coat paint is drawn from the E-coat tank by a UF Paint Feed pump. Next it is pre-filtered to 25 micron, or less, with a glazed or heat fused bag filter. The E-coat paint enters the UF System and is allowed to pass by the face of the UF membrane inside the UF Modules. Permeate solution contains low molecular weight material such as water, ions, and salts which pass through the UF membrane. All the larger particles such as the E-coat paint solids are rejected by the UF Membrane. These are then returned to the E-coat paint tank. These are general instructions that can be applied to any Mini Flux UF Machine. In some cases your UF Machine may not have all the options and some steps refer to a valve ID that will not be included with your machine. If this is the case please move to the next step. See Mini Flux Ultrafiltration Machine Piping Schematic at the end of this document for Valve Locations. For extra copies ask for UFS Part Number 997312.

Permeate solution is used to either rinse off the excess E-coat paint off the painted parts or else is purged to maintain paint bath chemistry.

Please see the Mini Flux UF Machine Flow Schematic Drawing in the appendix.

### ***Minimum System Requirements***

The UF system requires the following components in order to function properly: UF paint feed pump, paint Bag Filter vessels, glazed or heat treated 25 $\mu$  polyethylene Bag filter bags, 1 or more UF Modules, permeate storage & circulation pump(s), and UF Module cleaning system. If these were not included in your order, they will have to be purchased by the end-user or the installation contractor.

## **Mini Flux UF System Requirements by Others**

### ***Paint, Permeate, and Clean Drains***

A suitable drain is required for paint (back to the E-coat bath), permeate (either back to the E-coat bath or waste), and cleaning solution (back to waste). If the Mini UF System is not installed on a mezzanine above the rim of the E-coat tank, then air blown down must be used to drain paint from the system. Use only very clean shop air that is free of all oils and contaminates to the E-coat paint bath.

### ***Electrical Needs for Pump Control Panel***

The CIP System requires 460 (+/- 10%) V AC 3 ph 60 Hz power for the: 3 hp paint pump motor and ½ hp permeate pump motor. Internal transformer supplies 120 V AC to the, motor starter coil, audible alarm, panel lights, etc.

## Mini Flux UF System Getting Started Guide

### ***E-coat Paint Supply***

ALWAYS SOFT START E-coat PAINT PUMP TO AVOID HYDROLIC SHOCK TO UF ELEMETS.  
All UF Feed Pumps must be equipped with a soft start controller. The controller shall be adjustable so that the motor does NOT reach full speed until 20-30 seconds after startup. If not installed then the paint discharge pump control valve MUST ALWAYS be cracked open when the motor is started and then take a full 60 seconds to fully open the discharge valve.

Each 4040 type UF Module requires a minimum of 75 lpm (20 gpm) of E-coat paint at 3.4 Bar (50 psi) pressure at the inlet E-coat paint manifold of the Mini Flux UF system.

### ***Duplex E-coat Paint Prefilters, optional***

Duplex Bag Filter Vessels are typical on the larger TruFlux UF Systems. Use only glazed or heat treated bag filters. Polyethylene or polypropylene bag filters are generally acceptable to most E-coat paint supplier. Check with your paint supplier to confirm.

### ***Clean Solution RO Water or DI Water Make-up***

The customer must provide the appropriate piping and valves to fill the permeate tank with RO water (or DI water). Generally a 1" line is sufficient. This will be used to rinse parts in the even the UF Element is not producing permeate.

### ***Permeate Pump Piping***

Valve V6, Pressure gage P2, x" PVC pipe and PVC fitting are to be provided by the customer and piped as required by the paint company.

### ***Close Proximity above the Rim of the E-coat tank***

The best location for Mini Flux UF System needs to be placed near the UF Feed pump and no more than 1 - 1.5m (3 - 5 ft) above the discharge of the UF feed pump. If the location is any higher above the rim of the E-coat tank then the pump pressure discharge rating will have to be increased to compensate for the height of the UF System above the discharge of the UF Feed pump.

If the UF System has to be placed on the same grade as the E-coat tank. Some special equipment will be needed to return E-coat paint back to the E-coat tank when a Bag Filter is changed, UF Element is replaced, etc. Usually low pressure air can be connected to the top of the Bag Filter vessel and the paint can be blown back to the E-Coat tank. If you do not first isolate the Bag Filter Vessel and allow air into the UF Element you can damage the UF Element. The air used to blow down the Bag Filters must be oil free and clean of dirt.

Also take care not to create foam due to the air entering the E-coat tank.

If your Mini Flux UF System was provided with a paint feed pump, this is located on the skid and thus should be placed on the grade same as the paint tank.

## **System Information**

### ***Single Pass Design***

The Mini Flux UF machine is designed using the "*single pass*" process. In this design, the paint is pumped into the UF Modules and returns directly to the paint tank.

Each 4040 type UF Module consists of: an UF Element plus a UF Housing. For the purposes of estimating permeate production UFS Corporation suggests using 1.9 lpm (0.5 gpm) of permeate per 4040 type UF Module even though it may produce more at start up.

## Mini Flux UF System Getting Started Guide

### ***Estimating Permeate Requirement***

A typical 4040 type UF Element can produce as much as 3 lpm (0.8 gpm), or even more in some cases, just after startup, but this rate is not reliable for the long term. The steady state permeate rate for a 4040 type UF Element is 1.9 lpm (0.5 gpm) +/- 10%.

Generally the amount of permeate required is a function of the Painted Through Put (PTP) that is processed by the E-coat Paint System. The typical UF permeate criteria is to have 1.83 lpm/sm/min (4.5 gpm per 100 SF/min) of work. Your paint supplier should recommend a permeate flow rate for your system.

### **Monorail Systems**

This is calculated by taking the JPH (jobs per hour) times the surface area/job divided by 60 min/hour. For example: if the jobs per hour are 100 and the surface area per job is 0.5 sm, the PTP is  $100 \text{ jph} \times 5 \text{ sm/job} / 60 \text{ min/hr} = 0.833 \text{ sm/minute}$  (8.97 SF/min).

Then the permeate requirement is

Metric:  $0.833 \text{ sm/min} \times 1.83 \text{ lpm/sm} = 1.52 \text{ lpm}$

English:  $8.9 \text{ SF/min} \times 4.5 \text{ gpm} / 100 \text{ SF/min} = 0.4 \text{ gpm}$

# of 4040 type UF Elements recommended =  $0.4 \text{ gpm} / 0.5 \text{ gpm}/4040 \text{ type UF Element} = 0.8$  or Round up to 1 x 4040 type UF Elements.

### **Hoist Systems**

Important Note: The E-coat system is only painting when the parts racks are in their full down position and power is on. Calculate the work design rate (JPH) by dividing 60 minutes by the 'Power-On' time. For example, if your total cycle time is 5 minutes (or 12 racks painted per hour), but the 'Power On' time is only 3 minutes (i.e. it takes two more minutes to hoist the rack, index and lower in the next rack). The PTP =  $60 \text{ min/hr} / 3 \text{ min/job} = 20$  'Work Design Rate' JPH.

If the surface area is say 1.5 sm (16.2 SF), then the PTP is  $20 \text{ WDR jph} \times 1.5 \text{ sm/job} / 60 \text{ min/hr} = 0.5 \text{ sm/min}$  (5.4 SF/min).

If you use the actual 12 JPH you will undersize the UF System. The rinsing must occur during the same 3 minutes that the power is on.

Then the permeate requirement is -

Metric:  $0.5 \text{ sm/min} \times 1.83 \text{ lpm/sm} = 0.92 \text{ lpm}$

English:  $5.4 \text{ SF/min} \times 4.5 \text{ gpm} / 100 \text{ SF/min} = 0.24 \text{ gpm}$

# of 4040 type UF Elements recommended =  $0.24 \text{ gpm} / 0.5 \text{ gpm}/4040 \text{ type UF Element} = 0.48$  or Round up to 1 x 4040 type UF Element.

### **Setup & Making Connections**

Read the entire section first before proceeding. The System must be set in place, components need to be verified they are in the correct position and then a leak check must be done before any E-coat paint connections are made.

### ***Required Tools & materials***

#### **The following tools will be required to install the Mini Flux UF System**

$\frac{3}{4}$ " Open end wrench to tighten concrete anchor hardware  
Flat blade screw driver & pliers

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Large scissors to cut nylon tie wraps  
~30 cm (12") long bubble level  
Saw to put PVC pipe to length  
Electric Drill with 12.7 mm (½") concrete drill bit  
9/16" socket for lag screws that connects the skid to its wood skid runners

### **The following materials will be required to install the Mini Flux UF System**

4 x 1 mm steel shims [3 cm x 2 cm]  
4 x 2 mm steel shims [3 cm x 2 cm]  
4 x 3 mm steel shims [3 cm x 2 cm]  
PVC primer and cement

In addition there will be PVC pipe, PVC fittings, electrical wiring & hardware, and other items as required to complete the installation.

### **The following tools are optional**

none

### ***Typical Crate Identification***

The Mini Flux UF system will be typically be shipped in one or more crates. Please use the following pictures to identify what is in each of the crates.

The UF rack and CIP will be shipped in one or more crates based upon the overall length of the skid and any special customer requirements for handling at the job site.



The UF elements are always shipped loose and are typically in cardboard boxes. These boxes are placed on a wood skid and the shrink wrapped.

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Long PVC piping elements that are shipped loose are either secured to horizontal supports in the UF rack, placed inside another wooden crate (for example that might contain Membrane Electrode Cells, if this product was also ordered.), or placed on a separate wood skid.

### ***Look for shipping damage***

Take a careful look at the sides of each crate or shipping skid and look for damage caused by a fork truck or rough handling during shipment. Report this damage to your carrier immediately.

### ***Uncrating & Placement***

Carefully move the crates and shipping skids as close to the final resting place as possible. Begin to take the wood crates by removing the plywood skirt that surrounds the lower portion of the assembly.

Next you can remove the plastic sheeting that covered the upper portion of the assembly.

Use a scissors to cut the beige, clear or white colored nylon tie wraps. Take care not to cut anything else when performing this step.

Set aside any PVC piping that may be have been attached to protect it during shipment in a clean safe environment.

Use a 9/16" socket to remove the lag screws that secure the metal skids to the 4" x 4" wood skids. Note there is a rubber isolator between the mounting point on the skid and the wood skid. Throw these away as the UF machine is not meant to be mounted on rubber isolators.

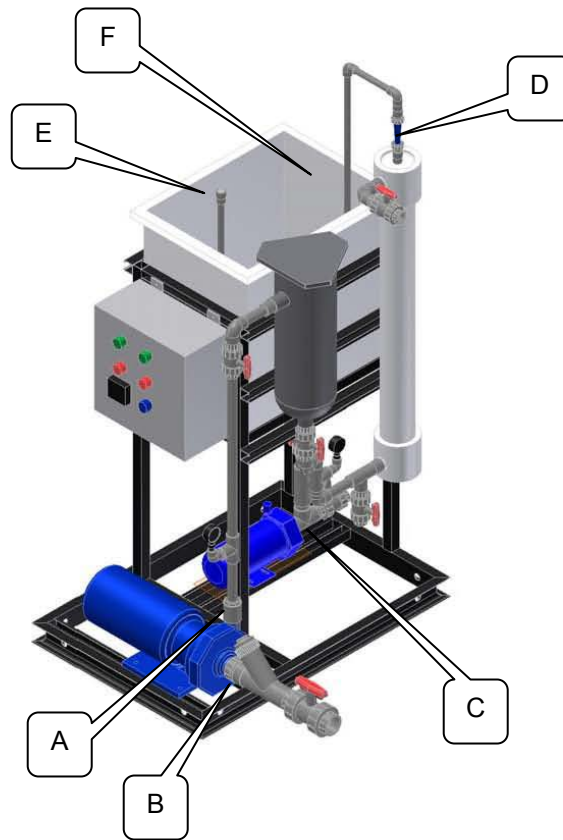
Do not remove any protective tape covering the of pipe opening until the opening is too used in order to keep dust and dirt from entering the piping.

## Mini Flux UF System Getting Started Guide

Take care when removing any protective tape to not loose any O-ring that is located in the gland cavity.

### **Match marks**

Match marks were used to identify to pieces that need to be reassembled. These are typically black letters or numbers printed on a yellow label. There will be a match mark drawing attached to the exterior of the Mini Flux UF System for your use.



Two pieces with the same match mark should be brought together.

### **Placement of Skids to form UF Machine**

If your UF machine was large enough are required that it be split into for shipment or movement in your plant, or if you ordered a CIP system or other option, then you will have locate the individual skids as required.

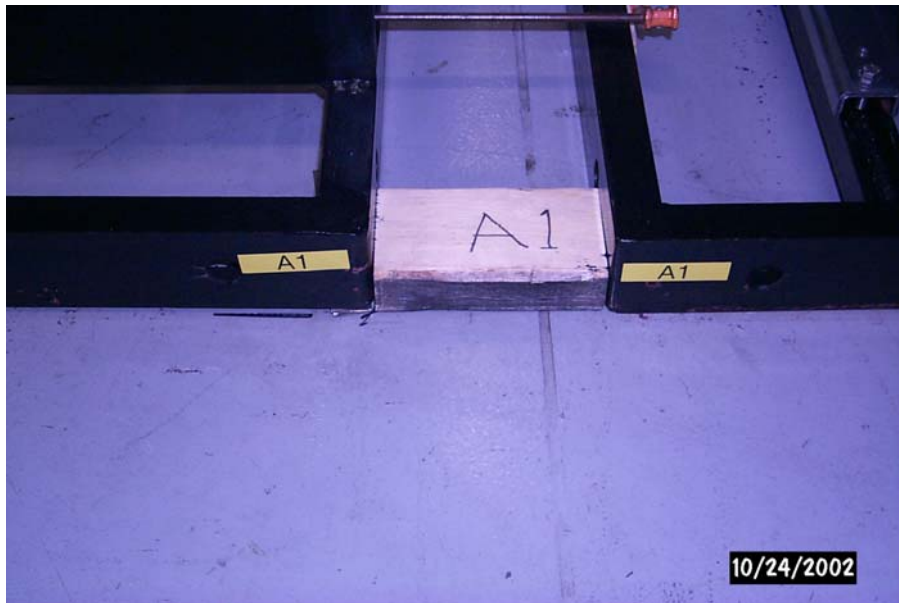
The ideal location has adequate space, 150 cm (60 in), on each of the long sides of the UF machine for maintenance. Check to make sure there is adequate headroom of 1.5 m (~5 ft) above the Top Cap for removal of the UF Elements from the UF Module.

Place the 'A' UF Rack (usually with E-coat paint connection flanges) in its proper location.

Next, if your UF Rack was made in two parts (otherwise skip to the next paragraph), place 'B' UF Rack next to Unit 'A' and insure the appropriate Match Marks are lined up & and each pipe joint that requires a Groove Clamp already has the Groove clamp gasket that can be slid into place.

If you order included a CIP system, locate the 2 wooden spacers located in a cardboard box as these were used to factory assemble the interconnecting piping.

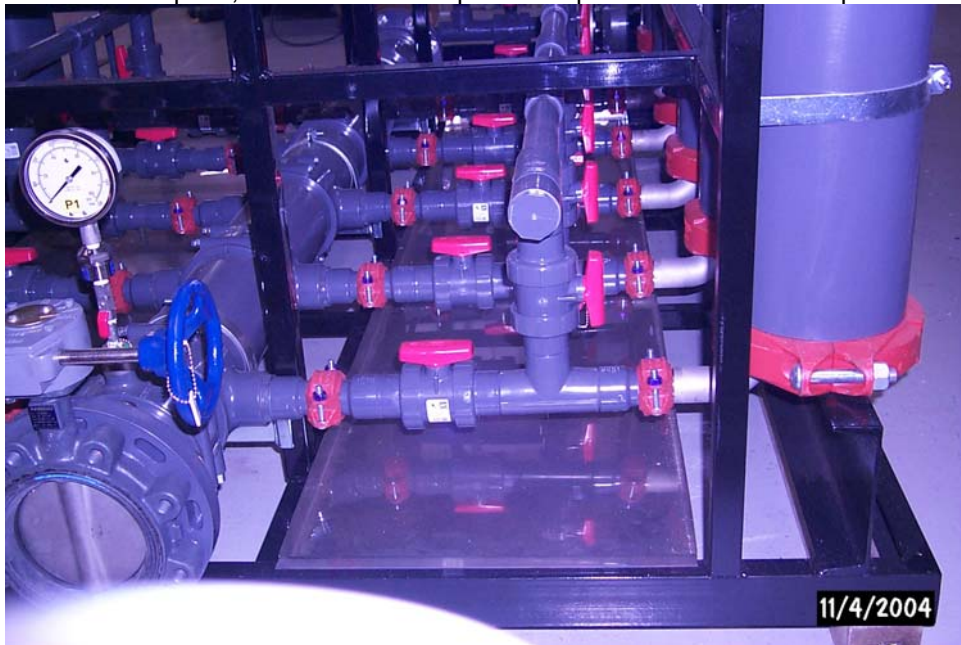
## Mini Flux UF System Getting Started Guide



A1 is the spacer block.

### ***Floor Drip Pans, optional***

If you ordered this option, then locate these parts and place as shown in the product drawing.



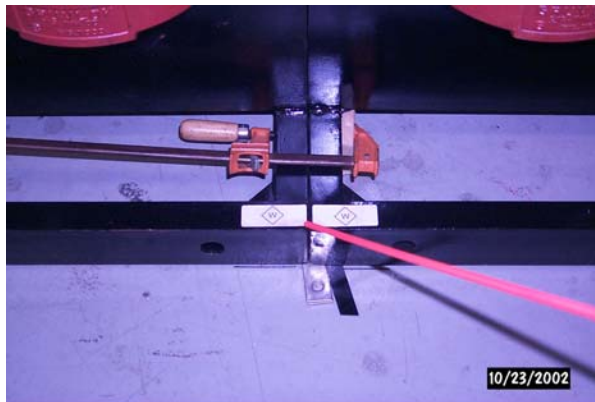
Stainless steel drip pan located under groove clamps.

### ***Leveling the UF Machine***

This is an important step and do not proceed with the assembly of loose items until the unit(s) have been put into place and leveled.

Start the leveling process at the highest corner by running a long bubble level completely around the perimeter of the UF machine.

## Mini Flux UF System Getting Started Guide



Note steel shims under the frame to level the frame on the floor. Add a shim(s) as required at one of the adjacent corners to the high corner. Move to the next corner and shim as required. Continue until you are back at the high corner again. Double check completely around on the top flange of the ~8 cm (3" C Channel) with the bubble level – adjust the shims as required.

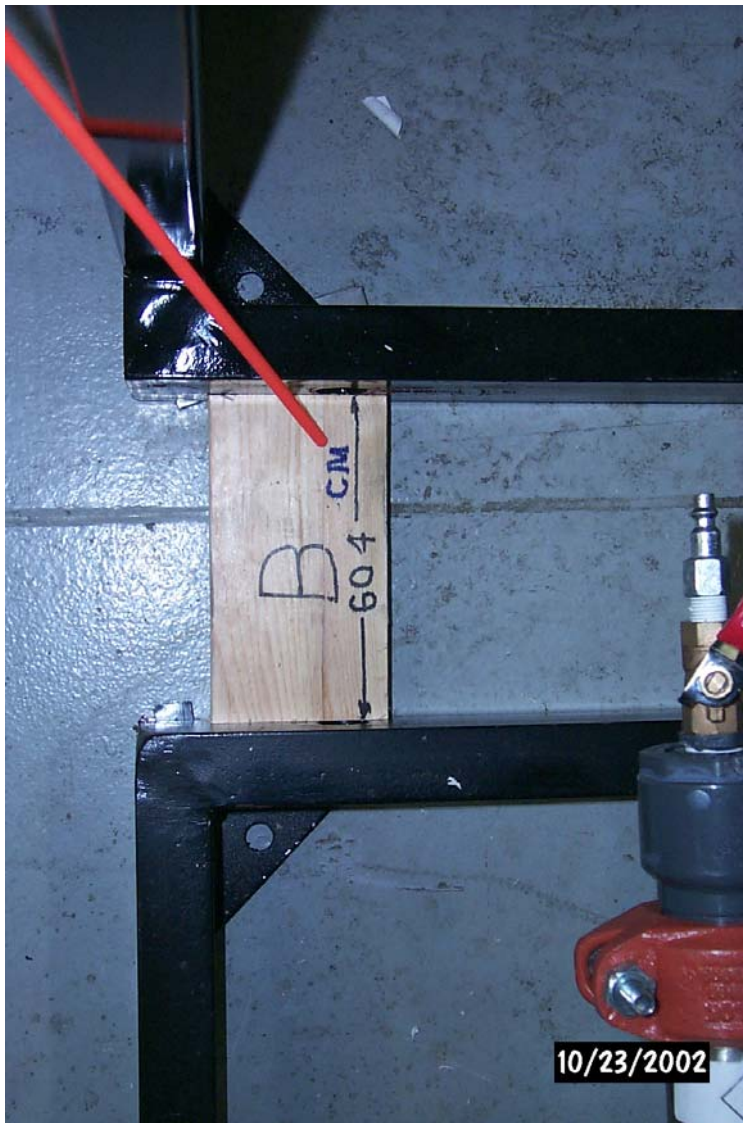


Typical use of bubble level used to confirm a manifold is still level after shipping. Use large C clamps where UF Rack Unit 'A' and UF Rack Unit 'B' are joined and also where UF Rack Unit 'B' and the CIP Unit are spaced apart by the width of the two spacers.

### ***Secure Skids to Floor***

For each of the Units that have a metal skid, there is a gusset with a 12.7 mm ( $\frac{1}{2}$ " ) in the center. Use a concrete drill bit to drill a ~7 cm (3") deep at each of the corners of of each skid.

## Mini Flux UF System Getting Started Guide



Note: Mounting hole in corner of the frame.

Make sure the shims are still in place and the skids are all leveled. Secure the shims permanently so they will not come loose or can be removed.

Insert a 12.7 mm (1/2") diameter concrete floor anchor (provided with shipment) into each drilled hole. Place the washer over the top threaded portion of the anchor, then attach the nut. Use an appropriate socket to tighten as required to secure the skids to the concrete floor.

Or if the floor is steel, create a weld bead every 2 feet or so or as required once all the shims are in place. Also weld the shims so they can not move out or be removed.

### ***Take care to protect fragile equipment during installation***

Do not step or lean against PVC piping, gages, or other equipment attached to the UF System. Remove any wood or cardboard bracing or other temporary supports or blocking as required. Remove any bolts, screws or exposed nails that are holding down the metal frame of the UF rack to the wooden skid.

## Mini Flux UF System Getting Started Guide

### ***Summary of Loose or Kitted Components & Sub Assemblies***

Here is a list of all the items that have been shipped loose or kitted.  
These parts will vary according to the Model you ordered.

#### **Mini Flux UF System**

Permeate purge interconnection piping

List others...

4 x concrete anchors

1 x 4040 type UF Element for each Mini Flux UF Housing

Misc goods: PVC primer & cement, Teflon pipe tape & Teflon paste, touchup paint, extra valve tags, etc.

1 permeate flow meter assembly for each UF Module

Valve ID tags for valves provided by customer (as requested)

#### **Making Threaded Pipe Connections**

To seal threaded PVC pipe connections, use Teflon tape and Teflon paste, which has been provided.  
For stainless pipe, use a liquid thread compound recommended or approved by your E-coat paint supplier or Teflon tape and Teflon paste.

#### ***Adjustment of components & Alignment of Piping Connections***

In most cases, some movement of the piping, pre-filter vessels, UF Housings, etc. may occur. It is necessary to review this matter and make adjustments as required.

Refer to the appropriate drawing of your system. You can find your Part Number on your invoice. This should be included with this document. Contact UFS if you do not have your appropriate drawing.

Measure the distance of the centerline of the E-coat paint manifolds (E-coat Supply, E-coat Return, E-coat balancing if PF option is included) from the floor or bottom of the metal frame, location of the PF vessels, etc. are as shown on the drawing. Use a tape measure to ascertain how close your dimensions are to the ideal.

GOAL – make sure all the inlet and outlet piping is square and level with the connection points of the UF Modules and PF Vessels. Each of the E-coat paint manifolds needs to be level & square as well.

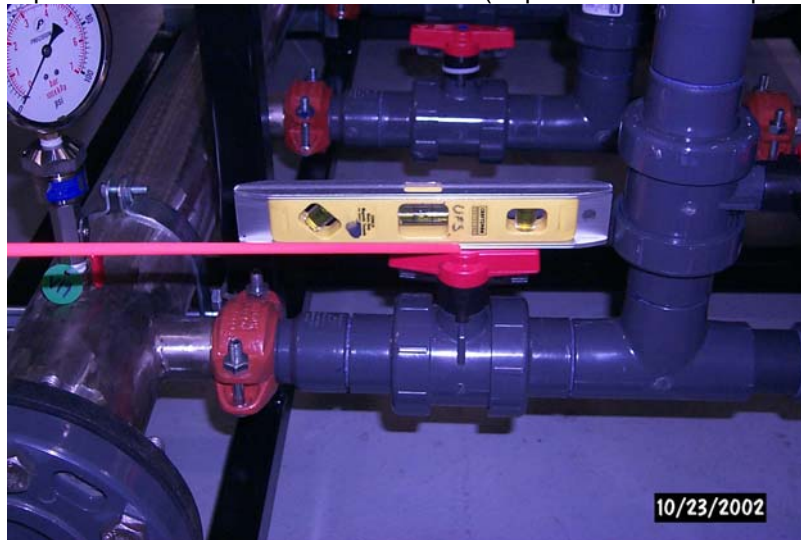
A good way to start checking is to place a 15 cm (6") bubble level on the E-coat paint Supply Manifold at each of the major diameters.



Bubble level on major diameter.

## Mini Flux UF System Getting Started Guide

Next place the bubble level (always keep the bubble level pointing in the direction of E-coat paint flow) on each of the 1-1/2" input isolation valves to the BF Vessels (skip ahead if the BF option was not ordered).



Check to make sure input piping is level.

Next place the bubble level on the vertical sidewall at several points around the diameter of the BF vessel to confirm it is vertical and true. Next place the bubble level on the 1-1/2" PVC valves on the discharge of the BF. Each of the input and output piping needs to be level. If these piping sections are not level, there could be a leak at one of the joints. Make a note of which piping sections and/or BF vessels are not level and/or square & true. These will have to be corrected after all the other items have been checked in a similar fashion.

Next, place the bubble level on the balancing manifold between the BF vessels and the input of the UF Modules, or the 1-1/2" PVC input isolation valves to the UF Modules (if BF are not included). Each of these input pipe needs to be level. The vertical position of the UF Module cannot be adjusted so if these isolation valves are not level the input piping is not level and there could be a leak at one of the joints. If some are not level, make a note of those that are not. Try loosening the 8" clamps around the UF Housing and see if it will set level on its C Channel support. Look at the inlet and outlet End Caps and make sure these are square and true. Retighten the 8" clamps.

Then, place the bubble level on the vertical sidewall of the TruFlow UF Housing at several points around its diameter to confirm it is vertical and true. If some are not level, make a note of those that are not.

Next, move the bubble level to the 1-1/2" output isolation valves from the UF Modules and check each one of these. Note any that are out of level.

Repeat the level test of each of the major diameters of the E-coat paint Return manifold. Note those portions that are not level.

Place a bubble level on the Permeate Discharge Manifold at several points and note any spots that are not level.

Place a bubble level on the Permeate Clean Return Manifold at several points and note any spots that are not level.

If all the tests show a level and square inlet and outlet piping to the UF Modules and the E-coat Paint Supply & Return Manifold, the check is finished by inspecting all the bolted joints to insure that the joints are tight.

### What if something is not Level?

If some checks show Corrective Action is needed. Generally this is so if one of the horizontal manifolds has shifted in a downward direction. Start with the lowest manifold. Loosen those clamps and/or cantilever supports as required and bring it up so it is level across its entire length. Then move to the next higher manifold and repeat the process.

## Mini Flux UF System Getting Started Guide

If some of the inlet and outlets piping to the UF Modules, BF Vessels are not level, or the BF or UF Housing are not vertical or true, adjustments need to be made. Start with loosening all the 1-1/2" groove clamps on the inlet side and/or the outlet side (if all the piping, for example on the outlet or the Return side is level, there is no need to adjust them. Next, loosen the E-coat paint manifold that is connected to the groove fittings loosened earlier. You must make several moves at the same time in order to make sure that the inlet and/or outlet piping is made level – also the appropriate E-coat paint manifolds must be made level as well.

Correct any problems with the Permeate Manifolds as required

The goal is to have the inlet piping to the UF Module, outlet piping from the UF manifold, and the E-coat Paint Manifold level and square to each other. If not done properly, it is likely that a leak may occur.

### **You DO Not want Paint Leaks**

Do not attempt to connect E-coat paint to the UF System until the unit has been leak checked and flushed with DI water. Failure to do so may void the warranty on the UF Elements. If a paint leak occurs and the UF Elements are installed, the UF System will have to be shut down while the repairs are made. There will be E-coat paint solids trapped in the UF Modules and these solids will foul the membrane and reduce the service life of the UF Elements.

### ***Installation of Loose & Kitted Components***

Note – Each true union valve has one O-ring for each of the unions – you must confirm that the O-ring is in place and has not fallen off or been lost. Replace any O-rings that are missing. Some items have to be installed once the UF System has been set in place and secured to the floor. Remove any packaging or tape used to keep a connection point free of dust or dirt. Start with the section entitled Basic and then proceed as required according to the Model you purchased

### **Mini Flux UF System**

1. Locate items with Match Marks "A thru F".
2. Starting with the suction pipe "A", attach to suction end of the paint pump "A".
3. Attach y-strainer "B" to the suction pipe "B".
4. Attach union portion of valve "C" (valve tag V5) to the permeate pump
5. Secure lid to top of permeate tank.
6. Attach piping assembly "D" to top of element housing while aligning "F" into lid of tank.
7. Insert Low Level Switch Assembly "E" into tip of lid.

### **Support E-coat Paint & Permeate Piping**

Support the E-coat paint inlet piping, E-coat paint outlet piping, and Permeate outlet piping all within 30 cm (12") of the Butterfly valve. The weight of the butterfly valves is significant and they need to be supported by pipe support or equal as near to the butterfly valve as possible. Otherwise support these PVC pipes at least every 1.5 m (5 ft).

### ***Pump Control Panel Completion***

The CIP Panel does not include a motor or panel disconnect switch. The size of the breaker or fuse for the CIP System should be about 20 amps for 460 V AC operation or 30 amps for 230 VAC operation.

### **Pump Motor Electrical Connection**

1. The paint pump is a 3 Hp, 3 phase, 460V AC (or 230 V AC). The permeate pump is a ½ hp 3 phase 460 V AC (or 230 V AC). Customer must provide an appropriate motor disconnect switch, conduit, wiring, etc to bring power to the motor. Do this in accordance with appropriate local and national electrical codes.
2. Do not bump the motors until the pumps can be filled and properly primed with DI water. Bump each motor

## Mini Flux UF System Getting Started Guide

for 1/2 second by pressing the green On switch or less and observe the direction of the fan on the opposite end of the pump. Check the direction arrow on each pump for the proper rotation. If the fan turns in the wrong direction, the motor leads are wired incorrectly. Rewire the motor and bump the motor again. You will damage the mechanical seal if the motor is bumped and the impeller is dry. This will void the warranty.

3. Confirm that the Reset Dial Adjustment on the Motor Starter is set to M for manual reset of the motor once the starter is turned off for an overload condition and the **FLA set point dial is as follows: Motor Voltage = 220V then FLA is set to 14 or if Motor Voltage = 460V then FLA is set to 6.**

### ***Make Paint Drain connections***

This connection will be send to send paint, permeate, RO water, or DI water back to the E-coat bath.

1. Use 1-1/2" (minimum) PVC piping to connect V31 valve back to the E-coat bath in a spot approved by the E-coat paint vendor. Slope this paint drain pipe at a 2%, or greater, negative slope towards the E-coat tank.
2. Connect **V21 valve** to the same pipe as Step 1 and maintain a 2% negative slope (for Models with CIP Option only).
3. Connect **V27-\* valves** (for Models with BF Option only)

### ***Make Paint Drain/Waste connections***

This connection will be send to send paint, permeate, RO water, or DI water back to the E-coat bath, OR to the waste if there is a chemical not compatible with the E-coat paint. This can be a 1" PVC pipe. Slope this waste pipe at a 2%, or greater, negative slope towards the pit or waste stream. Fabricate a manifold that can accept all the inputs and then direct it either to the Paint Drain or the Waste Drain.

1. Connect **V23 valve** (for Models with CIP Option only).

### ***Permeate Tank Overflow***

There is a 3/4" bulkhead fitting on the permeate tank. If the level gets too high then excess permeate will leave the tank. This flow should be re-directed back to the paint tank. This is not considered a drain connection.

### ***Make Waste Drain connections***

This connection will be send to send permeate, contaminated RO water, or contaminated DI water back ONLY to waste.

1. Connect **V12 valve** to a 3/4" or 1" pipe sloped to drain at a 1-2% slope.

### ***Permeate Tank Low Level Switch***

1. Remove packing tape from float switch.
2. Attach sensor assembly (1/2" PVC Pipe) to top of CIP tank with 1/2" Pipe clamps to strut channel so it is 6" above bottom of the Permeate Tank.

### ***Paint Pump Low Level Switch***

If your Mini Flux UF System includes a paint pump then the customer will have to provide a remote switch that will act as an input to turn off the paint pump in the event the paint tank has a low level condition.

### ***Clean Return Piping to CIP Tank, optional***

1. Attach the permeate discharge piping sections to the permeate purge valve & permeate clean return and support this piping assembly to suit.
2. Connect the 1-1/2" PVC pipe that is the Clean Return to the CIP tank.

## Mini Flux UF System Getting Started Guide

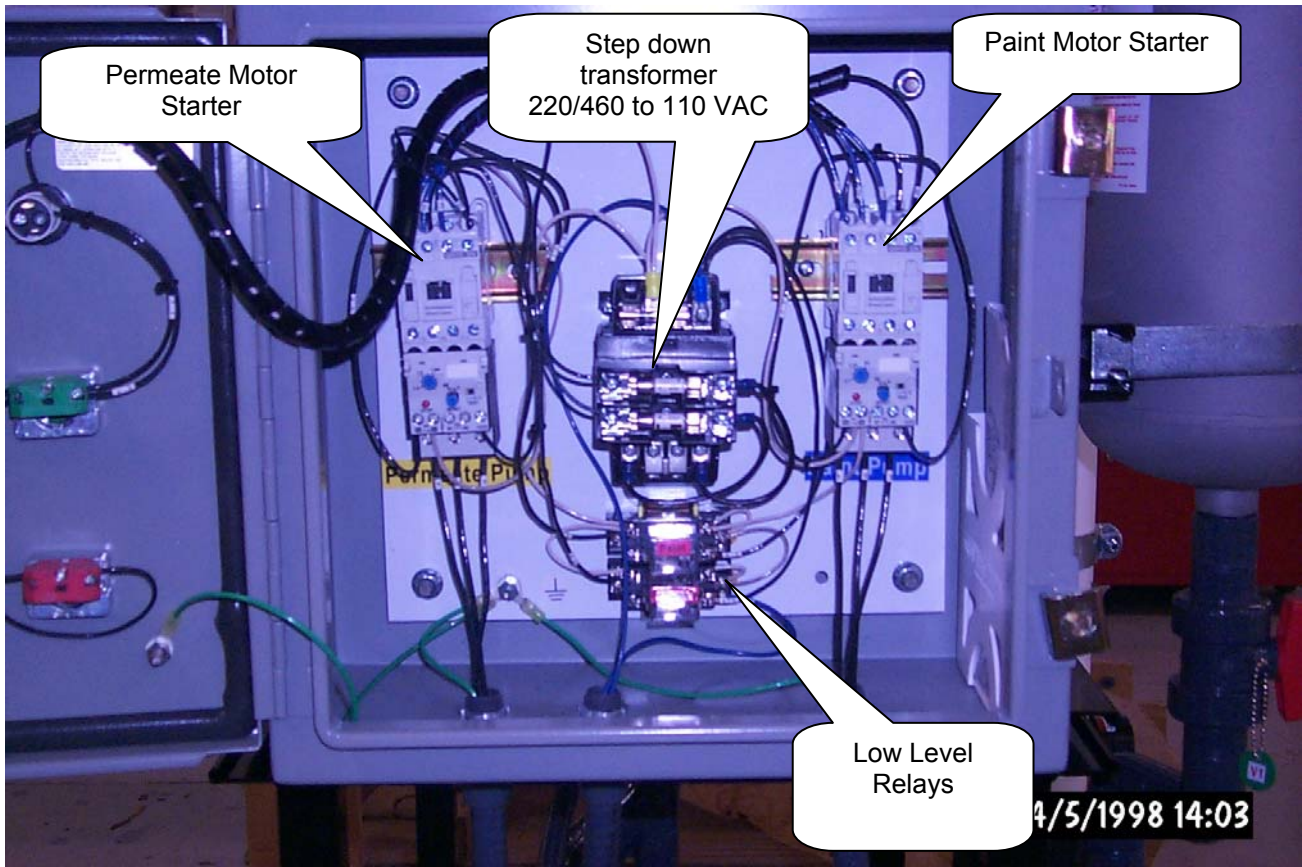
### ***Cooling Water Connection, optional***

1. Make sure the stainless steel cooling coil is installed in the CIP tank.
2. Rotate the PVC Elbow to suit the direction from which the chilled water will be provided. It does not matter which one is selected as the inlet.
3. Attach the other cooling coil connection to the chilled water return (or waste if city water is used as the chilled water source).

### **Pump Control Panel Check Out Procedure**

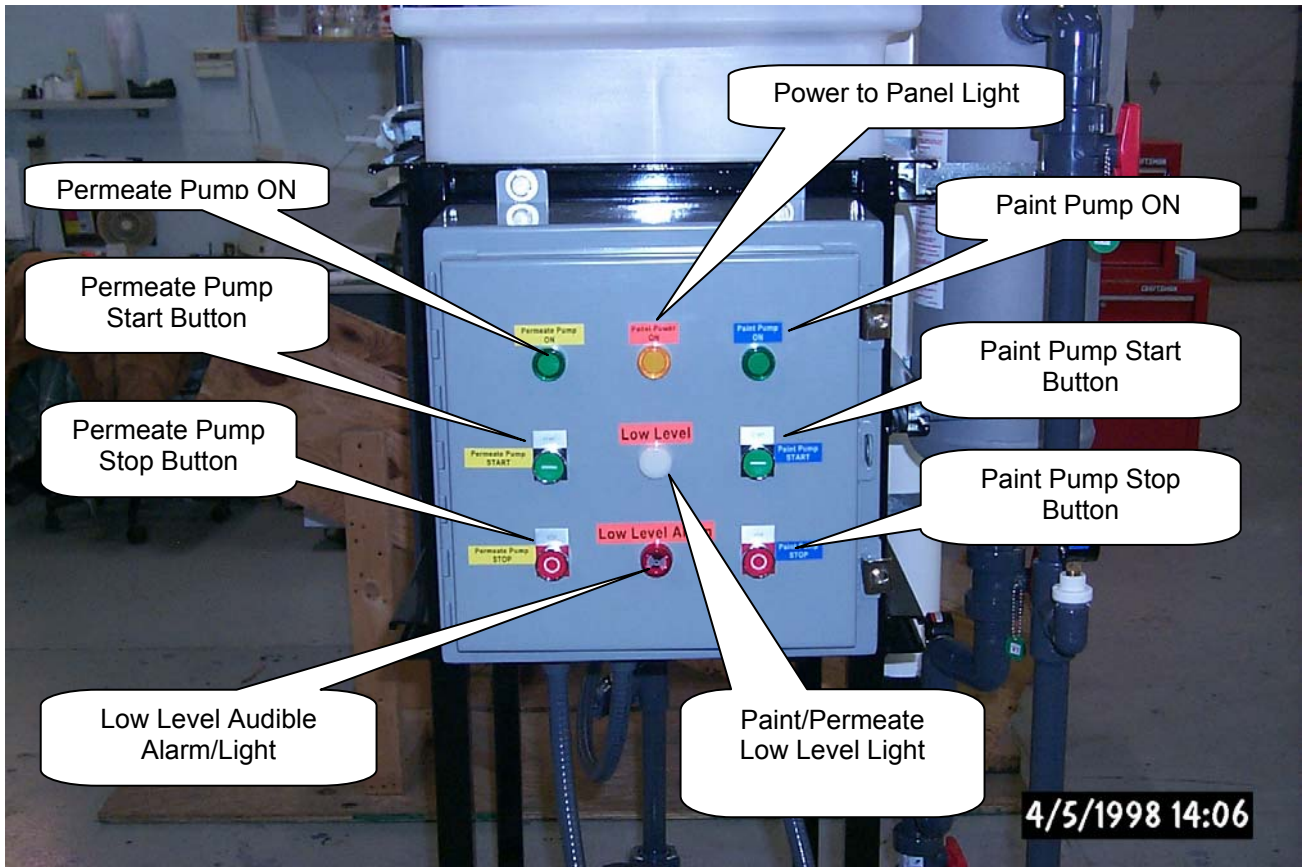
1. Close the Panel and secure it. Fill permeate tank with DI water.
2. Turn on the Motor disconnect switch. (by customer)
3. The amber light should be illuminated, indicating power is supplied to the Pump control panel. If not, check the connections at the transformer and the bulb.
4. The pump motor was previously bumped to check rotation. If not, refer to the section above. **DO NOT RUN PUMP DRY.** Turn on the permeate pump and allow the water to flow along its intended path.
5. Use a short section of PVC pipe to gently press down the float switch to simulate a low tank condition the permeate pump should turn off. If it does not check the connections and operation of the low tank level switch and the corresponding relay.
6. Turn on the permeate pump motor again, open the Panel Door (only by a qualified plan electrician, who is knowledgeable about electrical safety matters.) and manually trip (with a small screw driver) the motor starter to simulate a high current event. Check to make sure the motor turns off. Reset the motor starter and confirm that the pump can operate normally again.
7. Repeat steps 4, 5, and 6 for the paint pump motor.
8. If there is trouble refer to the Control Panel Wiring Schematic (drawing 221068) if there is trouble with any of these steps. Call UFS if the problem persist.

# Mini Flux UF System Getting Started Guide



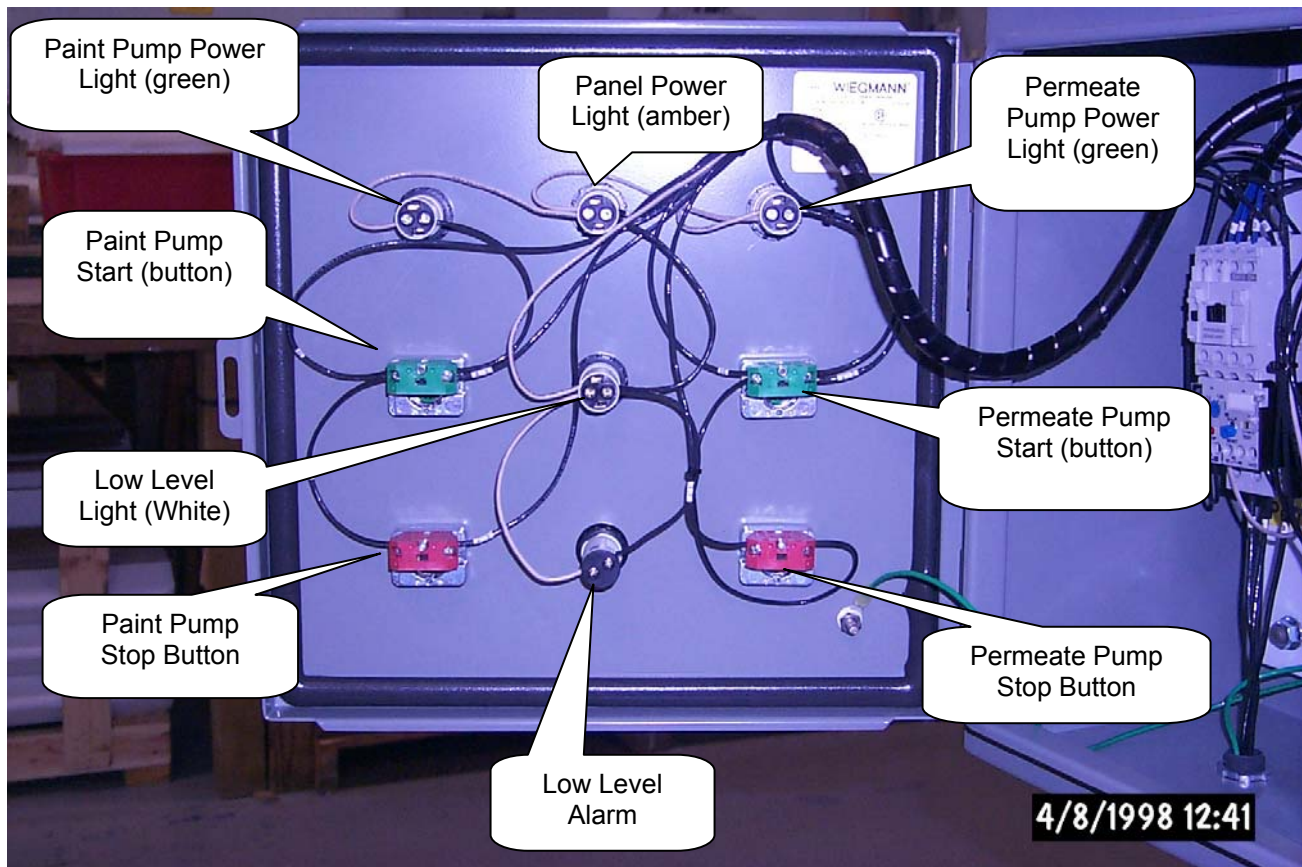
Inside Pump Control Panel with component placement

# Mini Flux UF System Getting Started Guide



Front view Pump Control Panel

## Mini Flux UF System Getting Started Guide



The photo above is of the Inside of a Pump Control Panel (Door).

Inside CIP Panel component placement

### ***Water flush & leak Check***

#### **Permeate Piping**

1. Close off the permeate tank drain Valve #V5, Open #V4, and fill the permeate tank with DI water.
2. Turn on the permeate pump and flush out this line, being careful not to contaminate the rinse tank area.  
Turn off the pump once the fluid runs clear at the exit point(s).
3. Turn off the last valve(s) on the permeate discharge line and then crack them open. Turn on the permeate pump and fill the lines and let air escape. Turn off all these valve(s) and perform a leak check for at least 60 minutes.
4. Fix or repair any leaks before proceeding.

#### **Paint Piping**

Note – the UF Element(s) can not be installed yet for the initial leak testing. Do not install a bag filter yet at this point.

## Mini Flux UF System Getting Started Guide

1. Attach a temporary DI water line to the suction side of the Paint pump and Open all the Valve(s) on the paint pump discharge side so all this piping is flushed out. Take care no to contaminate the paint tank.
2. Close the last valve(s) on the paint pump discharge side before any drains or the paint tank. Bleed off any air and perform a DI water leak check for at least 60 minutes.
3. Fix or repair any leaks before proceeding.

### Leak Repair Tips & Tricks

If a PVC True Union Ball Valve is still leaking, try an alternate O-ring with the same diameter, but the next larger cross section diameter. Order the appropriate O-ring as required.

Size & Item Original O-Ring PNA Alternate O-Ring PN

1/2" Ball Valve 565029565040

3/4" Ball Valve 565030565041

1-1/2" Ball Valve 565031565042

2" Ball Valve 565032565043

2-1/2" Ball Valve 565033565044

In addition the unions have an O-ring that may be missing, replaced, or select the next cross section larger to fix a persistent leak.

Size & Item

O-Ring PN

Original O-Ring PNA Alternate

1/2" Union 565034565038

1-1/2" Union 565035NA†

† You can try to fabricate one from another O-ring using Super Glue to join the two ends together. For threaded joints, use a joint compound approved by your E-coat paint supplier or Teflon thread tape.

### ***Chemical cleaning of the inside of the Mini Flux UF Machine***

At this point, especially if the UF Machine is being installed in a new E-coat Paint System, the typical procedure is to perform a cleaning with a strong caustic (high pH) cleaner. If caustic cleaner is used – read the safety label and wear the appropriate protective clothing, eye wear, etc. Be prepared to rinse out the eyes of a person who is splashed. Ask that person if they wear contacts and these too must be removed as part of the effort to rinse away the caustic. Contact your Safety Department for more detailed instructions.

You must rinse UF Machine 2 times **AFTER** chemical cleaning. You must then take a sample of the water used to flush out the UF Machine and submit it to your E-coat paint supplier to insure that there are no contaminants still inside the UF Machine.

### **Clean out Y Strainers**

Once the unit has been cleaned and rinsed it's a good time to open up the Y strainers and clean them of any debris. Clean them as required and replace and seal.

### ***Make E-coat Paint Connections***

Note - Do not proceed until the unit has passed the water leak check, system has been cleaned, and you are assured that there will be no E-coat paint leaks. Once the E-coat paint is connected, it is much more difficult to fix leaks and other piping problems. Also soft start E-coat paint pump to ensure that there is no pressure surge to system. Also please note that paint **MUST** circulate for 36 hrs before a UF Element is brought on line. Do **NOT** operate elements if paint is not at proper temperature.

1. Make the final connection from the discharge of the Mini Flux UF Machine to the paint tank as required.

## Mini Flux UF System Getting Started Guide

2. Repeat the above for the suction side of the paint pump (if provided) as required.
3. If there is an E-coat Paint By-pass around, it should NOT tee into piping downstream of the UF System. The pressure inside the By-pass piping is greater than that in the Return coming from the UF System. Flow uncertainties and other problems can occur. *The discharge of any E-coat paint by-pass needs to go back directly to the E-coat tank.*
4. Test these new E-coat paint Supply and Return piping segments with DI water and confirm there are no leaks. Fix any leaks now as required.

### ***Install 4040 type UF Element(s)***

Now it is time to install the UF Elements into the UF Housing before the UF System is started up on E-coat paint for the first time. You must remove the permeate flow meter before proceeding.

Rinse the new 4040 type UF elements by cutting off the top most portion of the poly sleeve and filling with DI water and sloshing the unit around for a minute. Dump the water and repeat 3 more times. You are rinsing off the preservatives that the UF element has been stored in.

Remove the top snap ring (white color) and take the top cap off. Make there is a large diameter O-ring that fits around the OD of the cap.

Take the longer of the two PVC permeate adapters and make sure it has two O-rings in the glands. Apply some provided glycerin to these O-rings.

Insert this into the bottom of the Element.

Insert one of the Lip Seals to the upper ATD (anti telescoping device) so that the lip is facing down and will 'balloon' outward when paint is coming up the exterior of the UF element. Use some glycerin on this lip seal too.

Take the shorter of PVC permeate pipe adapters and repeat step 3 & 4. Placing this into the top of the UF Element.

Now you are ready with the use a short step stool to lower the UF element into the UF housing. Do not drop the element as you can break the lower cap assembly and/or the permeate adapters.

Wiggle the unit until you feel the lower permeate adapter fit into place. You will also have to make sure the lip seal does not fold back over it self. The lip seal must be installed with the lip facing down, or the unit will suffer a short life as most of the paint will escape around the UF element and not go through the element.

If required you may have to remove the lower cap and visually confirm the lower permeate adapter is properly located. Re-install the lower cap if required, making sure the large O-ring is in its' proper location before the white snap ring is inserted.

Now you are ready to re-install the top cap, make sure the large O-ring is in place and then insert the white snap ring.

Re-install the permeate flow meter and related piping so the permeate will enter the permeate storage tank.

### ***Install Bag Filters***

Install a Glazed #1 FSI brand bag filter into each vessel. Use the FSI tool to fully seat the plastic flange of the bag filter. You should hear a snap as it seats into its groove. Do not keep the seat tool inside the vessel.

### **Normal Start-Up Checklist**

Never operate the UF Module with the permeate valve(s) closed. Permeate must never be dead-headed. To do so risks blistering the UF membrane or blowing a glue seam or delaminating the UF membrane.

If this happens, the UF Element is ruined and the warranty is voided.

Remember: Always open valves that are under pressure SLOWLY.

## Mini Flux UF System Getting Started Guide

### ***Typical Start Up Conditions***

#### **Observe some paint in permeate flow meters.**

It is common with a new UF Element to observe some cloudiness in the permeate discharge line at start up. This is because the pore size distribution includes a small number of large pores. Initially some paint solids can pass through these large pores, but very quickly these large pores become blocked off. Generally this process could take several minutes.

#### **Initial permeate flux decline.**

Even though the typical rating for a typical module on typical E-coat paint can be as high as 2.5 gpm +/- 10% for a 8" size, the initial flux can be as much as 4 gpm. To help get a baseline for your system please record the permeate flow rate for each individual UF Module. Please use Bulletin # 999301 (attached later in the document).

### ***Record First Day Baseline Data***

After all the UF Module(s) have been operating successfully for at least 4 hours, it is time to record the permeate flux rate for each UF Module. Use the Baseline Data Sheet for this task. You can make a copy of the form at the back of this manual.

### ***Posting of Operator Checklist Notebook***

Place in a prominent place the Operator Checklist Notebook. In addition you should have a written Emergency Operation Plan. A back up copy of the Operator Checklist is included in the Appendix D.

## **Operation of the UF System**

### ***Recommended UF Process parameters***

#### **E-coat Paint Flow**

Maintain a flow rate of at least 20 gpm +15%/- 5% per 4040 type UF Element. Use an E-coat paint flow meter to verify. If you do not have a TigerMag paint flow meter or a portable unit then you must use the pump curve provided by your pump manufacturer. The pressure gage must be located BEFORE the first valve on the discharge of the UF Supply pump. For a dedicated UF Supply pump, calculate the required flow rate based upon the number of 4040 type UF Elements and then add 20%. On the pump curve locate this flow rate and then follow up to the pump curve and then go over to your left to read what the supply pressure should be at this flow rate. The pump will only produce the required flow rate if the correct pressure value is shown on this discharge pressure gage. If the pressure gage is not reading the correct value (i.e. too low), then you have to ask your self if the paint flow rate to the UF machine is also too low. In many cases, poor UF performance is due to low or incorrect flow.

#### **E-coat Paint Pressure**

Normal Pressure at inlet to UF System is to be 3.4 bar (50 psi), which is gauge P2.  
Normal Pressure differential across the E-coat paint feed and return manifolds 2 bar (30 psi). This is P2 minus P3.

## Mini Flux UF System Getting Started Guide

### When to change Prefilter bags

In the past prefilter bags were generally changed when the delta pressure (delta P) across the filter vessel is 0.3- 0.5 bar (5-7 psi). If the delta P is allowed to become more, then that means the inlet pressure to the UF system will be less and could fall below what is recommended. The delta P can be greater only if the E-coat feed pump has plenty of pressure so that the minimum E-coat paint pressure at the inlet to the UF is never below the Low 'Normal' recommendation.

If you have a TigerMag flow meter then a better method is to watch the flow and when the flow has been reduced by say 5% or 10%, then you can change the bag filters. You should notice an increase in the flow rate (you do not have to change any of the valve positions) after you change the bags. If you did not then the flow reduction is a result of: 1) fouling layer on the surface of the UF membrane, 2) some one has closed a valve restricting the flow of E-coat paint, or 3) pump performance has declined for some reason.

### Permeate Rinse of UF Elements

UFS recommends the practice of periodic rinsing of the UF Element with permeate on a monthly basis starting after the first 30 days of operation. This generally requires a CIP (Clean In Place) system. This flushing should be done at the same flow and pressure conditions as with paint.

### Permeate Flux rate decline

The UF Modules must be cleaned when the permeate flux rate has declined by 20% from the baseline figure, which was reached after about 4 hours of use on the very first day of operation.

## Operator Training

A basic UF training Program is included in the Appendix. If you want a PowerPoint version of this, please contact UFS Customer Service for a free copy. UFS offered a 4 hour Onsite training program that costs \$1250 and included all expenses (Domestic US Locations). UFS also offers a 30 minute VHS video tape, or DVD at no charge to clients. This video uses the Tru Flux UF Machine so some features will not be the same

## Operation of the CIP System, optional

In normal operation the CIP pump may run for an hour or so until the Low Temperature Set Point of ~43 deg C (~110 degrees F) is reached at this point. If the temperature of the cooling water is 18 deg C (65 degrees F) then the CIP should be able to run for up to another hour, or so. At this point the cooling system will not be able to keep up and the CIP pump will shut down due to tripping the high temperature level. In most cases, this amount of time is sufficient to properly clean the UF Module. If necessary, the low temperature set point can be lowered so the cooling is initiated sooner so the cleaning cycle can be lengthened. Do not leave the paint solids in the CIP Tank. An accumulation of paint solids can harm the mechanical seal on the CIP pump. Therefore after use of the CIP System it is important to rinse all paint solids back to the E-Coat tank and make sure the pump is free of paint solids.

## General Maintenance and Cleaning

### *UF Module Storage:*

All UF Modules will be shipped in a sealed bag with a preservative solution applied to the membrane surface. This preservative typically has glycerin base with either water or water and propionic acid added. Normally this solution allows for storage for up to one year at between 40 and 100 degrees F.

**Under No Circumstances Should The UF Element Ever Be Allowed To Freeze or to Dry Out, this will void the warranty.**

## Mini Flux UF System Getting Started Guide

Upon receipt of the UF Elements, the shipping container should be checked for leaks to insure its integrity. If there is a leaking bag, it should be sealed immediately with a hot iron or tape to guarantee that it will remain airtight. The preservative that leaks out is excess material and will not affect the membrane. *Under no circumstances should you replace the preservative with water. This will encourage the growth of bacteria and mold that are detrimental to the membrane.* The UF Module should then be stored in your normal manner. Do not store above ovens or heat tunnels!!

### **UF Element Installation and Removal**

The installation of the UF Element into the UF Housing is a simple procedure that requires only a few minutes and can usually be done without removing the UF Housing. When handling the UF Elements, it is best to wear gloves as they can be slippery and also to avoid fiberglass slivers that maybe on the hard over wrap. Note - it is easy to break the permeate flow meter when removing the Top Cap. Take care not to damage the delicate flow meter.

Note - it is easy to lose the O-rings when disassembly prior to removal of the old UF element.

- 1) Refer to the Operator Checklist entitled 'Replacement of a UF Element-\*' located in the Appendix

### **General Maintenance**

Because of the number of variables, it is important that a detailed log of the performance and variables be kept and maintained on a regular basis. This will insure that potential problems can be avoided and the causes of permeate decline can be pinpointed and eliminated as a potential or reoccurring problem. UF maintenance ultimately refers to decline of permeate rate and recovery procedure. Several factors in the normal operation of the UF System can affect the permeate output from the membranes: feed concentration, oil, temperature, flow, pressure differential, pH, and inlet pressure.

#### **Preventive Maintenance – daily checks**

- 1) Confirm the proper E-coat paint flow is going to the UF Machine.
- 2) Check pressure drop across prefilter vessels is nominal
- 3) Record individual permeate flux rates for each UF Module
- 4) Confirm that the outlet pressure is at least 1 bar (10-15 psi) and the differential across the E-coat feed and return manifolds is nominal.

#### **Preventive Maintenance – weekly checks**

- 1) Flush one UF Module with permeate on Friday & hold in permeate till following Monday. Next Friday continue with a different Module. Each UF Module is to be flushed once per month.
- 2) Permeate flush a UF Module when its permeate rate is 90% of Baseline
- 3) Consider a chemical clean when the permeate rate is 80% of Baseline.

#### **Preventive Maintenance – as required**

Chemical clean UF Modules as required for any UF Modules when its permeate rate is 80% of Baseline

#### **Preventive Maintenance – semi annual checks**

Verify proper E-coat paint flow is being delivered to the UF System by using an indirect E-coat paint flow meter.

Verify the proper set points for the Low Temperature and High Temperature levels by testing with hot water and a thermometer.

Grease the electric motor as required by standard practice.

Clean out the CIP strainer as required.

## Mini Flux UF System Getting Started Guide

- Check for loose connections and persistent drips.
- Clean the drip pan underneath the UF System.
- Inspect the UF Feed pump and related subsystems for proper operation.
- Test the Power backup standby generator that powers the UF E-coat paint pump(s).
- Check the permeate supply pump/motor(s) to the rinse stages and perform required maintenance.
- Check the condition of each lamp in the CIP panel and replace as required.

### ***E-coat Paint seal on the UF Element***

If the UF Element has a Lip seal for blocking the flow of E-coat paint from bypassing the UF Element, then only one of these seals is required. This lip seal should be in the upper most gland (groove for the round seal). The seal should be oriented so the flow of E-coat paint from the bottom of the UF Housing forces the lip or skirt of the seal outward, so it properly seals. Use a thin tool as the UF Element is being replaced to properly position this thin seal in the downward facing position. Once again the appropriate O-ring, U-cup, or lip seal needs to be placed into the uppermost gland. Some UF Elements only have one gland why others have 2 glands built into the anti-telescoping device.

### **Changing the CIP prefilter bag, optional equipment**

This bag should be changed with a heat treated or glazed bag every several weeks or when ever there is sufficient paint solids in the bag to impede the flow of flushing solution (i.e. permeate) through it. Refer the Operator Checklist for specific instructions.

### **Changing Low Temperature Set Point, optional**

If the Low Temperature Set Point is too high for your situation, it can be lowered. Please refer to the Watlow brand temperature controller section in the back of this manual.  
Important – Do not change the high temperature set point. After making the change to the Low Temperature Set point – perform the check out of the CIP Panel Checkout Procedure section earlier in this manual.

### ***Standard Cathodic E-coat Paint Cleaning Formulations***

Do not clean at temperatures above 50 deg C (~120 deg F).  
Always contact your E-coat paint Supplier FIRST before purchasing any UF Cleaner or UF Charge solutions and make sure these solutions are approved for use with the specific E-coat paint you are using.

#### **Standard Flushing**

See Operators Checklist for more information.

#### **Normal E-coat Paint Fouling,**

Typical cleaning time is up to 2 hours  
94% DI water + 3: Butyl Cellosolve + 3% Latic or Formic Acid

#### **Severe Paint Fouling**

Same as above + 0.5% Triton X-100 surfactant for the last ½ hour of planned cleaning time.

#### **Lead & Phosphate Fouling**

Limit cleaning time to 30 minutes or less  
99.5 % DI water + 0.5% nitric acid

# Mini Flux UF System Getting Started Guide

## Iron Fouling

Limit cleaning time to 30 minutes or less  
96 % DI water + 4% citric acid made by mixing citric acid powder with equal amount of DI water.

## Permeate Flushing & Chemical Cleaning Procedure

The procedure to either flush a UF Element with permeate or use a chemical cleaner is the basically the same, except for the fluid used. Place a glazed filter bag over the Clean Return piping that enters the CIP tank. This will collect any dirt, or other fouling that was inside the UF Modules. Change this each time the System is cleaned.

Note – Use the Mini Flux UF System valve locations drawing in the back of this guide shown below to identify the appropriate valve location.

1) Refer the Operator checklist entitled, 'Monthly Permeate Flushing' located in the appendix.

## CIP Control Panel, optional

Refer to wiring layout of Drawing 221033 for details in the wiring of the CIP panel and the factory default settings. This drawing is located INSIDE the CIP PANEL.

Safety Note - disconnect line power to the CIP panel before performing any maintenance on the CIP panel. This disconnect switch is to be provided by the client.

The relay contacts that open and close to control the cooling water solenoid valve need to be inspected every 6 months as these contacts do suffer wear and tear as they are operated.

Make sure the cooling fan openings on the CIP pump are not obstructed and are free and clear. If the motor started has shut down the motor due to high current conditions then check the operating conditions of the three 'heaters' that perform the shutdown operation if the current is high or unusual for some reason.

## *UF Restart after a Power Outage*

It is critical that this be addressed as quickly as possible. Follow the Checklist in the Operator Checklist Notebook entitled 'Abnormal Shutdown.

After power has been restored, flush each UF Element with permeate as presented earlier in the manual. Once all the UF Elements have been flushed, restart the UF Elements with E-coat paint using the procedure presented earlier in this manual.

## *Warranty Statement*

Any items purchased to produce the UF System will carry the original manufacturer's warranty. UFS will assist the client with any such requests for warranty consideration. Please see the Appendix for the warranty statement on the Mini Flux UF System.

UFS does not offer a performance warranty on the UF Element because so many of the process, operational, power outages, operator training levels are variables that are far outside the scope of control for UFS Corporation. UFS Corporation will endeavor to assist, trouble shoot and stand beside clients in difficult situations.

## Frequently asked Questions

### *UF Element*

#### **When should I begin permeate flushing?**

You should be immediately and set up a plan where each UF Module is flushed once a month. Each week another UF Element needs to be flushed and rested over the weekend before it is brought back on line the following Monday. The next Friday another UF Element is permeate flushed and rested in the same manner.

## Mini Flux UF System Getting Started Guide

This is repeated again with the next UF Element and so on. Then the next month the whole process is repeated all over again.

### **What if I do not want to spend the time and effort to permeate flush one UF Element every week?**

Then be prepared to flush the UF Element at least when there has been a 20% decline in the permeate flux rate. You must also chemical clean when there has been a 30% decline. Many clients report that chemical cleanings are ineffective especially, the UF Element flux rate has declined more then and no permeate flushing was every performed

### **There was a power outage and the E-coat feed pump was turned off for some time?**

This is a problem because the E-coat paint solids were able to settle inside the UF Element during the time that the E-coat feed pump was shut down.

### **What will happen if I close off the permeate discharge valve(s), or block the flow of permeate?**

If permeate valve is closed, then UF membrane will rupture away from its backing sheet and paint will leak into the permeate causing the UF Element to fail. The UF membrane is cast onto a backing sheet. The normal pressure gradient is from the side that the membrane is on to the permeate side. If the permeate side is closed Off, then the permeate side will begin to become pressurized so it may eventually become more that the membrane side causing the rupture to occur.

### **Why do I have to take 2 minutes to fully open valve V1?**

This valve controls the entry of E-coat paint into the UF System. If this valve is opened too quickly then there will be an initial pressure imbalance between the exterior of the UF Element and the interior (since it has not had a chance to fill up, while the high pressure is allowed to encircle the entire exterior surface of the UF Element.

### **How long can I keep a UF element packed in RO or permeate?**

Not a good idea in general. After about a week, bacteria will start to grow. Even if the element is flushed and replaced with fresh RO or permeate the bacteria will still be on the surface. We suggest a RO with 500ppm H2O2 flush and lock the membrane in the solution. Repeat weekly.

### **What should I use to pack a UF element?**

Use a Propionic Acid Preservative which contains; 47.7% Glycerin, 47.7 % D.I. Water, 3.8% Propionic Acid and 0.8% Caustic Soda.

### **What is the anti-telescoping device (ATD)?**

This appears to be shaped like a bicycle wheel that has spokes. The portions of the ATD that appear to look like the spokes actually keep the spiral membrane from being pushed out of position by the force generated by the E-coat paint as it enters the bottom end of the UF Housing.

### **What is the Baseline permeate flux rate?**

This is defined as the permeate flux rate some time after the initial startup, but not so long that the flux rate has started to decline significantly. The initial flux rates can be quite high sometimes, but allow 4 to 6 hours before recording a more stable and reliable value of the permeate flux rate.

### **What is PVDF UF membrane?**

Polyvinylidene fluoride (PVDF) is the standard polymer material used by most spiral UF manufacturers. This is a polymer that is cast onto a thin backing sheet. Once the polymer cures, the porous structure of the UF membrane has been established. It is through these small pores that the low molecular weight components in the E-coat paint can pass through.

### **What will happen if the E-coat paint flow rate is less than the recommended?**

Proper operation requires that the flow of E-coat paint flow through the UF be monitored closely so that it is held within the allowable range. Low E-coat paint flow results in low permeate flux rates.

### **Can I hurt the UF Element if the flow of E-coat paint is greater than the recommended rate?**

It is possible to harm the UF Element if the flow of E-coat paint is too high. Take care when you take a UF Element Off Line to flush or clean it that you reduce the flow of E-coat paint accordingly.

### **What happens if I close the permeate discharge valve when E-coat paint is going through the UF Element?**

The permeate will have no place to exit the UF Element and so after a couple of seconds the pressure on the backside (i.e. permeate side) will increase. This pressure increase on the backside of the membrane can be enough to cause rupture of the UF membrane from its backing sheet. This rupture event will result in an E-coat paint leak and the permeate will be discolored from the E-coat paint leak.

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### **Should I throttle back the permeate discharge valve?**

UFS does not generally recommend this practice. In some cases there may be a limit to amount of permeate storage capacity, which may be a reason for doing so, otherwise do not throttle back the permeate discharge.

## ***Prefilter Bags***

### **What happens if I run out of heat treated filter bags and I use an untreated filter bag either in the E-coat paint prefilter vessel or the CIP filter vessel?**

Fine lint fibers will come off this style bag prefilter. These fibers will then be directed to the inlet of the spiral wound UF Element. These fibers will not be able to pass through the narrow flow channels and will wind up blocking off flow of the E-coat paint. This will shorten the service life of the UF Element and greatly reduce the permeate flux rate. The only thing that may help this is to reverse flush so that as many of these fine lint fibers are flushed out of the UF element and some relief can be achieved.

## ***UF Rack***

### **How do the groove type pipe clamps work?**

There is a groove cut into each of the ends of the pipe where the groove clamp will be placed. The seal for the groove clamp is rather wide and is meant to straddle across where the two pipes come together. The groove clamps can tolerate some amount of mis-alignment and still not leak. If there is a persistent leak, then you must make sure the seal is not damaged correct any mis-alignment in the piping so that the two pipes share the same longitudinal axis and are straight and square with respect to each other.

### **What happens if the pressure in the E-coat paint feed manifold is about the same as the E-coat paint return manifold?**

If the pressure gage reads about the same in both manifolds, then there is little or no flow of E-coat paint. This must be quickly corrected so that the proper pressure differential exists. You should begin by closing the butterfly valve on the return manifold (V9). Then you can either open or close the butterfly valve on the E-coat paint feed manifold valve (V10). Adjust until the proper pressure differential

### **If I have one or more UF Elements already operating on E-coat paint, how do I bring on line a UF Element that I just flushed or chemically cleaned?**

This generally can be accomplished by first cracking open the paint discharge isolation valve (V3\*). Keeping one hand on (V3\*), place your other hand on the E-coat paint inlet isolation valve (V5\*). Slowly taking 30 seconds or longer, open both (V3\* and V5\*) at the same rate until both valves are full open.

### **Why should I spend the money to purchase an expensive E-coat flow meter?**

For low lifetime cost of any UF Element, the flow of E-coat paint must be closely controlled and monitored. Without a flow meter, it is practically not possible to know with certainty what flow rate is going into the UF paint feed manifold. Thus you are always guessing what the flow rate and will probably not get the longest life possible from your UF Elements.

## ***UF Housing***

### **I cannot remove the UF Element from the UF Housing?**

This can occur if the E-coat bypass seals were placed on the bottom end of the UF Element and E-coat paint solids were allowed to settle above the seals, or maybe the piece of PVC pipe used was made has a thick wall and so the inside dimension is smaller than normal. In this case, you must remove the UF Housing from the UF Rack. Then remove the Bottom Cap and push the UF Element out of the Housing.

Note – use a solution of permeate and solvent (approved by the E-coat paint supplier) to wipe down the inside of the UF Housing to remove any E-coat paint solids so the installation of the new UF Element is made easier.

## Mini Flux UF System Getting Started Guide

### **CIP**

#### **Why can I only flush or clean one UF Module at a time?**

The size of the CIP tank is sized to handle the turnover of one 8 inch UF Element and the CIP pump is only capable of producing enough flow to handle just one UF Element.

#### **What is total UF System Cleaning?**

This is a system that has a sufficiently large holding tank and a large enough pump that can provide the same flow conditions as the E-coat feed pump. Thus this system can be quite large and costly. Many companies can not justify the expense of such a system that is used maybe every other month or so.

#### **Should I reverse the flow of the flushing or cleaning solution?**

### **Cleaning**

#### **What is P3?**

This is polyethyleneamine, a compound that is commonly available.

#### **What does polyethyleneamine do?**

When it is used as part of the final rinse after a chemical cleaning, it can impart a slight positive charge to the surface of the UF membrane. Since the E-coat paint solids are positively charged (only for cathodic E-coat paint) it is believed that the performance of the UF can be improved.

#### **Does UFS recommend the use of polyethyleneamine?**

If you have experience with this and you believe it extends the interval between cleanings, then it will not harm the PVDF UF membrane.

### **Cooling**

**The cleaning time is too short before the CIP is turned Off for high temperature. How can I increase the cleaning time?**

- 1) **Make sure that the low temperature set point is set for 46 C (115 F), or lower as previously reset.**
  - 2) Make sure the cooling water temperature is no more than ~18 C (65 F).
- 3) Make sure that the cooling water solenoid valve is properly working when the temperature controller turns it On.
- 4) Adjust the Lower temperature set point to a lower temperature so that the cooling water is used sooner. Do this especially if the ambient temperature is higher than ~27 C (80 F).
  - 5) Ask to see if the cooling water temperature can be lowered.

#### **The High Temperature (red light) is turned on and the CIP pump is not operating.**

The high temperature limit has been reached and the CIP pump has been shut down. The UF Element can be damaged by high temperature as well as the PVC and other plastic parts that make up the CIP portion of the UF System.

#### **Why does the flushing fluid or the cleaning solution get warm?**

The CIP pump injects heat into the flushing or cleaning solution as the fluid is accelerated and moved by the pump impeller.

### **CIP Panel**

#### **Why is there a capacitor placed in parallel with the cooling water solenoid valve?**

The purpose of the capacitor is to reduce the normal electrical arcing that occurs as the relay contacts come into contact and also when they are opened.

#### **What does the 'Power' on green light indicate?**

When this is illuminated, there is power to the CIP Pump.

#### **What does the High temperature (red light) indicate?**

When this is illuminated, the high temperature set point has been reached and the CIP pump has been turned Off.

## Mini Flux UF System Getting Started Guide

### **What does the Cooling 'On' (green light) indicate?**

When this is illuminated, the temperature of the permeate flush or the chemical cleaner solution is above the Low Temperature set point and the cooling water solenoid valve is turned On.

#### **I press the red button to turn on the CIP pump, but it does not start?**

Make sure the high temperature red light is not On.

Make sure the power to the CIP Panel is OK. Restore power as required.

Turn off power to the panel and have a qualified electrician inspect the motor starter. Reset the blue push button if the motor started was turned off.

Have the electrician inspect the three heaters and replace as required.

Make sure the contacts of the green (start) push switch operate and that there is not another wiring problem elsewhere in the control circuit of the CIP pump motor.

#### **I press the red Stop button, but the CIP pump does not turn off?**

There has been a wiring failure, problem with the contacts of the red (stop) push button, or other problem.

Ask electrical maintenance to use the wiring diagram and trouble shoot the problem.

## **Pump Control Panel**

### **What does the 'Power' on amber light indicate?**

When this is illuminated, there is power to the Control Panel.

#### **I press the green button to turn on a pump, but it does not start?**

Make sure the amber panel light is ON.

Make sure the motor overload relay has not been tripped. Have a qualified electrician open the panel and inspect.

Make sure the contacts of the green (start) push switch operate and that there is not another wiring problem elsewhere in the control circuit of the pump motor.

#### **I press the red Stop button, but the CIP pump does not turn off?**

There has been a wiring failure, problem with the contacts of the red (stop) push button, or other problem.

Ask electrical maintenance to use the wiring diagram and trouble shoot the problem.

## **Replacement Parts**

### **Prefilter Bags**

Always make sure to use a prefilter bag that has been heat treated on the exterior surface so there are no loose fibers that can fall off and block the inlet of the spiral wound UF Element.

## **Warranty**

We warrant all equipment manufactured by UFS Corporation to be free from defects in material and manufacture at the time of shipment for a period of one (1) year from the date of shipment. We will furnish without charge, but not install, replacements for such parts as we find to have been defective.

This warranty shall not apply to any equipment which has been subjected to misuse, neglect or accident, or has been altered or tampered with, or if corrective work has been done thereon without our specific written consent. No allowances will be made for such corrective work done without such consent. Improper maintenance, deterioration by chemical action, and wear, do not constitute defects.

Equipment manufactured by others, and included in our offering, is not warranted in any way by us but carries only the manufacturer's warranty, if any and will be passed on without modification.

All warranty claims must be submitted within ten (10) days of discovery of defects or shall be deemed waived.

All parts returned for inspection must be sent prepaid. No representative of our company has any authority to waive, alter, vary or add to the terms hereof without prior approval in writing. The foregoing is in lieu of all other warranties (including that of merchantability), whether express or implied.

## Mini Flux UF System Getting Started Guide

### Liability

It is expressly understood that our liability, including that for breach of contract, negligence, strict liability in term, or otherwise for our products is limited to the furnishing of such replacement parts, and that UFS Corporation will not be liable for any expense, injury, loss or damage, whether direct or consequential, including but not limited to loss of profits, production, increased cost of operation, or spoilage of material, arising in connection with the sale or use of, or inability to use, our equipment or products for any purpose, except as herein provided.

### For More Information

If you desire more information please click on the links below –

[www.ufsc.com](http://www.ufsc.com)

[www.spearsmfg.com](http://www.spearsmfg.com)

[www.cutlerhammer.com](http://www.cutlerhammer.com)

[www.sepromembranes.com](http://www.sepromembranes.com)

[www.haywardindustrial.com](http://www.haywardindustrial.com)

[www.bluwhite.com](http://www.bluwhite.com)

[www.unistrut.com](http://www.unistrut.com)

[www.b-line.com](http://www.b-line.com)

[www.automationdirect.com](http://www.automationdirect.com)

<http://www.fsifilters.com>

### Appendix

(See provided CD containing manufacture and the items below)

TruFlux UF System Baseline Data Recording

TruFlux UF Element Cleaning Log sheet

Flow Schematic Mini Flux UF System Drawing 997312

Mini Flux Panel Wiring Diagram, Drawing 221068

Mini Flux Checkout Procedure, Bulletin 998303

# Mini Flux UF System Getting Started Guide

## TruFlux™ UF System Start-Up Baseline Recording Form



Customer: \_\_\_\_\_ Location: \_\_\_\_\_  
 ED Line: \_\_\_\_\_ Beta Solids: \_\_\_\_\_  
 Conductivity: \_\_\_\_\_ Paint Solids: \_\_\_\_\_

Temperature:

Day 1	A	B	C	D	E	F	G	H	I	J	K	L
12:00am												
2:00am												
4:00am												
6:00am												
8:00am												
10:00am												
12:00pm												
2:00pm												
4:00pm												
6:00pm												
8:00pm												
10:00pm												
Day 2	A	B	C	D	E	F	G	H	I	J	K	L
12:00am												
2:00am												
4:00am												
6:00am												
8:00am												
10:00am												
12:00pm												
2:00pm												
4:00pm												
6:00pm												
8:00pm												
10:00pm												
Day 3	A	B	C	D	E	F	G	H	I	J	K	L
12:00am												
2:00am												
4:00am												
6:00am												
8:00am												
10:00am												
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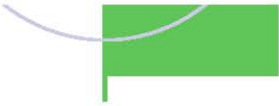
UFS Corporation. . .dedicated to providing quality, innovative solutions to the electrocoating industry.

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Think and act in a safe manner. Always disconnect power and use a lockout before you work on the E-coat system, or any of the related subsystems. Observe any confined space conditions. Use the appropriate safety equipment and clothing for the task.

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