Removal and Installation of Heat Exchanger Plate Set

A heat exchanger is used in both the Batchmaster batch metering system and the Autocaster continuous casting machines to heat the resin used in making the cultured marble, solid surface, or polymer concrete matrix. Since a promoted resin system is used, resin will build up on the inside of the heat exchanger over time. Eventually, the buildup will restrict the flow of resin and result in an increase in the resin pressure in the system that can cause leaks or shut the machine down if the high-pressure limit is hit. There are two types of heat exchangers used – a disposable heat exchanger or an expandable heat exchanger. Only the expandable heat exchanger can be modified, cleaned, or rebuilt.

The expandable heat exchanger consists of the outer frame (2 thick blue steel frame plates, positioning rods, and mounting brackets), eight all-thread bolts with washers/nuts, a set of exchange plates (stamped plates), and gaskets. The gaskets are applied to the exchange plates and then the plates are stacked to build up the exchange plate set. The exchange plate set is placed between the outer frame and the eight pieces of all-thread, washers, and nuts are tightened to compress the plate set to a specified dimension.

When the expandable heat exchanger is clogged, the exchange plate set needs to be removed and refurbished. To refurbish the exchange plate set, the eight all thread bolts are loosened from the outside frame and the exchange plate set is removed. Each plate in the set needs to be separated, cleaned, inspected, new gaskets applied, and the exchange plates need to be restacked in the proper direction and order. Then the refurbished exchange plate set can be inserted back between the outer plate frame and the all-thread bolts can be retightened to the correct dimension.

Gruber Systems does not recommend that our customers clean and refurbish the exchange plate set. It is very important that each plate is not bent or scratched as that could lead to potential leaking. The gasket set used on the plates is expensive and is not warranted if self-replaced. Therefore, Gruber Systems offers an exchange plate set exchange program. Under the program, Gruber Systems will send a reconditioned set of exchange plates to the customer. A charge for the refurbished exchange plate set and a deposit on the return of the used exchange plate set is required. When the refurbished exchange plate set is received, the customer will then loosen the eight all thread bolts from the outside frame, remove the used exchange plate set, clean the frame, insert the refurbished exchange plate set in the frame and tighten eight all thread bolts to the correct dimension. When the used exchange plate set is returned to Gruber, the deposit will be returned to the customer. The used exchange plate set will be reconditioned by the manufacturer and put in stock for the next customer's use.

The following set of instructions should be used when removing and replacing the exchange plate set. Note that this can be done with the heat exchanger installed in the machine or with the heat exchanger removed from the machine:
**Materials Required:**

A. Refurbished exchange plate set.
B. 4 Gallons 50/50 Glycol (Automotive Antifreeze)/Water Mix
C. Small shallow container to drain thermal fluid into.
D. Plastic cup to transfer thermal fluid from shallow tray to another container for disposal.
E. Funnel with hose for refilling thermal fluid.
F. Plastic sheeting to place under heat exchanger during rebuild process.
G. Small buckets to drain resin into.
H. Acetone to clean frame plates.
I. Disposable rags to use in the cleaning process.
J. Two 1-¼ Wrenches (adjustable wrench or ratchet/socket can also be used)
K. Thermal Fluid Hose (Required if the hose is damaged or if a buildup of any material is seen in the hose).
L. Resin Hose (Required if the hose is damaged or if a buildup of resin is seen in hose)

**Process for Removal and Replacement of Heat Exchanger Plate Set**

1. Turn of power to the machine. Use proper lockout/tagout procedures used in dealing with electrical equipment.
2. Close all resin valves.
3. Use tape to mark the hose and inlet/outlet location for each thermal fluid hose and resin hose.
4. Using a tape measure or caliper, measure the distance between the inside of the thick blue plates at several positions around the perimeter of the heat exchanger. Write down this spacing dimension on a piece of tape and tape it to the outside of the heat exchanger.
5. Place plastic sheeting under the heat exchanger and thermal fluid pump.
6. Drain the thermal fluid from the resin heating system into a shallow container using the drain cock mounted at the bottom of the thermal fluid line going to the thermal fluid pump. Transfer the used thermal fluid to an appropriate container for proper disposal.
7. Remove the thermal fluid hose from the thermal fluid outlet on the heat exchanger.
8. Inspect the thermal fluid outlet and inspect the hose and barbed fitting for any signs of gelled resin or other garbage. Clean or replace hose as required. If resin or garbage is found, unbolt the thermal fluid pump flange, and rotate the pump around to allow for visual inspection of the pump. Look for any resin or garbage. Clean if necessary, then return pump to mounting position, and tighten the flange bolts.
9. Remove the lower resin hose, rotate the elbow over, and drain the resin from the heat exchanger and resin output hose into a small container.
10. Remove the upper resin hose and drain any remaining resin from the hose coming from the resin pump.
11. Inspect both the inlet and outlet resin hoses and barbed fittings for resin buildup. Clean fittings and replace hose as required.
12. Go to the side of the heat exchanger where the long all-thread bolts are exposed. Loosen the nuts by turning each 1/4 turn until loose. Unscrew the nuts off all of the bolts and remove the bolts from the frame if possible.
13. Remove (or tilt back) the back blue plate to expose the exchange plate set.
14. Remove the used exchange plate set.
15. Clean both blue plates as required
16. The new plates should come preset in the correct arrangement but it is a good idea to inspect them before inserting them into the exchanger. See the illustrations below.
17. Position refurbished exchange plate set on alignment rods.
18. Replace back blue plate.
19. Hand tighten the nuts while checking on the alignment of the exchange plate set. Check the spacing between the inside of the 2 blue plates and adjust until the spacing is the same around the perimeter of the heat exchanger.
20. Tighten each nut ¼ turn in a crossing pattern with wrench until the correct spacing is reached around the perimeter of the heat exchanger. See measurement taken above in step 4 or use 1.65”-1.76” for the 14 Plate Heat Exchanger / 3.07”-3.28” for the 26 Plate Heat Exchanger.
21. Reattach the resin hoses.
22. Reattach the thermal fluid hose.
23. Make sure the thermal fluid drain cock is closed.
24. Refill thermal fluid using a little over 4 gallons of a 50/50 glycol (automotive antifreeze) and water mixture. You can use one of the openings on the top of the thermal fluid heater tank to fill the tank using a funnel with a hose. About 4 gallons of the thermal fluid should go into the tank. At this point you should be able to put the tip of your finger down into the tank opening and touch the thermal fluid. Close and tighten the opening in the tank. Use the expansion tank to add additional thermal fluid (You may have to move the hose going from the expansion tank to the heater tank up and down to allow the fluid to move to the heater tank). Fill until you have about ¼ of the expansion tank full.
25. Open all resin valves.
26. Remove the lockout/tagout locks.
27. Start machine and verify thermal fluid warm up and check for leaks. Top off thermal fluid in the expansion tank if required.
28. If leaks are found, tighten nuts on heat exchanger plate in ¼ turn in a crossing pattern until leak stops.
29. Remove the plastic sheeting under the heat exchanger and dispose of properly.
The back plate (pictured on the left) does not have any openings. This sets against the back blue block. Note that one side does not have the gasket completely surrounding where the openings normally are on one side.

The middle “A-B” plates (only one shown) have one side with the gasket completely surrounding the openings and the other side has an open flow path on one side (left in the picture). The open side must alternate with each plate. As pictured the back is open on the right and the next plate to be put onto it would have the opening to the left with the next plate open on the right and so forth. To switch the opening from left to right rotate the plate 180°.

The front plate (pictured on the right) has gasket surrounding all holes completely. This seals against the front blue block.