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INSTALLATION, OPERATION AND SERVICE MANUAL

MIGHTY ION MODEL

MI SERIES

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**MANUFACTURER/DESIGN OF AIR & GAS COMPRESSOR SYSTEMS, ELECTROSTATIC PRECIPITATOR SYSTEMS
AND RELATED CONTROLS AND ACCESSORIES**

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1. OPERATING PRINCIPLE

The **Universal Air** precipitator is composed of four (4) basic components: the ionizing section, the collecting section, the power pack and blower. The first two combine to form the collecting cell.

The collecting cell(s), within the air cleaner housing, is ahead of the air moving unit. The dirt particles, carried by the air, pass first through the ionizing section where a high-voltage direct current charge is applied. All dirt particles, as they pass through the ion field, acquire a negative charge. These charged particles then pass into the collecting plate section where an additional electrical field then repels the charged particles to alternately-spaced ground collector plates.

Periodically, the collecting cell(s) and mechanical filters must be removed for cleaning.

The power pack converts 115 or 220 volts AC to Direct Current.

2. ELECTRICAL CIRCUIT

In the primary circuit, 115 or 220 volts, 60 Hertz, single phase, AC enters the power pack through a safety switch that is mechanically operated by the screw retaining the power pack cover, then through a circuit breaker which is used as an "on" and "off" switch and which will trip "off" in the event of a short in either the power pack or the collecting cell. In series is a variable rheostat which is used to obtain the proper operating range. Turning the rheostat slot clockwise increases the operating range and counterclockwise decreases the operating range.

When the power pack cover is removed, it opens the safety switch to prevent shock from contact with the circuit.

The primary power enters a transformer which produces the necessary voltage for the operation of the precipitator. In series from the transformer is a rectifier which converts the AC output of the transformer to DC. Connected across the DC is a fixed resistor which bleeds off the charge when the circuit is de-energized.

A meter in the DC circuit measures the current of the collecting cell(s). Each **Universal Air** precipitator model has a specified operating range.

!! CAUTION !!

- (i) The power pack must be grounded when being bench tested.
- (ii) Discharge the secondary circuit with an insulated handle screwdriver before touching any of the components.

3. INSTALLATION

A. Determine Location of Precipitator

The **Mighty Ion** can remove only those particles that reach its collecting element(s). It is, therefore, important that the unit(s) are installed near the source of heavy pollution approximately five (5) feet from the inlet. In the case of multiple units, they should be spaced approximately forty (40) feet apart, depending upon the CFM capacity of the units.

The unit(s) should be positioned so as to provide a perimeter movement of air. The output of each unit should be directed into the intake of the next unit. If the room is wider than seventy-five (75) feet, it may be necessary to install additional units through the center portion of the room or provide circulation to disperse the air to its perimeter. Airflow should not be directed into heater discharge.

DO NOT locate the air cleaner inlet too close to the corner of a room. Air will bypass the unit and not be cleaned. DO NOT locate the air cleaner outlet too close to a corner or wall. The air will bounce back and restrict recirculation.

Whenever space permits, the unit(s) should be hung approximately six (6) feet from the wall and approximately ten (10) feet from the floor using the eye bolts provided. It is better, however, to have a rigid mount for the unit(s) for ease of maintenance. A minimum of twenty-seven (27") inches must be provided for collecting cell removal clearance.

B. Connect Water Wash

For **Mighty Ions** equipped with an integral water wash system, run a hot water line with a readily accessible hand service valve, to the precipitator water wash manifold. The water should be approximately 125° to 140° F.

Install drain assembly (2" IPS). The pipe size should not be reduced from the precipitator drain. A trap must be provided to prevent sewer gas and odor from being drawn into the system.

4. ELECTRICAL REQUIREMENTS

The precipitator power pack is equipped for 115V or 220V, single phase operation only. The blower motor can be operated on 115V.

Plug in the primary cord. The precipitator is ready for operation by turning the blower switch and power pack circuit breaker "on".

With the power pack circuit breaker "on", the indicating light will glow and the meter will register a reading. If the meter registers above or below the specified range, turn the rheostat adjustment screw to obtain the required meter reading. If a malfunction prevails, it will be indicated by the meter or the circuit breaker switch will trip "off".

A. No Meter Reading

1. Primary power is not being supplied to the power pack.
2. The power pack safety switch is not activated.
3. High voltage lead is not attached to the panel insulator.

B. Circuit Breaker Switch Trips "Off"

1. Meter reading set too high.
2. Bent or warped collector plate.
3. Foreign metallic object between collector plates.

5. MAINTENANCE

Effective air cleaning performance requires regular cleaning of the collecting cells. Prefilters usually require cleaning at the same time.

CAUTION: The precipitator collecting cell(s) is a delicate instrument and should be handled gently. Avoid grasping the cell at the plate section or setting it on any protruding objects. A bent or warped collecting plate will cause the cell to arc frequently and reduce its performance.

6. PREPARATION FOR CLEANING

Unscrew the time delay screw from the safety interlock box. Unlatch the cell access door and discharge the collecting cell with an insulated handle screwdriver. Remove collecting cell.

7. CLEANING FREQUENCY

Cleaning of the collecting cell will vary from one installation to another, depending on many application-related factors. For most common applications, cleaning frequency is from once a week to once a month or when the precipitator begins to arc frequently. With a heavy dirt loading, more frequent washing will usually be required.

If a very heavy build-up of dirt is found on the collecting cell(s) after washing, they should be washed more frequently.

A wash reminder schedule should be posted after a frequency schedule is established.

8. CLEANING PROCEDURE

The best cleaning procedure is usually soak-washing. Recommended cleaning compounds, depending on the character of the contaminant collected, vary. Regular commercial dishwasher detergent is effective in many cases. As an alternate, the standard cleaners used on plant and process equipment may be used if they are inhibited to be safe with aluminum.

If the collected contaminant is a dry dust or powder, it can adequately be cleaned by rapping the collecting cell against the side of a dust bin or blowing off the dust with a blast of compressed air. Eventually, it will become necessary to provide a soak-washing. Detergent steam can also be used effectively or a detergent solution under pressure.

9. SOAK-WASHING

Provide a suitable soaking container large enough to hold at least one collecting cell completely immersed in solution.

Hot water should be used to readily dissolve the selected detergent suitable for local water conditions. CAUSTIC cleaners CANNOT be used. They will destroy the aluminum.

Soak the collecting cell and mechanical filters in the dissolved solution for approximately twenty (20) minutes. After soaking, slosh the collecting cell and mechanical filters to remove loosened dirt. Length of soaking should be determined by quantity and tenacity of dirt build-up.

Rinse the collecting cell and mechanical filters thoroughly to remove all traces of detergent and allow to drip dry.

Examine the collecting cell for broken ionizer wires or bent collector plates, and then replace the cell in the precipitator housing. At this time, it is advisable to clean the insulator which supports the high voltage jumper.

Turn on the blower and power pack. If the collecting cell arcs, turn off the power pack and allow the blower to thoroughly dry the collecting cell(s). (A spare collecting cell will eliminate any down-time of the precipitator.)

10. TROUBLE SHOOTING

!! CAUTION !!

- (i) The power pack must be grounded when being bench tested.
- (ii) Discharge the secondary circuit with an insulated handle screwdriver before touching any of the components.

A malfunction is indicated by either an erratic meter reading or the circuit breaker switch will trip "off". The difficulty can be isolated to either the power pack or the collecting cell, as follows:

- (a) Remove power pack cover.
- (b) Disconnect the high-voltage lead by removing the nut at the through-panel insulator.
- (c) Pull the high-voltage lead away from any point of contact.
- (d) Turn range adjustment full clockwise.
- (e) Turn "on" circuit breaker switch.
- (f) Depress the safety switch button and hold for a couple of minutes. If the circuit breaker switch trips "off", the difficulty is in the power pack. If it does not trip "off", the difficulty is in the collecting cell. The exception would be a defective rectifier.

A. Power Pack Difficulty

1. Defective Transformer - To check this possibility:

- a. Disconnect the secondary lead of the transformer from the insulator to which it is attached and pull it away from any point of contact.
- b. Turn the rheostat full clockwise.
- c. Depress the safe switch button. If the circuit breaker trips "off", the transformer is defective.

Check all primary leads for any bare wire and avoid having them lay across the high-voltage lead or rectifier.

2. Defective Rectifier - With the cell connected (assuming there is no cell difficulty) and the range adjustment turned full counterclockwise, a faulty rectifier will generally allow a partial meter reading but will begin to fade toward zero. If the faulty rectifier does not trip "off" the circuit breaker within a few minutes a quick check can be made, after de-energizing the circuit, by touching the rectifier. If it is hot, it is failing.

A failing rectifier can only be checked by comparison with a known good rectifier. For example, if you had a meter reading of 0.5 with a questionable rectifier and you replaced it with a good rectifier, you would immediately obtain a high meter reading.

3. Defective Meter - A defective meter can be somewhat confusing, but if it registers full scale with a minimum rheostat adjustment, or if it barely moves off the zero position without tripping the circuit breaker, it can be assumed to be defective. Generally speaking, a quarter turn on the rheostat is sufficient to provide the desired secondary voltage.

4. Defective Bleeder Resistor - It will appear blistered or corroded and cause a high meter reading.

5. Defective Rheostat - The winding will be open. Turning the rheostat from the full counterclockwise position, no voltage will be supplied to the transformer until you reach a point beyond the break in the winding when suddenly there is too much voltage. The over-voltage will cause the collecting cell to arc or the circuit breaker to trip "off".
 6. Defective Capacitor - A defective capacitor will cause erratic behavior of the meter or circuit breaker. Its defect is generally revealed by a ruptured case or traces of oil. The unit will function satisfactorily without the capacitor.
- B. Collecting Cell Difficulty - Trouble in the collecting cell may be the result of one or more of the following:
1. Collecting cell still wet after washing.
 2. Broken or loose ionizing wire(s).
 3. Foreign object between collector plates.
 4. Extremely dirty collecting cell.
 5. Bent or warped collector or end plates.
 6. Cracked or porous insulators in collecting plate section. This condition would develop after washing. An OHM meter, in some instances, may provide a reading.
 7. On multi-cell units, the jumper must be between the cells.
- C. Insulator Difficulty - A cracked or porous insulator may cause a ticking sound, cause the meter needle to flick or to read high. The defective insulator can be isolated by energizing the unit for several minutes and touching the insulators. The defective insulator will become warm.
1. A defective stand-off insulator in the power pack can be determined by removing the screw from the ground side. The screw will be corroded.
- D. Meter Reading
1. A zero meter reading would indicate that primary power is not being supplied or that the safety switch is not actuated.
 2. A zero meter reading, or a slight flicker, before the circuit breaker trips "off" is caused by a defective transformer.
 3. A partial or near normal reading before the circuit breaker trips "off" is caused by:
 - a. Defective rectifier
 - b. Insulator starting to fail
 4. A high meter reading before the circuit breaker trips "off" is caused by:
 - a. Defective insulator
 - b. Foreign object between collector plates
 - c. Broken or loose ionizing wire
 - d. Rheostat adjustment set too high
- E. Circuit Breaker Occasionally Trips "Off"
1. Voltage set too high
 2. High line voltage during the night hours
 3. Insulator starting to fail
 4. Coated ionizing wires

F. Constant or Intermittent Arcing

1. Operating range higher than required
2. Loose or defective ionizing wire
3. Excessively dirty collecting cell
4. Bent or warped collecting plate
5. Cracked or porous insulator
6. Coated ionizing wires

**POWER PACK WIRING DIAGRAM
AND
PARTS LIST**

- 1 - Safety Switch**
- 2 - Rheostat**
- 3 - Circuit Breaker**
- 4 - Transformer**

- 5 - Rectifier**
- 6 - Bleeder Resistor**
- 7 - Milliammeter**
- 8 - Capacitor**