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END-OF-SEASON LAY-UP

of air conditioning equipment

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Experience shows that the start-up period is the most critical period in the life of a machine. We would add, however, that in regard to seasonally-operated equipment, the observance of proper end-of-season lay-up procedures holds the key to greatest efficiency and longest possible equipment life.

Proper end-of-season lay-up requires:

- 1) Checking for signs of trouble that may have developed during the operating season; and
- 2) Observing proper maintenance procedures.

Air conditioning articles that have appeared in past issues of "The Locomotive" have stressed the importance of sound maintenance practices prior to and during the operating season. A review of the Company's air conditioning loss files indicates, however, that a number of failures can be traced to a lack of attention when the equipment was taken out of service at the end of the cooling season.

Based on our analysis of these failures, we offer a number of recommendations which, when followed, can help to eliminate start-up failures each spring and increase equipment life and operating efficiency.

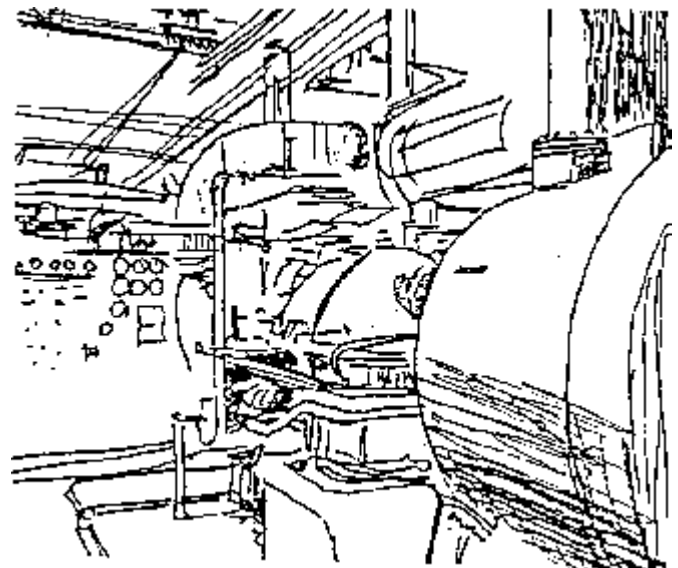
Some of the recommendations apply to components of air conditioning systems. Others apply to central systems or factory-packaged units. The selection of the recommendations to follow will depend, of course, on the type of installation involved.

Refrigeration Systems — General

- When cooling is no longer required, the refrigerant system should be pumped down to relieve pressure on the shaft seals, to prevent loss of refrigerant, and to limit the effect of refrigerant migration. When the refrigerant has been pumped into the receiver or condenser, as specifications require, the

valves at the inlet and outlet should be closed, and the vessel connections should be checked for leaks.

- Relief valves on the condenser and the receiver should be checked for leaks.
- The power supply to the control circuit should be disconnected and tagged to prevent compressor operation during the "off season."
- The refrigeration system and piping should be thoroughly checked for possible repairs or changes that may be required, prior to the spring start-up; e.g., piping supports, control changes, system piping modifications.
- All pressure gages and thermometers should be calibrated and adjusted.
- Safety controls should be checked for proper setting and operation.
- Electrical connections should be cleaned and tightened.



- For lithium bromide absorption units, the refrigerant water and the lithium bromide solution should be lab-tested for contaminants and inhibitor strength, respectively. All adjustments and changes to these solutions should be made at this time.

Compressors and Motors

- Full or partial dismantling of the compressor should be scheduled now, checking for valve wear, bearing wear, misalignment, and other signs of possible distress.
- Draining, checking, and cleaning of oil reservoirs, oil filters, and strainers should also be done.
- An oil sample should be taken for acidity testing, and a separate sample should be lab-tested for traces of metal, indicating wear.
- Oil heaters and controls should be checked to be sure that they work properly.
- Thrust bearing end clearance should be checked and recorded. Any increase of .003" or more in one season should be investigated by removal and replacement of the bearing, if required.
- Inlet damper mechanisms should be inspected for cracks and wear and replaced when necessary.
- All sight glasses should be cleaned.
- Purge units should be inspected and overhauled.
- Speed-increaser gear sets, where used, should be drained of oil and refilled with clean, fresh oil. Bearings and gear teeth should be inspected for wear and replaced or corrected, as indicated.
- The coupling on open-drive units should be checked for wear and alignment.
- Motors should be serviced by cleaning the windings and lubricating the bearings. Motors subject to weather or airborne contaminants should be covered.

Heat Transfer Surfaces

An air conditioning system is basically a heat transfer machine, the efficiency of which is dependent on the condition of the heat exchange components of the system. Accordingly, the cleanliness of the heat transfer surfaces and proper water treatment should be of foremost consideration in maintaining top efficiency and minimizing corrosion.

The precautions taken when laying up the water-cooling system will add years to its life and prevent undesirable shutdowns when cooling is desired.

- If the condenser is exposed to freezing temperatures, care must be taken to prevent freezing damage to the condenser tubes and headers. Because water can often be held in cavities in the heat exchanger the condenser should be air-blown

to remove any trapped water. An alternate procedure would be to circulate an anti-freeze solution through the condenser and water piping prior to draining the system.

- Lay-up time is a good time to remove the condenser heads in order that condenser tubes can be cleaned of mud, debris, scale, and other sediment that collects during operation. This material is washed out of the air and tends to collect in the condenser. Condenser tubes should be cleaned with a nylon brush or one of similar material, and the condenser should be inspected for signs of corrosion. Where scale deposits are formed, chemical cleaning may be required, and the water treatment reevaluated.

Cooling Towers

- Float and ball-cock valves on the cooling tower makeup should be taken apart, cleaned, and re-washed.
- The interior of the cooling tower and the tower boards or packing should be washed down.
- Perforated head pans and spray nozzles should be thoroughly cleaned.
- Tower pans, pipelines, and pumps should be drained and flushed and, if exposed to freezing temperatures, these components should be air-blown to remove all water.
- All condensing water piping not subjected to freezing should be left filled with treated water to prevent corrosion.
- Automatic "fill" valves should be locked closed.
- Strainers and screens should be removed and cleaned.
- Tower fans and fan drives should be carefully inspected for wear, cracking, corrosion, and other conditions that may cause service interruptions.
- If possible, fan and louver openings should be covered or screened to minimize the amount of airborne dirt carried into the tower or evaporative condenser during the idle winter period.
- Pumps should be winterized by using foamed lubricant, and pump motor bearings should be checked and lubricated.
- All metal parts subject to alternate wetting and drying should be painted to prevent corrosion.

Air Cooled Condensers

- Air cooled condensers should be cleaned, inspected, and covered, if possible, to prevent accumulation of airborne debris during the idle winter period. Any repairs to be made to the casing or piping should be noted and scheduled during the "off season."

- Air cooled condenser fan blades should be cleaned and also checked for cracks, corrosion, and other conditions that may cause service interruption.
- Air cooled condenser fan bearings should be inspected and lubricated for the long idle period.
- Fan belts should be loosened or, preferably, removed to indoor storage.

Air Handling Coils

Chilled water coils in air handling units subject to freezing should be drained and air-blown to remove water, or flushed with an anti-freeze solution.

- The coil face should be cleaned and the condensate traps and pans cleaned and drained.
- Freezestat controls in the air ducts should be checked for proper operation to prevent sub-freezing air temperatures from passing through the undrained chilled water coils or hot water heating coils.
- Suitable freeze alarms should be installed in ducts where damper mechanism failures, pump outages, or control failures can cause coils to be exposed to freezing conditions.

By following proper lay-up procedures, the owners and operators of air conditioning equipment will not only eliminate the causes of many costly accidents, but also benefit by knowing that the equipment will be ready to operate—following proper start-up procedures—with the greatest degree of reliability during the next cooling season.