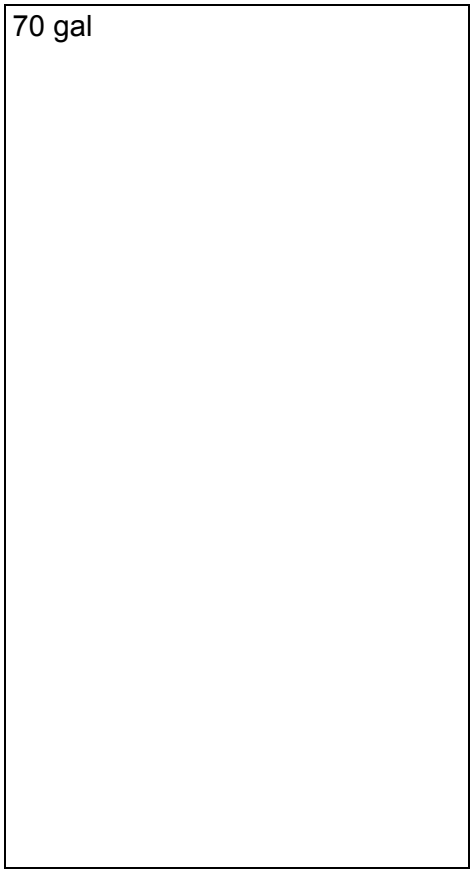
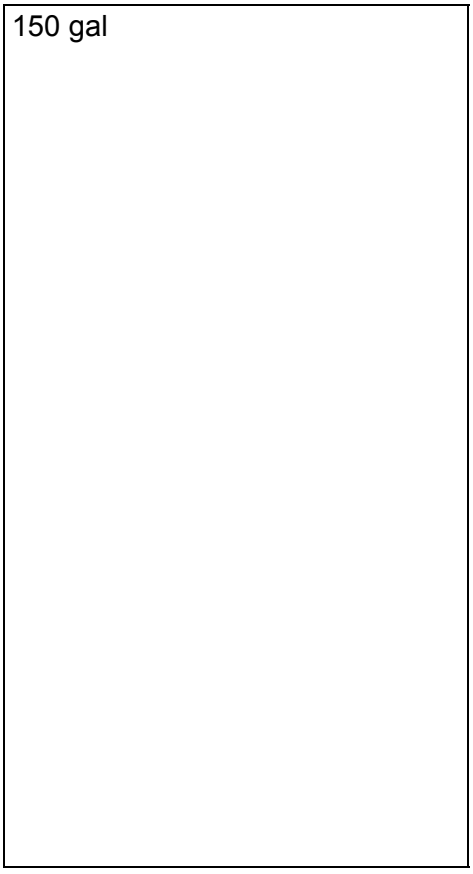
UFS Corporation
Getting Started
Cell Circulation System
125ℓ - 575ℓ Models





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Welcome to UFS Corporation

This manual is intended to be an overview of a typical Cell Circulation System (CCS) and how it works. It is presented to the owners, system designers, installers, and members of the paint-finishing department where the equipment is to be used. Included are drawings that are specific to your system. It is important that you keep this documentation in an easily accessible place for future reference.

Product Support and Customer Service

For customers in the **United States** and **Canada**:

You may call or fax our office during normal business hours (7:30 a.m. - 5:00 p.m., CST). Your UFSc Sales and Service Engineer carries a pager for around-the-clock response. They can be paged by calling 800-800-7759.

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Introduction

This manual provides the user with general information needed to install, operate, and maintain the Cell Circulation System. All measurements and dimensions are in metric units. Some instructions may not apply, since these instructions are written for all CCS. The Description and Function and Installation Sections describe the function of the CCS and the various system input requirements. Installation and operation of the CCS are discussed in the following sections. Finally, the remaining sections describe the servicing of the CCS. It is recommended that the user also carefully review the Membrane Electrode (ME) Cell "Operation and Maintenance Manual", as well as the major component manuals that can be found at the end of this manual.

While every CCS contains the same basic components and embodies a similar design, the physical dimensions and component selection depend upon the user's paint system. This particular model has been designed to operate efficiently with ME Cells. The user will find at the end of this manual drawings and specifications that apply to their particular system.

Description and Function

The function of the CCS is to provide a flow of anolyte to each TECTRON Cell, which automatically purges excess acid from the system and cooling the electrode. The former is achieved by adding D.I. water to the anolyte tank when the conductivity level rises above a preset level. This dilutes the acid concentration in the anolyte tank and causes the tank to overflow to drain, thereby removing the excess acid from the system. The Pump Discharge Design Flow Rate is designed to provide adequate cooling for the electrodes. Flow rates below the Pump Discharge Design Flow Rate will most likely result in faster electrode corrosion rates. Generally the more flow there is, the longer the electrodes will perform satisfactorily.

Refer to the CCS Flow Diagram (Drawing Number S-000-061) in the Appendix for aid in understanding the system operation. After leaving the discharge of the pump, the anolyte flow encounters the by-pass loop. The purpose of the by-pass is to get rid of any dissolved or entrained oxygen that may be in the anolyte fluid. The anolyte then flows through a check valve, control valve, and flow meter. From this point the anolyte flows through local piping to the anolyte supply manifold on the sides of the paint tank.

Each ME Cell has an individual supply valve. The anolyte fluid is delivered to the bottom of the ME Cell by the anolyte supply tubing attached to the electrode. Anolyte overflows by gravity back into the anolyte return manifold through the overflow nozzle and anolyte return tubing. There should be an air gap between the overflow tubing and the hole in the anolyte return manifold or a vent in the return manifold to let air escape. The anolyte then returns by local piping back to the CCS. The anolyte conductivity is monitored by a sensor that is located in a tee fitting in the discharge piping.

Whenever the conductivity level in the tank rises above the preset level, relay contacts in the conductivity monitor/controller send a signal to a Solenoid valve to open and let D.I. water into the anolyte tank. The tank level is maintained by an overflow and thus the conductivity level is reduced by the addition of the D.I. water. When the conductivity level has fallen below the set point, the D.I. water turns off. A bottom tank drain valve is provided when manual draining of the tank is required. A low liquid level alarm switch in the tank provides a means to detect a loss of anolyte fluid.

The D.I. water circuit includes two manual valves. One valve (referred to as manual D.I. water valve) is used to by-pass the Solenoid valve and for initial charging of the anolyte tank. The other valve is used to isolate the Solenoid valve, in the event servicing is required.

The composition of the anolyte is mostly acid and water. This is so because the ion-selective membrane that is part of the ME Cell allows the negatively-charged ions to pass from the paint bath into the anolyte solution, thus removing the excess neutralizer or solubilizer from the paint bath.

System Requirements

The necessary requirements that enable the CCS to function properly are: D.I. water, electrical power (motor and starter, conductivity monitor/controller, and Solenoid Valve), proper drain, suitable location, and siphon breaker. Most of these items are the responsibility of the user.

A. D.I. Water. The incoming flow rate of the D.I. water should be in the range of 40-60% of the anolyte pump capacity. This will ensure an orderly mixing of the D.I. water and the anolyte solution, such that the conductivity can be lowered at a predictable rate. The incoming pressure of the D.I. water should not exceed 80 psi, which is the upper limit for the Solenoid Valve.

B. Electrical. An electrical line of the proper voltage and number of phases should be brought to the CCS. The user must supply the appropriate starter, start switch, and disconnect switch at a location of their choosing. Likewise, line power must be supplied to the conductivity monitor/controller and to its relay contacts. The Solenoid valve cable harness has been attached, but must be connected to the conductivity monitor/controller after the unit has been installed at the site. Lastly, the grounding stud on the tank should be connected to a local ground.

C. Proper Drain. There are two drain connections: the gravity overflow and the bottom tank drain. Both of these should be connected to a suitable local drain pipe. It is important that

there be no reduction in pipe size of the overflow drain line to avoid unnecessary piping restrictions that could cause the tank to overflow out the top of the tank.

D. Suitable Location. A close and level location should be identified near the ED paint tank. The CCS should be placed as close as possible to the paint tank to minimize the friction loss in the local piping. It is important to note that the liquid level in the anolyte tank should be at least 8-18" below the bottom of the return manifolds (measured at the last Cell on the low end of the return manifold). This differential is necessary because the anolyte return flow depends on gravity to propel it back to the tank. Also, the CCS must be located so that the CCS tank level is no more than 10 feet below the ED paint tank level. This is usually the maximum level differential allowed for in the CCS pump design.

E. Siphon Breaker. A siphon breaker must be provided to ensure that the ME Cells are not drained of their anolyte fluid because the fluid inside them has been siphoned if the pump is turned off. If the Cells are drained, it is likely that the draw-down inside the anolyte tank will trip the low level alarm switch after the pump is restarted and then more D.I. water and acid will have to be added to refill the tank. If UFS Corporation supplied the Supply and Return Manifold, these siphon breakers are already included in the kit. See Drawing Number S-000-072 for more details.

Installation

This section details the sequence of installation steps to be taken to ensure a good working installation. The installation sequence consists of setting the tank, re-assembly of the PVC piping and electrical installation.

A. **Setting the Tank**

1. Carefully remove the crating, making sure to locate any items that may have shipped loose. Remove all exposed nails from the packing crate. Keep the stainless steel hold down clips for use in step 2.

1. Set the tank on a flat, level concrete floor no more than 3 M (10') below ED tank rim. Secure with the stainless steel hold down clamps.

   NOTE: If the tank is placed on a metal grid or floor surface, use ½" thick rubber isolation pads in five places.

2. Place the conductivity controller at eye level no farther than 1500 M (60') from the pump/motor.

Photo Side View

B. **PVC Piping Re-assembly**

NOTE: Refer to Drawing 997126 (in the back of the manual) as you read this section.

1. Remove the tape holding the gasket/o-rings located at the top of the pump discharge and D.I. water input.

1

2.

C. **Electrical Installation**

NOTE: Refer to Drawing 997116 (in the back of the manual) as you read this section.

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 sub systems. Observe any confined space conditions. Use the appropriate safety equipment and clothing for the task.

Install per local and national electrical/safety codes.

1. Bring three phase, 460V AL Parr to pump motor through an appropriate sized motor starter and disconnect _____. **Bump motor and insure proper direction.**
2. Connect the D.I. Water Solenoid to the conductivity controller. Be sure to enclose the terminal strip.
3. Connect the conductivity probe to the conductivity controller. Be sure to enclose the terminal strip. **Make sure the Phase 5 column leads are connected.**

   NOTE: If the conductivity sensor cable needs to be extended, Call UFS to exchange the existing sensor for one with a longer cable (there will be a modest charge due to the longer cable length). UFS does not recommend that the cable be spliced to make it longer.
4. Connect the alarm circuit to the low tank switch

   NOTE: 20 VA rating of standard.
5. Attach ground wire from stand on tank to each ground.
6. If ordered, attach the high tank level float switch lever control.
7. **Confirm that a 3-amp fuse is properly installed.**

Installation Checklist

Start-up and commissioning is comprised of flushing the entire anolyte system, checkout, and initialization of all equipment and components.

A. **System Check-Out Checklist**

☐ Remove any hold-downs, packing materials or restraints used to protect equipment during shipment.

☐ Compare all connections to and from the CCS with the general arrangement drawing (Attached for your reference), flow schematic, and electrical wiring diagrams for accuracy.

☐ Bump motor and observe rotation. Motor rotation should be same as arrow on motor housing.

☐ Fully rotate all control valves to ensure proper operation. Turn all valves OFF.

☐ The Cells should already be checked and filled with D.I. water.

B. **System Flushing and Cleaning Checklist**

☐ Fill tank by opening manual D.I. water valve until water begins to overflow through the skimmer to drain. Close manual D.I. water valve. Remove the lid.

☐ Open bottom tank drain valve and empty the tank. Use a water hose to empty the tank of any sediment left on the bottom of the tank. Close bottom tank drain valve and refill tank.

☐ Close all the supply header valves controlling flow to the Cells.

☐ Disconnect the anolyte supply (at the supply valve) and return tubing (at the return manifold connection) from the Cell furthest away from the CCS on both sides of the tank. Take two scrap pieces of 3/8" ID tubing and place over this valve and place the other end into the return manifold and open these last two valves just enough to let air escape.

☐ Open pump by-pass control valve. Open the manual D.I. water control valve. Remove conductivity sensor from tee and fill pump impeller cavity with water. Put conductivity sensor back into place ensuring that hole in sensor probe is parallel to fluid flow. Turn on pump. Slightly open the pump discharge control valve to approximate the incoming D.I. water flow rate. Turn off the manual D.I. water control valve when the return manifold begins to overflow back into the tank. Fully open the two Cell valves only after all the air has escaped. Open the pump discharge valve to increase the flushing of the manifolds. Flush for 5-10 minutes. Turn pump off.

☐ Open bottom tank drain valve and empty tank. Use a water hose to empty the tank of any sediment left on the bottom of the tank. Close drain valve. Clean strainer bag.

☐ Repeat steps 4 through 6 to flush system a second time. Before turning off pump for the second time, turn all valves OFF (except for siphon breaker valves). Close the last two Cell valves and check all the supply lines for leaks.

C. **System Start-up Checklist**

☐ Open pump by-pass control valve. Open manual D.I. control valve and fill tank. Turn on pump (prime pump if necessary) only when tank begins to overflow to drain. Turn off the manual D.I. valve when fluid begins to overflow into the tank from the return manifold.

☐ Open the by-pass control valve such that at least 1-2 gpm flows through the by-pass loop.

☐ Add enough acid (as specified by paint supplier) to the anolyte tank to increase the conductivity to 80-90% of the paint manufacturer's recommended level.

☐ To check proper operation of the conductivity monitor/controller refer to the manufacturer's instructions. For a quick test, do the following: observe the reading on the meter after adding acid, and lower the conductivity set point to below the former reading. The red light on the conductivity monitor/controller should switch on and the Solenoid valve should open to let D.I. water into the anolyte tank. The typical time required to lower the conductivity level of the anolyte system is 5-15 minutes.

☐ Adjust the conductivity set point of the conductivity monitor/controller to the paint manufacturer's recommended level. Confirm set point agrees with documentation.

☐ Check the operation of the low level alarm switch by using a short length of pipe to gently push the float down. When the flow becomes horizontal, the alarm switch should close and signal an alarm buzzer or light.

☐ Open all the individual Cell valves and adjust the flow rate according to the minimum established by UFSc.

☐ Check the CCS flow meter and compare it to the Pump Discharge Design Flow Rate. These two figures should be in close agreement, otherwise adjust as necessary.

Maintenance

Periodically, inspections of the CCS should include checking the pump suction strainer to make sure it is clean, ensuring that there are no obstructions blocking either the supply or the return pipes to the anolyte tank, and confirming that the conductivity set point is adjusted properly. For further information on normal operation and maintenance procedures, the user should read the component operation manuals supplied in the Appendix.

Troubleshooting

A. **Leaking D.I. Solenoid Valve**

1. If the leak is coming from between the two halves of the valve body, then either the flange needs to be tightened, or a pressure regulator has to be installed ahead of the valve in order to lower the inlet pressure to less than 80 psi.
2. If the leak is coming from underneath the solenoid valve, then remove the solenoid bypass lever and fully tighten the valve seat into the valve body and then reassemble the solenoid and bypass lever.

B. **Low flow and/or Low Pressure**

1. Is pump primed? If not, prime pump.
2. Is the motor rotating in the proper direction? If not, re-wire.

C. **Malfunctioning Conductivity Controller**

1. Check that the conductivity probe is correctly installed.
2. Is the fuse blown? If yes, replace.

D. **Low Tank Level**

A. Pump failure

Spare Parts and Accessories

Refer to the end of this manual, Major Component Listing and Recommended Spare Parts List, for appropriate UFSc part numbers and manufacturer's model numbers.

Safety

A safe work environment is of utmost importance to UFS Corporation; therefore, we recommend that our customers:

A. Design and implement a comprehensive health and safety program that includes training on working with electrical and chemical equipment.

B. Design and implement a lockout, tagout program for maintaining ED equipment.

C. Conduct on going training for ED employees that encompasses system installation, operation, and maintenance for UFSc components and other ED equipment.

D. Post adequate warnings at the job site including labels and tags on energized circuits.

E. Use proper techniques to lift heavy objects and wear the appropriate clothes and safety equipment for the task at hand.

F. Upon request, MSDS sheets for appropriate chemicals are available from UFS Corporation.

Limited Warranty and Liability

A. Warranty

We warrant all equipment manufactured by us 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 F.O.B. our factory, but will 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. All electrodes (and or cathodes), of any material, are not warranted by us in any way since they by nature are sacrificial and will erode or corrode away with time.

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.

B. Liability

It is expressly understood that our liability, including that for breach of Contract, negligence, strict liability in tort, or otherwise, for our products is limited to the furnishing of such replacement parts, and that we will not be liable for any other 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.

UFS Corporation is a distributor of:

- **Myron L** Conductivity Controllers
- **Synder Filtration** Ultrafilters
- **Webster** Pumps

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