

MAINTENANCE RECOMMENDATIONS

COOLING SYSTEM:

Very high secondary currents are developed in resistance welding equipment. This, coupled with compact design, high upset temperatures, and fast cycle times, makes the need for proper cooling apparent.

The water supply must be sufficient and at the proper temperature, pressure and required flow rate as recommended. Failure of the cooling system to function properly can cause serious damage to a resistance welder. Water circulation should be checked often to ensure that all parts of the welder requiring cooling receive the proper amounts of water. Water filters and strainers should be cleaned at regular intervals.

When equipment is not to be used for a period of time, the water should be shut off to avoid damage from leaks and condensation. This can be accomplished by using a manual or electrically operated shutoff valve. The electrical “water saver” valve provides for an automatic means of stopping water flow when the interval between machine cycles is long. Water should continue to flow for a period of time after the weld is made. It is advisable to have the water flow for one (1) to three (3) minutes after completing a weld.

If the period of machine lay up will be long or if the machine may be exposed to freezing temperatures, the cooling water circuit must be drained and purged.

Water leaks should be repaired promptly. Neglecting water leaks creates a safety hazard to personnel and can cause serious damage to the welder. When repairing the water circuit *make sure* the water circuit is *not changed*.

DANGER: Do not touch ignitron tubes or SCR packages until control is safely LOCKED-OUT

Proper cooling of ignitron tubes and SCR packages is very important. For SCR packages, follow the “in-out” markings on the device.

A thermal protective device is furnished and is employed to inhibit initiation of the weld control if the safe operating temperature of the SCR package has been exceeded.

CAUTION: Do not defeat thermal protective devices.

The resistivity of the water should be greater than 2,000 ohm-cm. This is necessary to prevent electrical leakage currents from causing injury, or premature mechanical system failure. It should be noted that some pump lubricants and anti-freeze may be conductive. When recirculating water from an open system, don't just add make-up water if the level drops due to evaporation –this will concentrate impurities. Instead drain and refill the system frequently.

In addition, water hoses exposed to line voltages must be long enough to ensure there is sufficient fluid resistance. The resistance of the water must be sufficient to minimize the current flowing through the water, because excessive current will cause the water to heat. If unchecked, this heat will ionize or create steam with sufficient pressure to rupture the hose or in some cases start a fire in the control. To prevent this, hoses exposed to line voltages must be at least 18" long and water should flow whenever power is on.

CAUTION: Never leave power applied to an electronic contactor that is directly water cooled, without water flow.

ELECTRODES:

The high current generated in the welder secondary is concentrated at the contact area of the welding electrodes. The current must be transmitted under force, into work pieces to be welded. Therefore, the electrodes must have good electrical contact and thermal conductivity as well as being able to withstand high force. It is very important to maintain electrical contact and thermal conductivity as well as being able to withstand high force. It is very important to maintain the cleanliness, smoothness and shape of

the electrode contact points to ensure consistent, good quality welds. The force applied to the electrodes is to be used for welding only and not as a means of re-forming the piece parts to be joined.

Electrodes do wear, pick up foreign matter at the contact surfaces, and pit. The electrodes should be “dressed” to the starting condition when any of the above conditions are present.

Cleaning or “dressing” of electrodes helps to maintain weld quality, and lengthen the useful life of the electrode. There are a number of ways of “dressing” electrodes:

- a. Closing the electrodes under light force in the proper shaped dressing tool.
- b. Using a pneumatic dressing tool with the proper shaped cutter.
- c. Removing electrode and machining the electrode in a lathe or like machine.

Proper cooling of the electrodes is very important. The flow of water to the spot welding electrode must enter through the water deflection tube and leave along the inner walls of the electrode. The angled end of the water deflector tube should be inserted to extend to 1/8” from the end of the water hole in the electrode, this reduces the chance of steam pockets occurring during welding. Improper cooling will tend to soften the electrode material and reduce electrode life, while increasing refacing or dressing frequency and maintenance costs.

Water leaks around the seat of spot welding electrodes may occur. These leaks should never be stopped with paper, teflon, or other insulating materials. Leaks of this nature can be stopped by removing the electrode and applying a small amount of special current-carrying grease to the contact surfaces between the electrode and its holder. Alternatively, a light hand reaming of the tapered socket can be used to remove any burrs, nicks, or scratches.

After replacing electrodes, they should be brought together several times under welding force or tapped gently with a rawhide, nylon or rubber hammer to insure the electrode is properly seated to seal the water circuit and provide proper current passage.

Alignment between the welding electrodes is essential for consistent, good quality welds and electrode life. Re-alignment is usually necessary only after the welding heads, arms or guns have been removed and replaced. During alignment, using a low force is recommended. Loss of alignment while operating indicates that some part of the welding head or gun is not secured tightly or the piece parts being joined are incorrect.

Seam welding electrodes should never be dressed by hand in the welder. If refacing is required, the weld wheel(s) or backup die should be removed from the welder and machine redressed or replaced with spare parts.

Dirt, grease, oil, scale, or other oxides on the work will shorten electrode life. When possible, these contaminants should be removed prior to welding.

Butt welder electrodes should be cleaned of oxide scale before each weld. This scale, if not removed, will cause pitting and burning of the welding dies, requiring increased maintenance. Never use files to dress flash welder dies, they should be removed from the welder and accurately machined. If die adjustment is required and shimming is the only means of adjustment, a minimum quantity of current carrying shims are recommended. An excessive amount of shims, shims with deformed edges, or corroded shims all increase contact resistance and lower welder efficiency.

PNEUMATIC SYSTEM:

The following is a brief description of basic pneumatic system components.

1. Air Isolation Valve:

Air isolation valves are provided so that the equipment may be isolated from the air supply and the pressurized air within the equipment may be exhausted. These devices are a requirement of the Federal Occupational Safety and Health Act and the implementing regulations (29CFR Part 1910 et seq.). Clear access to the valve should be provided for emergency operation.

2. Compressed-Air Filter:

The filter will trap any particulates and a large portion of the moisture before it enters the equipment. The filter uses a media or mesh partition which provides a barrier to the unwanted contamination. Periodically the filter will have to be cleaned or replaced. When the filter is replaced, it is important that an equivalent filter grade be used.

A filter may be of a manual or automatic type. The manual type will require periodic removal of trapped water and other foreign particles. Usually this service is done, after opening a petcock at the bottom of the bowl and catching the foreign matter in a container. A filter with an automatic drain will empty itself as required.

Occasionally the filter will have to be replaced or disassembled and cleaned.

3. Compressed-Air Lubricator:

The lubricator should always contain oil within the specified levels. The oil recommended is a light machinery oil and is usually specified as a type having a viscosity of 150 SSU at 100 degrees F.

If the lubricator is not of the automatic-fill type, the oil level should never be above the line indicated on the bowl. When filling, be sure that the air shut off valve is open before removing the filter plug.

All air systems require lubricating oil. The amount of the oil to be provided by a lubricator cannot be specified but a good “rule of thumb” is one drop of fluid for every twenty (20) strokes of the most frequently operating cylinder. To adjust the lubricator, turn the adjustment screw as indicated.

4. Compressed-Air Regulator:

The air regulator is used to reduce the supply line pressure to the desired pressure for welding. The accurate adjustment of the pressure is essential for the process. Preventative maintenance is not generally required for these devices. If the gauge pressure cannot be controlled or the regulator makes excessive noise, then cleaning, repair or replacement will be necessary. Occasionally cleaning may be required when foreign material that has entered the system causes the diaphragm or piston within the regulator to be held in the relieving position.

5. Valves:

Directional control valves are used, as their name implies, to control the flow of fluid. There are three basic valve constructions: poppet, lapped spool and packed spool.

Normally, although valves are subjected to elevated operating temperatures, fluid hammering and contamination they do not require preventative maintenance. The severity of the operating conditions will affect the valve life.

6. Cylinders:

For reliable operation, the cylinder must remain securely mounted with correct cylinder rod alignment. Undue strain due to misalignment will cause excessive wear to the piston rod and packings, causing bypass leakage and loss of motive force. It

can even deform cylinders or break piston rods. Periodic checks should be made on all cylinder mounts.

Leakage may be internal or external and may be located by visually observing cylinder or listening for escaping air. If leakage is noted as being external, tighten the end caps. If this fails, the gasket should be replaced. Leaks noted around the piston rod can be corrected by tightening the packing gland or replacing the packing.

Internal leakage is not as readily discovered. Usually, lost efficiency or sluggishness will be noticed. Worn packings, worn piston rings or scored cylinders are all causes of internal leaks. Scored cylinder walls are often caused by dirt, grit or rust in the system. Every effort should be made to eliminate foreign matter from the air system.

7. Pressure Sensors/Switches:

These devices provide an interface between the pneumatic and electric controls. The interface must be unrestricted, and the switch maintained, so that the switch/sensor can accurately reflect the status of the welding pressure. It is important to remember that these devices measure pressure, not the force on the electrode.

In some installations a pressure switch/sensor may be used to ensure system pressure is adequate before the cycle is allowed to start.

Generally, the pressure switch is used to check that sufficient air pressure is present at the weld cylinder before current is passed. Although the pressure switch can generally be adjusted during a normal cycle, it is typically adjusted with the welder in an off-line condition. In this instance the procedure for setting the pressure switch is as follows:

- A. Put the weld control in the “no-weld” state
- B. Adjust the switch so it will not actuate (by increasing the adjustable pressure setting)
- C. Prepare the part (if the welder cannot be cycled without a part) and ensure the weld area is clear
- D. Initiate the sequence (the control will wait for pressure switch)
- E. Adjust the pressure switch downward to the point where the control completes its sequence
- F. Adjust the switch down slightly lower (5 psi) to account for any minor variations in pressure

HYDRAULIC SYSTEM:

The components within this system are very similar to those found in pneumatic systems. The primary difference is the system operating pressure. Typical maintenance activities are fluid condition monitoring and level correction, and filter replacement. Hoses should be inspected for wear to reduce the possibility of hose rupture.

ELECTRICAL SYSTEM:

In addition to the welding transformer, tap switch and the secondary circuit, there is a welding control and the sequence control. The latter two parts, are not classified as part of the welding machine electrical system. The controls will be considered separately in the following section.

DANGER: Stored energy devices (capacitors) must be depleted before accessing equipment.

1. Welding Transformer:

The welding transformer is the heart of the machine electrical system. Its function is to change low AC current at a high voltage to a high AC current at a low voltage or, in some cases, high DC current at a low voltage.

Maintenance of the welding transformer should consist of periodic visual inspection and cleaning. Transformers, which have loose core bolts or internal clamps, will usually become noisy. When noise is discovered, the welder should not be operated. Continued operation will aggravate the condition and eventually will result in transformer failure. Another possible cause of noise is "half-cycling" which results from only one half of the AC wave form being switched to the transformer. This condition should be checked by a qualified technician prior to changing the transformer. Please consult factory.

2. Tap Switch:

The tap switch is a device used for coarse selection of higher or lower secondary welding voltages by connecting the various primary transformer taps to the primary supply line.

The tap switch should be kept clean and connections tight.

DANGER: Never change the welding transformer tap switch when weld current is flowing.

3. Secondary Circuit:

The secondary circuit conducts the current from the welding transformer to the work pieces. The greatest amount of maintenance to the welding circuit will normally involve the secondary circuit.

The secondary circuit should always be kept clean. Dirt, grease, and weld flash can reduce the welder's performance and efficiency. Secondary connections on the transformer and throughout the secondary circuit must be kept clean, free of oxidization, and all joint bolts periodically tightened.

Periodic checks should be made to insure that adequate cooling water is flowing at all times during the welding operation. Lack of water can seriously damage the welder electrical system.

4. Welder Sequence Controls:

The welder sequence control system should be serviced by a qualified electronic or electrical technician.

DANGER: Mixing control voltages (even through a volt meter) can cause permanent damage to control components. Only qualified personnel should attempt to inspect, modify or repair machine controls.

WELD CONTROL:

Generally, welding controls require little maintenance beyond the occasional external cabinet cleaning.

Common maintenance tasks are:

Visual Checks:

- Check for water leaks or excessive condensation on the ignitron or SCR.
- Look for obvious signs of heating.
- Areas showing accumulation of dust, dirt, or grease should be cleaned.
- Be sure cable harnesses are not pinched, trapped or scraped as the control is closed.

- Look for deterioration in the keypad, thumbwheel or other input device.
- Look for the battery low signal if so equipped.

OPERATORS CONTROL STATION:

Operators control stations are relatively trouble-free, provided that preventative maintenance is applied. Burned-out indicator lights should be replaced immediately.