

employed in the operation of large plants during the periods when the boilers are operated only up to their normal rating. When the rate of operation is increased above the normal rating, some form of mechanical draft is employed as an auxiliary to overcome the increased resistances or draft losses. Natural draft systems are used almost exclusively in the smaller size plants where the amount of gases generated is relatively small and it would be expensive to install and operate a mechanical draft system.

The principal advantages of natural draft systems may be summarized as follows: (1) simplicity, (2) reliability, (3) freedom from mechanical parts, (4) low cost of maintenance, (5) relatively long life, (6) relatively low depreciation, and (7) no power required to operate. The principal

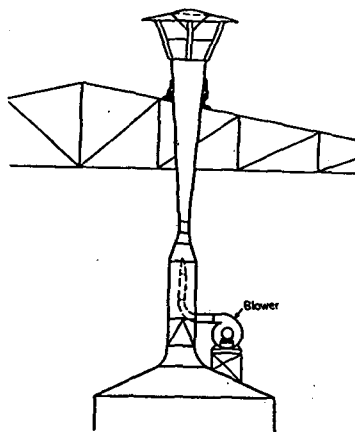


FIG. 1. DIAGRAM OF VENTURI EJECTOR

disadvantages are: (1) lack of flexibility, (2) irregularity, (3) affected by surroundings, and (4) affected by temperature changes.

Mechanical Draft

Artificial draft, or mechanical draft, as it is more commonly called, is a difference in pressure produced either directly or indirectly by a forced draft fan, an induced draft fan, or a Venturi chimney as the pressure transformer. The intensity of mechanical draft is dependent for the most part upon the size of the fan and the speed at which it is operated. The element of temperature does not enter into the creation of mechanical draft and therefore its intensity, unlike natural draft, is independent of the temperature of the gases and the atmosphere. The purpose of any mechanical draft system is to produce a difference in pressure between the point at which the air for combustion enters the boiler and the point at which the products of combustion leave the boiler. Such systems include the blower or fan type which produces a plenum or pressure above that

of the atmosphere under the fire and the exhaust fan and Venturi types which produce a partial vacuum that is minimum under the fire, and maximum at the point of exit of the products of combustion from the boiler. The latter types are known as induced draft systems. A mechanical draft system called a Venturi ejector¹ is illustrated in Fig. 1, in which the blower forces air, taken from the outside, through a Venturi tube which draws the gases from the furnace, boiler or hood. With this system, the hot or corrosive gases do not come in contact with the blower. A mechanical draft system may be used either in conjunction with, or as an adjunct to, a natural draft system.

Draft Control

To obtain the maximum efficiency of combustion, a definite minimum supply of air to the combustion chamber must be maintained. To pro-

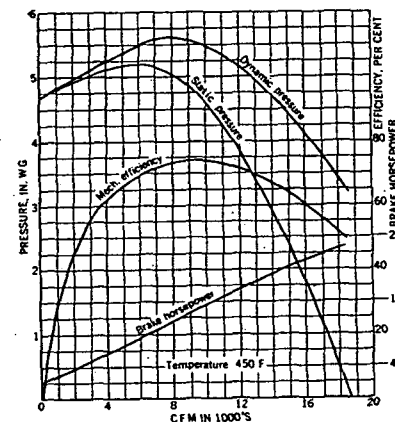


FIG. 2. GENERAL OPERATING CHARACTERISTICS OF TYPICAL INDUCED DRAFT FAN

vide this condition, it is necessary to have some automatic mechanical means of draft control or adjustment, because of variable wind velocities, fluctuations in atmospheric temperatures and barometric pressures, each of which has an effect upon draft.

For this purpose there are various mechanical devices which automatically control the volume of air admitted to the combustion chamber. Mechanical draft regulators designed to control or adjust draft should not be confused with mechanical draft systems that create draft mechanically, but which must also be automatically controlled.

The use of such a device, to provide a more uniform and dependable control of draft than could be maintained by manually operated dampers, will produce better combustion of fuel. This higher efficiency of combus-

¹The Venturi Ejector for Handling Air, by F. F. Kravath (*Heating and Ventilating*, June, p. 17, August, p. 46, 1940).