

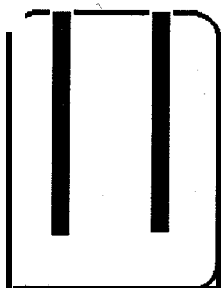


Installation and Maintenance

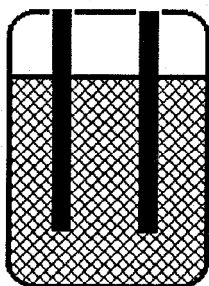
WATER QUALITY AND TREATMENT FOR EHU SERIES HUMIDIFIERS

GENERAL: The real reason to acquaint yourself with this material is maintenance. On poor quality water, EHU Series Humidifiers require more maintenance, also your water heater, drinking fountains, washers, etc., so this maintenance is required when you can least afford to perform it. Hopefully, understanding the problem and possible solutions will help avoid problems in the first place.

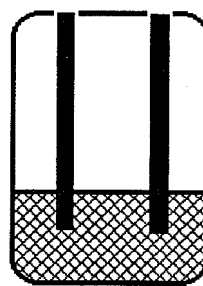
HOW WATER AFFECTS THE EHU: The EHU is an electrode boiler. When no water is present, the electrodes are separated by air and no current is conducted. When water contacts the electrodes, the conductive minerals in the water allows current to flow. Conductivity is the measure of how conductive the water is and is measured in micromhos (MMHO). The more conductivity, the lower the water will be to draw a given current say, 10 amps:



Dry,
No
Current



Low
Conductivity
10 amps



High
Conductivity
10 amps

STEAM GENERATOR WATER LEVELS AT GIVEN CURRENT AND WATER CONDUCTIVITY

WHAT AFFECTS CONDUCTIVITY? Obviously, minerals dissolved in the water. Pure, distilled water is surprisingly not conductive. This includes deionized and reverse osmosis diffusion water treatment. Pure water can't work in an EHU because it can not draw amps (it's not conductive). Most tap water is conductive however, so it will work in an EHU. The type and quantity of minerals can vary greatly depending on the source of the water (see following chart).



Water Quality & Treatment for EHU Series Humidifiers

TYPICAL MINERALS FOUND IN WATER

Constituent or property	Analyses of water, in parts per million, except for pH and color			
	River	Well;	Canal ³	Lake ⁴
Silica (SiO ₃)	5.4	41.	6.6	11
Iron (Fe)	.11	.04	.11	.10
Calcium (Ca)	9.6	50	83	2.9
Magnesium (Mg)	2.4	4.8	6.7	9.5
Sodium (Na)	4.2	10	12	8690
Potassium (K)	1.1	5.1	1.2	138
Carbonate (CO ₃)	0	0	0	3010
Bicarbonate (HCO ₃)	26	172	263	3600
Sulfate (SO ₄)	12	8.0	5.4	10500
Chloride (Cl)	5.0	5.0	20	668
Fluoride (F)	.1	.4	.2	-----
Nitrate (NO ₃)	3.2	20	1.3	5.8
Dissolved solids	64	250	310	25000
Hardness	34	145	235	46
Color	7	0	97	2
pH	6.9	7.9	7.7	9.8

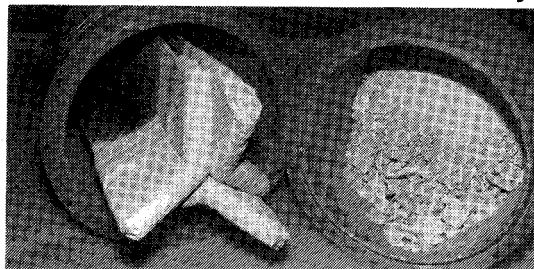
1 -Stream in Connecticut.
2-Logan County, CO

3-Drainage from the Everglades, FL
4-North-central North Dakota

THE DRAIN CYCLE: EHU Series Humidifiers have a built in blow down circuit to intermittently purge mineral accumulations from the water. This is a bottom blow down, so if minerals stick to the sides of the steam generator, they will accumulate.

WATER RELATED MAINTENANCE: There are two types of water related maintenance required in EHU Series Humidifiers:

- 1) Tank Cleaning -- The tank is full of white or light brown colored mineral build up. This build up may be anywhere from soft and chalky to rock hard.





Water Quality & Treatment for EHU Series Humidifiers

Tank Cleaning can usually be handled one of five ways:

a) Mechanical -- wire brush or scrape electrodes and tank walls clean.

b) Chemical -- Commercial Muriatic acid preparations work well on most accumulations. In most cases the tank can be left assembled since it is water tight, plug the bottom, and fill halfway with treatment. Repeat as necessary. Check local codes before disposing of chemicals.

CAUTION: Muriatic acid can cause severe chemical burns if not handled properly. Wear rubber gloves and eye protection when using. Read and follow carefully the safety procedures on the chemical package.

c) Softening -- Water softeners remove calcium and add sodium which stays in solution instead of plating out. Minerals will drain out and accumulate less. **CAUTION:** Soft water is more conductive and does not allow protective coating to form on electrodes. Expect to replace electrodes more frequently. Discontinue if any arcing occurs in tank.

d) Water Purification -- If you have pure water available such as:

- Deionized Water
- Reverse Osmosis diffusion water
- Distilled Water

they can be blended with tap water to reduce the total mineral content.

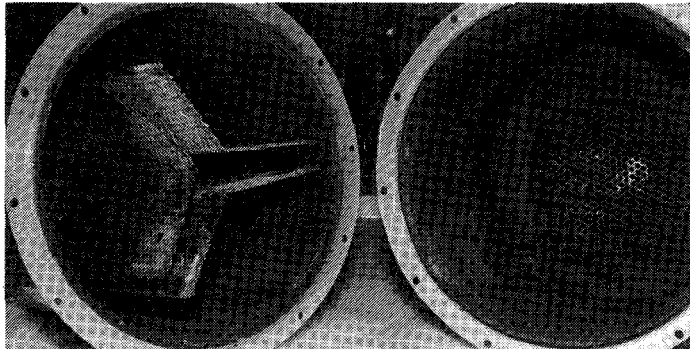
Pure water alone is nonconductive enough to pull current. Consult your water purification equipment vendor for proper blending equipment.

The water is too pure when the "tank full" light comes on excessively.

e) Magnetic Treatment -- Magnetic coils designed to allow water to be "magnetized" have been found useful in reducing mineral build-up in the steam generator. The coil is inserted in the incoming water line and may or may not be electrically powered. Best success has been seen on well water with high amounts of calcium dissolved in it.

2) Electrode disintegration/replacement

The tank may turn black or red, arcing or flashing may be visible inside the tank when operating.





ELECTRODE DISINTEGRATION: Starts generally due to poor quality water being present in the steam generator. Poor quality water means water with high conductivity. Because the water is highly conductive, the EHU automatically lowers the water level to avoid over-amperage. Low water levels mean that high amperage is concentrated on a small amount of electrode surface area and is flowing through very little water. This high amp flow/low water level is what usually gets arcing started, besides being very corrosive.

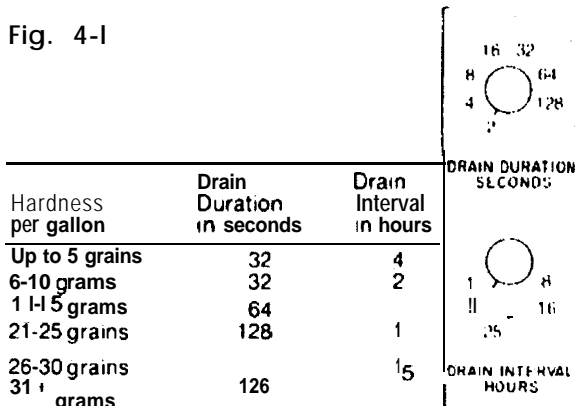
Electrode disintegration is most likely in the following instances:

1. High voltage (especially 460 and 600 volts)
2. Hard water (in excess of 20 grains/gal.)
3. Long drain lines
4. Low amperage units
5. Any unit with a plugged drain line
6. Any unit with a malfunctioning or mis-set drain timer
7. Any unit with any of the above on softened water

EHU-300-400-500 ONLY: To help avoid arcing in the first place, we have updated the following catalog information:

Drain Timer Setting - Changed from a general recommendation to one that considers voltage, capacity and water conditions.

Fig. 4-1



from this

TABLE 4-1 RECOMMENDED DRAIN SETTINGS 208 TO 240 VOLT UNITS

Hardness gr./gal.	Maximum Capacity per tank		
	to 15 lb./hr.	16-30 lb./hr.	31-48 lb./hr.
0-5	8 sec./2 hr.	8 sec./1 hr.	8 sec./1/2 hr.
6-10	8 sec./1 hr.	8 sec./1/2 hr.	16 sec./1/2 hr.
11-20	16 sec./1 hr.	16 sec./1/2 hr.	16 sec./1/4 hr.
above 20	16 sec./1/2 hr.	16 sec./1/4 hr.	32 sec./1/2 hr.

TABLE 4-2 RECOMMENDED DRAIN SETTINGS 380 TO 600 VOLT UNITS

Hardness gr./gal.	Maximum Capacity per tank	
	to 45 lb./hr.	46-96 lb./hr.
0-3.5	8 sec./1/2 hr.	16 sec./1/2 hr.
4-7	16 sec./1/2 hr.	16 sec./1/2 hr.
8-14	16 sec./1/4 hr.	32 sec./1/4 hr.
15-28	32 sec./1/4 hr.	64 sec./1/4 hr.
above 28	64 sec./1/2 hr.	64 sec./1/4 hr.

to this



Water Quality & Treatment for EHU Series Humidifiers

Electrode Setting - Changed from a general recommendation to a factory setting based on voltage.

E. As a general guideline, the electrodes should be set in the following positions based upon the number grains of hardness per gallon within your water source.

10 GRAINS PER GALLON OR LESS
 - Set electrode in position 1 (closest together).
1 I-20 GRAINS PER GALLON - Set electrodes in position 2 (mid - point).
21 GRAINS PER GALLON OR MORE - Set electrodes in position 3 (farthest apart).

from this

E. As a general guideline, the electrodes should be set in the following positions depending upon water condition and voltage:

Electrode Position	Condition
#1 (Approx. 3/4" spacing)	Low-conductivity water. (Wider spacing results in tank filling 2/3 full or more.)
#2 Approx. 1" spacing)	208-240 Volts. Average water.
#3 (Approx. 1 1/4" spacing)	380-600 Volts. High conductivity water. (Closer spacing results in tank filling only 1/4 full.)

to this

When arcing occurs, we have included this warning:

NOTE: ARCING OR FLASHING IN THE STEAM GENERATOR TANK CAN BE CAUSED BY ONE OR MORE OF THE FOLLOWING:

1. POOR DRAINAGE
2. ABNORMAL WATER CONDITIONS
3. DIRTY TANK (NEEDS CLEANING)

IF YOU NOTICE ARCING, SHUT THE UNIT OFF AND CALL THE FACTORY BEFORE RE-STARTING UNIT.

NEW PC BOARD: In addition, we have changed the Main PC Board on EHU-300; 400; 500 Series to include a relay which will block the fill valve if a drain valve burns out. This will prevent high mineral concentrations from occurring-(because of the burned out valve) which can cause arcing. On 500 Series EHU Humidifiers, this relay will also de-energize the contactor, blocking power to the electrodes as well as blocking the fill valve.

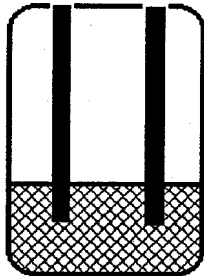


Armstrong

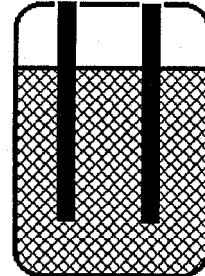
Water Quality & Treatment for EHU Series Humidifiers

MODIFIED ELECTRODE SETTING: Using a special electrode installation procedure with modified electrodes (See MS 41694, attached) it is possible to raise the operating water level, reducing arcing. By reducing the electrode area and increasing the distance between them, the water level will increase.

Regular electrodes
10 amps
High Conductivity
Water



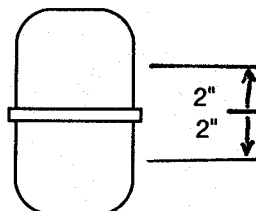
Special electrodes
(MS 41694)
10 amps
High Conductivity
Water



PREVENTION OF ELECTRODE DISINTEGRATION THEN. CAN BE HANDLED IN THE FOLLOWING WAYS:

- a) Be sure unit is draining freely;
- b) Clean the existing tank and electrodes being sure to scrub around the high water probe or better yet, replace the steam generator top;
- c) Check that electrodes are in the proper position -- or use modified electrodes in the inverse position (see MS 41694, attached);
- d) Softened water should not be used to prevent electrode disintegration. Softened water is more conductive and does not allow mineral build-up, which protects the electrodes.
- e) Water Purification -- If you have pure water available such as: Deionized Water; Reverse osmosis diffusion water; distilled water, they can be blended with tap water to reduce the conductivity. Pure water alone is not conductive enough to pull current. Consult your water purification equipment vendor for proper blending equipment. The water is too pure when the tank full light comes on excessively.

OPTIMUM WATER LEVEL: As you are aware by now, water level plays a key role in EHU Amperage Control. The EHU will change water level automatically to adjust humidity output. Therefore, to provide optimum humidity control, the tank water level should be within 2" of the center of the steam generator.



4/15/86

• * D. Fischer

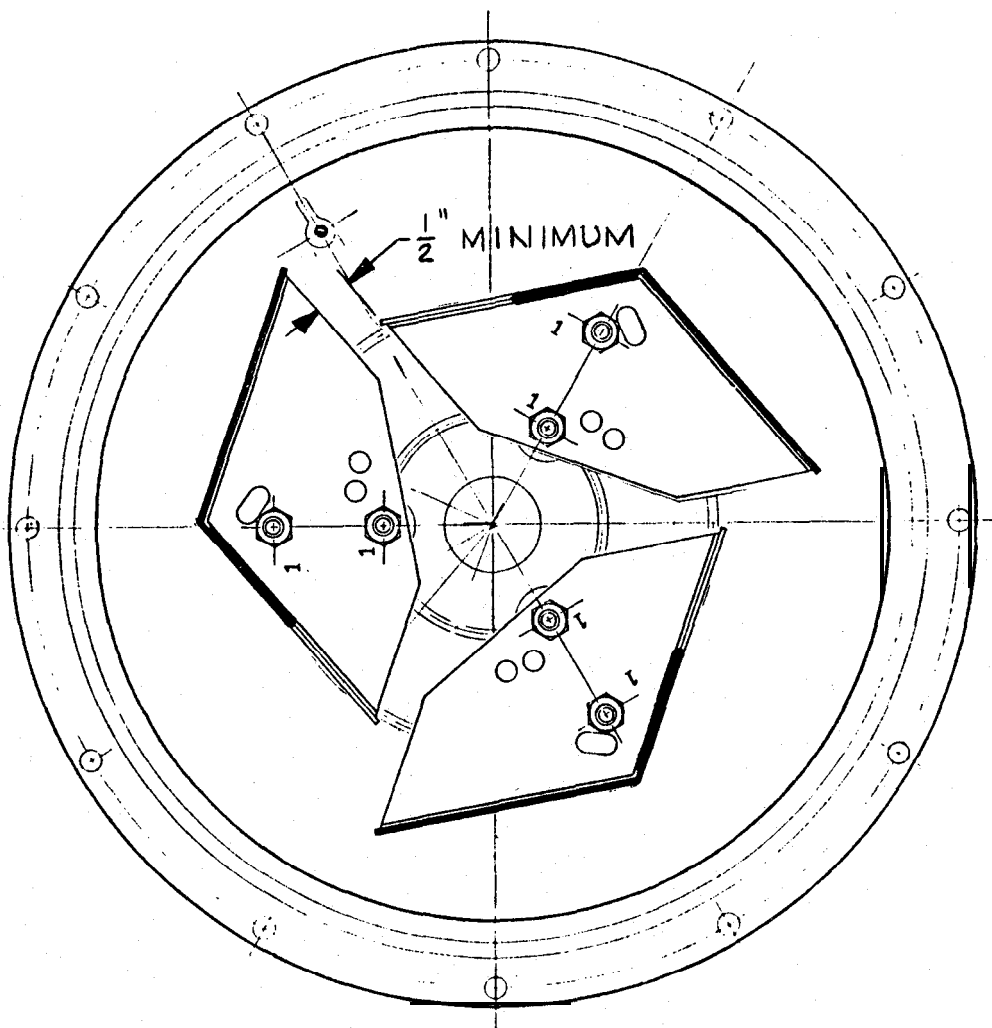
SUBJECT: Special Installation Procedure
for 3-phase EHU electrodesDEPT. Supersedes
MS-41694 dated
DETAIL 12/21/83

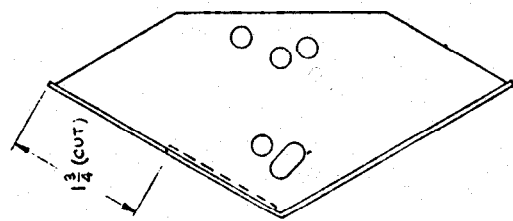
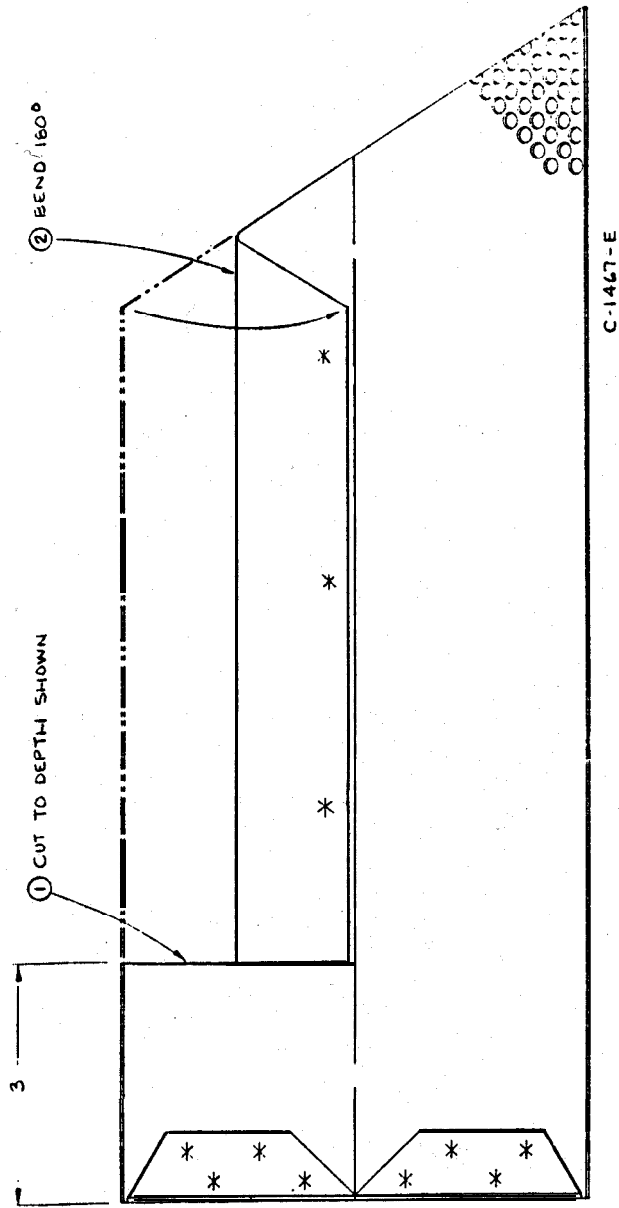
1. This special procedure is for use on 3-phase EHU steam generators operating with water of moderate-to-high conductivity and low hardness, as a means of correcting one or more of the following problems:
 - a. Low water level in steam generator
 - b. Rapid erosion or corrosion of electrodes.
 - c. Excessive arcing at the electrodes.

2. Remove the electrodes from the steam generator (a 7/16" socket wrench with a long extension is recommended) and clean the inside of the steam generator.

3. Install a new set of electrodes (special parts *are required) with the V-shape pointing outward, using the holes identified as "1". This is important, to maintain required spacings between electrodes. Fasten electrodes with a lock-washer under each nut. Then complete the steam generator assembly as usual.

* Part No. C-1467-E; see page 2 for dimensions if field modification of standard electrode is required.





- NOTES
- 1. MAKE FROM STANDARD ELECTRODE C-1467-C-1 BY CUTTING AND BENDING AS SHOWN.
 - 2. SEE PAGE 1 FOR APPLICATION AND INSTALLATION DATA.