The high speed of these fans makes necessary heavier construction, larger shafts and bearings. Consequently, more operating attention and service is required than for the multiblade type. The dimensional bulk for a given duty is one and one-half to two times that of a forward curved multiblade fan.

SELECTION OF FANS FOR VENTILATION

Two important factors in selecting fans for ventilating systems are: Efficiency (which affects the cost of operation) and Noise. First cost and space available are secondary. Proper size fans should be selected to operate at maximum efficiency without noise. Noise in a ventilating system is irritating and cause for complaint; fans must be selected of proper size in order to reduce it to a minimum. Noise may be caused by other factors than the fan; namely, high velocity in the duct work, location of the fan room, construction of floors and walls and improper installation. (See Chapter XXVIII on Air Duct Design and Construction.) Where noise is chargeable directly to the fan, it is either caused by excessive peripheral speeds or the fan is of insufficient size. A fan that is noisy is usually one that is operated at a point considerably beyond maximum efficiency.

For a given static pressure there is a corresponding outlet velocity and peripheral speed wherein maximum efficiency is obtained. If a fan be selected to operate at this point, cost of operation and noise can be held within control.

To aid in selecting fans as near as possible to point of maximum efficiency, there are listed for each static pressure corresponding outlet velocities and tip speeds that will give satisfactory results.

TABLE 1. GOOD OPERATING VELOCITIES AND TIP SPEEDS FOR FORWARD CURVED MULTIBLADE VENTILATING FANS

STATIC PRESSURE IN INCHES OF WATER	OUTLET VELOCITY FEET PER MINUTE	TIP SPEED FEET PER MINUTE
¼	1000–1100	1520–1700
⅜	1000–1100	1760–1900
½	1000–1200	1970–2150
⅝	1100–1300	2225–2450
¾	1200–1400	2480–2700
⅞	1300–1600	2660–2910
1	1500–1800	2820–3120
1¼	1600–1900	3162–3450
1½	1800–2100	3480–3810
1¾	1900–2200	3760–4205
2	2000–2400	4000–4500
2¼	2200–2600	4250–4740
2½	2300–2600	4475–4970
3	2500–2800	4900–5365

Lower outlet velocities than listed above may be used, but care must be exercised to avoid selecting a fan operating below its useful range.

In exhaust ventilating systems where the air column moves toward the fan, noise due to the higher tip speeds and outlet velocities, will not be so readily transmitted back through the air column to the building.

Therefore, higher outlet velocities up to 2000 ft. per minute may be used, but at the expense of increased power. Amply large fans should be used for both exhaust and supply systems, as there may be leakage through joints in the duct work, necessitating the delivery of more air than is exhausted from or supplied through the openings in the various rooms.

Long runs of distributing ducts, heaters, air washers, etc., are usually part of a system where high static pressures are needed; therefore, it is good practice to select fans with the higher outlet velocities and peripheral speeds recommended, as the duct system, itself, will tend to muffle objectionable air sounds. Where the fan is connected with short ducts to register faces, fans with low outlet velocities should be used regardless of the static pressure.

FANS FOR DRYING

Both disc and centrifugal types of fans are used for drying work. The former is well adapted to the removal of moisture-laden air when operating against low resistance and handling air at low temperatures. Motors on these fans are usually of the fully enclosed moisture-proof type so that saturated air or air containing foreign material will not injure the motors.

Unit heaters employing disc or propeller type fans are widely used in the drying field. In drying, disc or propeller fans can be used where duct work is required and air is to be delivered against pressure as the noise developed from the high peripheral speed is not ordinarily objectionable in process work of this nature.

Centrifugal fans or blowers of the multiblade type are generally selected to supply air for drying, as they are capable of delivering large volumes against all pressures with a minimum amount of power.

Belt driven fans are preferred as they make a more flexible and economical unit. Wherever drying is done throughout the year and air requirements change as the drying conditions change, the drying can be speeded up or reduced through control of the fan capacity by either fan speed or volume dampers.

Due to low speeds of forward curved multiblade or paddle wheel type fans, these can be direct connected to reciprocating steam engines and the exhaust steam used in the heating coils. In selecting engine driven fans for drying processes, wherein a large quantity of exhaust steam is used in the heaters, a smaller fan can be used because power economy is not essential.

Where static pressure in a dryer varies and battery operation is required, the full backward curved fan is recommended. This type is well adapted for direct connected motors of the higher speeds.

FANS FOR DUST COLLECTING AND CONVEYING

The application of fans or exhausters for handling refuse, dust, fumes, etc., generated by machine equipment is well covered in Chapter XXXII of THE GUIDE. Information is there given regarding the method for determining the necessary air quantities, velocity required for carrying various materials and method of determining maintained resistance or total static pressure at which the fan is to operate.