BLOWER Fundamentals

What To Do When You Run Out Of Wind

by Dave Junchen

The wind supply for theatre organs has been a source of frustration to many enthusiasts. It seems that few of us are ever satisfied with an organ of a given size — it always needs to be larger! After a few ranks are added, the original blower is often unable to keep up with the demand for the extra wind required. The problem is especially frustrating to many people who put together an organ from parts and are uncertain about the size of blower required for a given size organ.

As a general rule of thumb, theatre organs require about ½ horsepower of blower capacity per rank. Many Wurlitzers used blowers of the following sizes: for 4 ranks, 2 horsepower; for 6 ranks, 3 horsepower; for 10 ranks, 5 horsepower; for 15 ranks, 7½ horsepower; and for 20 ranks, 10 horsepower. This rule holds true for organs whose average pressure is 10". Lower pressure organs require less horsepower per rank; organs with several 25" pressure ranks require considerably more horsepower per rank.

In the "good old days," 10 to 20 years ago, it was relatively easy to obtain a larger blower if one needed more wind for added ranks. Now a days, however, larger blowers are offered relatively infrequently, and the ones which do become available fetch premium prices. Smaller blowers are usually readily available, however, and it is possible to use two or more of them in tandem to obtain the same wind capacity as one larger blower.

Blowers, like electric batteries, may be connected in series or in parallel, depending on the results desired. In a *series* connection, the static pressure of the system will be the *sum* of the pressures of the individual blowers. The *volume* of wind available at this pressure, however, will be the same as the volume of the *smallest* blower. In a *parallel* connection, the volume capacity of the system is the *sum* of the volumes of the individual blowers, but the maximum pressure at this volume will be that of the *smallest* blower.

Let's look at an example of two typical blowers connected in both series and parallel and see what can be expected from each combination. The smaller blower is rated 500 cubic feet per minute at 10" pressure and the larger blower 2000 cubic feet per minute at 15" pressure. See Figure 1. This example illustrates the limitations experienced when combining two blowers of differing pressures. Let's examine another example where the two blowers have the same pressure, although differing volumes. See Figure 2. Note that to increase *volume,* blowers must be connected in *parallel.* This is the requirement most often encountered when an organ is enlarged.

It is possible to increase the volume and/or pressure output of a single blower by altering the blowers speed or fan dimensions. This will usually necessitate a motor of larger horsepower as well. Merely installing a larger motor, however, will *not* result in more volume from a blower (assuming the speed to remain constant) because the volume is determined by the width of the fan blades. The following formulas will prove helpful to those wishing to re-design a blower:

1. The pressure and volume of a given blower are inversely proportional. A blower rated 500 ft³ @ 15", for example, would deliver 1000 ft³ @ 7½" or 750 ft ³@ 10" with no change at all in motor or fans.
2. Pressure is directly proportional to speed.
3. Pressure varies as the square of fan diameter. If a fan were enlarged from 30" to 34" diameter, for example, the pressure would raise $(34/30)^2$ = a factor of 1.28.
4. Volume increases proportionately with speed.
5. Volume varies as the cube of fan diameter.
6. The horsepower requirement *at a given pressure* is directly proportional to the volume. If it is desired to increase both pressure and volume from a given blower, however, the horsepower requirement increases exponentially.

One word of caution: Blower fans are manufactured to withstand a certain degree of stress at a given speed. Dramatically increasing speed has been known to result in fan disintegration, so proceed with caution!

Dave Junchen is currently putting the finishing touches on the second volume of his ***Encyclopedia of the American Theatre Organ.*** □

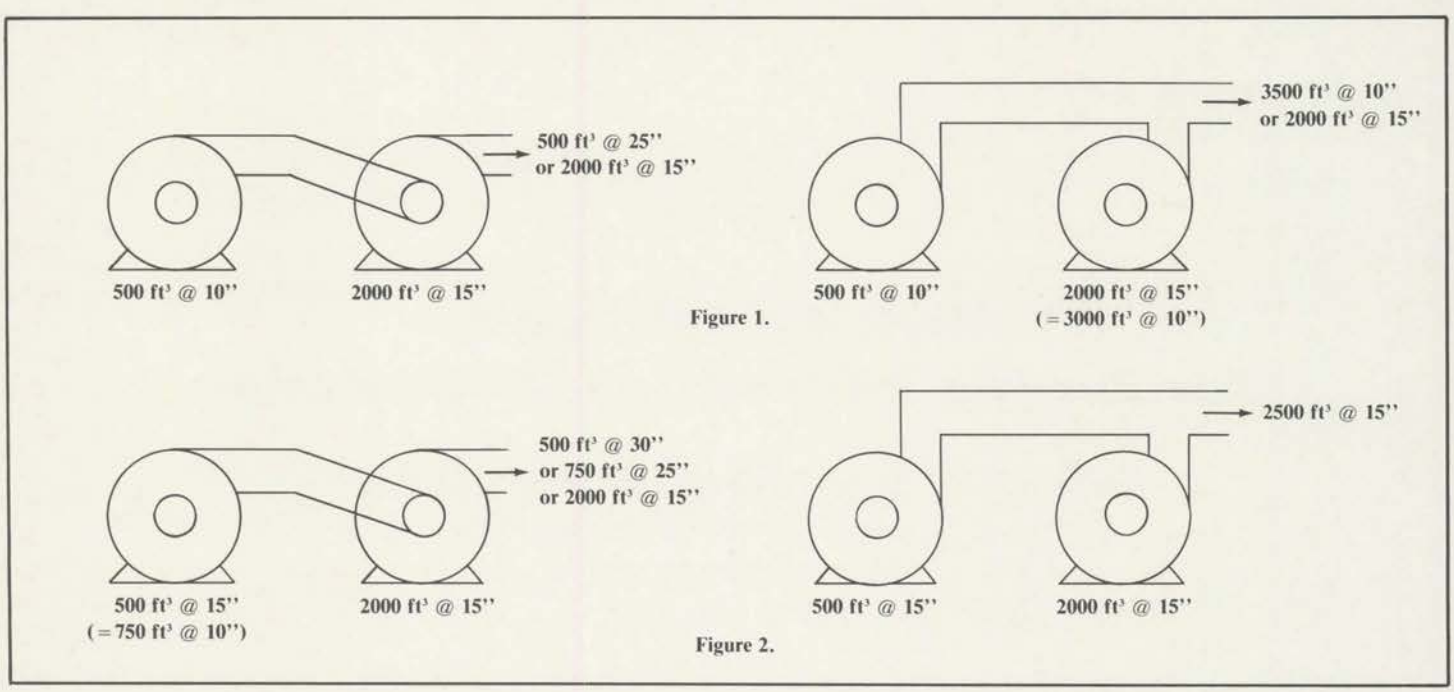

Figure 1.

Figure 2.