

regulators, where the operating speed of the motor is set by a dial-switch or regulator (which may be near the fan or at a remote point) and the motor is then automatically controlled at this speed merely by operating the remote control push-button for starting or stopping the equipment.

Arrangements may be made for remote control of fan motors, or for automatic control by influence of temperature. Remote control may be by pneumatic or by hydraulic manipulation as well as by electrical means.

In many large ventilating systems which have heating plants in connection, steam engines are used to operate fans. A medium speed steam engine, exhausting at low pressure into the radiators which heat the building or which warm the air, is a very economical source of power, is quiet in operation, and has a wide range of speed variation. The steam economy of such an engine usually is of little importance, since the engine serves as an auxiliary to the pressure-reducing valve interposed in such cases between the boiler and the radiators.

Internal combustion engines and line shafting are often used for fan driving, requiring clutches or shift-belts with loose pulleys in order to secure proper starting and control.

It is seldom necessary to reduce the speed of ventilating fans more than 50 per cent from the maximum fan speed, but for economical operation on large systems there should be a number of operating speeds between maximum speed and 50 per cent below maximum speed.

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Chapter 35

INDUSTRIAL UNIT HEATERS

Functions; Types; Heating Mediums; Heat to be Supplied; Entering Air Temperature; Delivery Air Temperature; Ratings and Capacities; Arrangement of Heaters; Discharge; Boiler Capacity; Electric Units; Direct Fired Units; Turbine Driven Units; Automatic Control.

THE industrial unit heater is composed of a heating element enclosed by a casing in which a power driven fan or fans are mounted. The fans draw or force air over the heating surface, and discharge it in selected directions. Other auxiliary apparatus such as valves, by-pass dampers, louvers, screens, controls, etc., may or may not be a part of the unit, depending on the type. Generally no ducts are attached either to the outlets or to the inlets, the units being complete in themselves.

The heating and ventilating of factory and industrial buildings is frequently accomplished by means of units which include all the apparatus necessary for providing, directing and controlling the necessary volume of air heated to the proper temperatures for the purpose. Unit heaters usually are placed directly within the room to be heated and have the inherent characteristic of delivering and distributing the air by mechanical impulse. In many buildings this feature results in exceedingly economical and successful heating.

FUNCTIONS OF UNIT HEATERS

Unit heaters are designed to:

1. Circulate the air in the building at a rapid rate.
2. Promote uniformity of temperature and quick heating-up.
3. Direct the heated air so as to accomplish the positive and rapid placing of the heat where it is effective.
4. Reduce the temperature differential between floor and ceiling.
5. Reduce the number of heat emitting units and simplify piping and installation.
6. Increase the capacity of the heating surface by passing the air over it at high velocity.
7. Provide a system by which room temperatures are readily controlled manually or by thermostats.

In addition to their prime function of heating buildings, unit heaters may be adapted to a number of industrial processes, such as drying, curing, etc., with which the use of heated air in rapid circulation with uniform distribution is of particular advantage. They may be used for moisture absorption, such as fog removal in dye-houses or for the prevention of condensation on ceilings or other cold surfaces of buildings in