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Greenhouse Heating Checklist[1]

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Effective and economical greenhouse heating is the union of an appropriate heat source and an efficient heat distribution system. The best greenhouse heat source in the world is useless if the heat cannot be transferred to the plant environment. Likewise, an efficient heat distribution system is useless if an adequate heat source is not used. The most efficient greenhouse heat source and the most efficient heat distribution system can continue to work well -- only when properly maintained.

An important step in the proper maintenance of a greenhouse heating system is to establish an orderly plan for inspection of the system's components. These components include the heaters and all other elements of the structure that effect the efficient operation of the heating system. Each heating system component should be inspected annually before the heating season.

When nursery personnel lack expertise or specialized equipment for heating system and greenhouse maintenance, the use of maintenance specialists is recommended.

The following checklist covers the steps that should be taken to insure that greenhouse heating systems operate at peak efficiency. All elements mentioned will not be present in each greenhouse. Check the operation of those that are part of your system.

STRUCTURE

Fiberglass Covering

1. Replace damaged or excessively darkened panels.
2. Repair or seal cracks or holes.
3. Install missing closure strips.
4. Remove unnecessary shading compound to allow light penetration to enhance winter growth.
5. Clean side panels of algae and dirt.
6. Add a polyethylene inner layer in situations where light intensity is not a problem.

Glass Covering

1. Scrape and paint bars.

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2. Replace damaged panes.

3. Adjust any panes which have slipped out of place.

4. Caulk and seal panes.

5. Remove all unnecessary shading compound to allow light penetration to enhance winter growth.

6. Clean side panels of algae and dirt.

7. Add a polyethylene inner layer in situations where light intensity is not a problem.

8. A double layer inflated film used inside the glass can be used instead of a single inside layer if light intensity is not a problem.

Double Poly Covering

1. Replace old, discolored or badly damaged poly.

2. Check and clean inflation fans.

3. Repair all tears, rips or small holes with poly tape.

4. Condensation between layers of poly can be reduced by using warm dry inflation air.

5. Remove all unnecessary shading compound to allow light penetration to enhance winter growth.

6. Clean side panels of algae and dirt.

Vent System

1. Repair or adjust vents to reduce cracks at mating surfaces.

2. Check vents for free operation.

3. Check polytubes for rips and tears.

4. Have a replacement polytube on hand.

Doors

1. Weather strip all doors.

2. Seal and caulk molding and frame.

3. Use door closures or springs.

Plastic Sealings

1. Replace cloudy or dirty plastic film.

2. Repair all rips and tears.

3. Seal all laps and joints.

4. Remove all algae and clean off dirt.

Thermal Blankets

1. Operate through a complete cycle.

2. Check that the opening sequence is staged properly.

3. Check that the time sequence for opening and closing is properly set.

4. Check that all seals are closing properly.

5. Check that wires and pulleys are aligned and tight.

6. Repair all holes and tears.

7. Lubricate all bearings.

8. Tighten drive shaft couplings if loose.

9. Check motor and gear for unusual wear and check lubrication.

10. Remove all algae and dirt.

STANDBY GENERATOR

1. Clean and check battery.

2. Drain and refill generator fuel tanks.

3. Check fuel tank and lines for leaks.

4. Start and run weekly.

5. Check and insure that all lubricants are at proper levels.

6. Inspect wiring and switches for deterioration.

7. Check the operation of the alarm system.

8. Service cooling system.

UNIT HEATER (FORCED AIR)

1. Contact fuel dealer in advance of heating season to insure that an adequate fuel supply is available in case of shortages.

2. Use proper fuel.

3. Check fuel pressure and adjust the air-fuel mixture.

4. Check and clean burner nozzles.

5. Clean and adjust pilot lights or ignitors.

6. Insure that adequate outside air is available to burners.

7. Check flues for proper size and obstructions.

8. Check fuel lines for leaks.

9. Check heat exchangers for cracks and carbon and dirt buildup.

10. Lubricate and clean fan motors.

11. Clean and lubricate fan bearings.

12. Make sure that ALL heaters are VENTED to the outside. The stack should extend a MINIMUM of FOUR FEET above the house ridge.

13. Check the condition of the wiring.

14. Make sure that good quality water is available.

BOILERS (STEAM OR HOT WATER)

1. Check system for signs of vandalism or damage.

2. Check for mechanical damage to boiler or to piping.

3. Check and adjust air-fuel ratio.

4. Check and insure that safety or relief valves are operative and not leaking.

5. Clean tubes -- both fireside and waterside.

6. Check refractory for cracks and patch if necessary.

7. Align door and water side gaskets.

8. Check and insure all flue connections are tight.

9. Clean blower fan blades.

10. Check fan motor and lubricate bearings.

11. Check, clean and adjust alarms.

12. Maintain accurate water treatment records.

13. Establish a boiler blow-down schedule.

14. Clean condensate tank.

15. Check packing on pumps.

16. Inspect check valves.

17. Install condensate and insulation or repair damage to existing insulation.

18. Check blow down valves for leaks.

19. Replace inoperative or leaking valves.

20. Check all piping in boiler room for leaks and repair if needed.

21. Remove all flammable materials from boiler room.

22. Check boiler operating pressure and adjust to proper pressure.

23. Verify settings to activate back-up boilers.

24. Check all back-up boilers to insure proper operation. Backup boilers should operate as effectively as the principal boiler.

25. Operate and monitor boilers continuously until they run through several cycles before trusting automatic operation.

26. Insulate hot water heater or boiler.

27. Make sure wiring is in good condition.

28. Make sure good quality water is available for the system.

29. Make sure that the water chemistry of the water in the system is properly maintained to maximize boiler tube life.

STEAM OR HOT WATER DELIVERY AND RETURN SYSTEM

1. Fix pipe leaks.
2. Support pipes off the ground and slope for drainage.
3. Be sure that there is enough pipe to transfer the available heat to maintain desired greenhouse temperatures.
4. Check equipment using flue gas to preheat return water.
5. Clean heating pipes as needed. Clean both inside and out, and clean heating fins.
6. Adjust valve seats and replace if needed.
7. Check that valves are properly sized for Btu rating of heater and piping.
8. Inspect bypass valve and repair if required.
9. Inspect, clean and repair traps.
10. Insure that each trap is of proper size and pressure rating.
11. Check for the proper layout of piping for maximum efficiency.
12. Make sure that good quality water is available.

CONTROL

1. Vacuum clean the control box.
2. Check for proper calibration.
3. Set proper differential between stages.
4. Insure that heating and cooling cycles or stages do not overlap.
5. Check for accuracy of thermostats with a thermometer.
6. Check that the aspirator is properly located.
7. Calibrate, adjust or replace thermostats.
8. Check operation through all stages.
9. Make sure that thermostats are located near to or at plant level.
10. Make sure that thermostats are not exposed to nearby heat sources.
11. Locate controls on wooden backing - not against metal.
12. Check the condition of the wiring.

INSULATION

1. Check that all steam or hot water delivery lines are insulated.
2. Repair cracks or gaps in insulation around pipes.
3. Repair or seal cracks and gaps around fans and doors.
4. Insulate all boilers and hot water tanks.