

# Power Requirements of Pipe Organs

by R.J. Weisenberger

There are various factors involved in making a good installation great. The first of these is **adequate power**.

A blower of sufficient power must be used to meet or to exceed anticipated usage requirements for any installation.

To move air at 1 PSI (28" dynamic pressure) through a windline of 1 sq. ft. represents about 10.3 KW of power or about 13.8 hp. A 12"X12" windline will be sufficient for most organs. The flow rate would be approximately 21,000 CFM for such a blower. The static (no flow) pressure will be somewhat in excess of the dynamic (flow) pressure, although the dynamic pressure represents the maximum usable pressure after regulation. **The CFM rate may drop severely through inadequate regulators.**

A blower with a high efficiency of 60% would require 23 hp to be developed in the blower motor. The power required for various installations will be reflected as "the square of the change in pressure" for a given windline size, or "in direct proportion to the cross-sectional area" of the windline for a given pressure.

A 25 hp blower (figuring 60% eff.) could power all but the largest high pressure unit organs, while for most classic organs voiced on no greater than 5" WP, a 1 hp blower will usually suffice (using adequately designed regulators).

The above technology represents nothing new. The exact specifications of a particular blower can be obtained from its manufacturer.

**Note: Most blowers may have efficiencies considerably less than 60% (necessitating higher hp).**

Unless its purpose is solely to provide background music, or as an accompaniment for singing, an instrument with such a broad range of frequencies and tonal colors as the pipe organ should also be capable of filling an auditorium with a full-organ level of at least 100 DBc for full aesthetic appeal and to utilize the full capabilities of the hearing range. For reasons of safety to the ear, as well as to buildings with large installations, the upper levels should be limited to 110 DBc in the auditorium. 110 DBc equals 10 times the power required for 100 DBc.

Many pipe organs presently installed in churches fall short of adequately filling the area with a commanding tone. The rear organ in a local cathedral, for example, can only produce about 90 DBc from a typical seating location when played wide open. 90 DBc equals 1/10 the power required for 100 DBc. 90 DBc is attainable by a 1 watt amplifier in a small room of a home, driving a typical home speaker system.

**Note: Do not interpret me as saying that this organ is no more powerful than a 1 watt amplifier. The fact is that the power required to produce a given sound level is directly proportional to the cubic volume of a room.**

This organ had been previously installed in another church, for which it may have been adequate. It was not up to the task of adequately filling the huge cathedral.

Obviously, this weakness does not lie in the number of ranks, which outnumber most theatre organs, but in the pressure on which the

pipes are voiced (3" WP).

If this organ were revoiced on a little over three times its pressure (approximately 10" WP), levels up to 100 DBc could be obtained.

After repeated tests, I found that raising the mouth cuts 80% for such an increase in pressure (and careful revoicing) leaves the tonalities basically unchanged (in the flue divisions), but causes them to speak with 10 times their present power for an awe-inspiring sound that will make itself felt as well as heard.

Theatre and concert organ builders were more generous in the area of power than classic organ builders, as can be proved by measurements and heard by ear.

The newly-installed 3/20 Wurplitzer in Emery Theatre in Cincinnati, for example, has produced measured levels in excess of 105 DBc at a typical seating location in the auditorium, which has a seating capacity of nearly 2000 including the balcony. An extra 15 DB in a similar sized structure means that this organ has approximately 25 times the acoustical power output as the previously mentioned church instrument, and it is well-suited to its environment.

Home installations I have seen have ranged from great to moderate in the quality of the sound. With one exception, none had any trouble being heard, (to the contrary, upper levels typically reach 110 DBc), but those with the pipework located one floor below the console typically exhibit a noted weakness toward the treble, particularly when the treble pipes are mounted on chests far from the tone chute.

This can also be remedied through application of the data gained in my research (which will appear in my next article), and through use of the more conventional knowledge of architectural acoustics.

The use of this new knowledge, combined with the knowledge of those already familiar with the con-

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struction, rebuilding, and voicing of pipe organs, should produce a new generation of instruments of unparalleled tonal beauty, dynamic range, awesome power, and fewer limitations, capable of meeting all musical demands placed on them by the performing artist under any circumstance.

Cases where electronic amplification had to be used to augment the sound from a given installation, due to inadequate design planning, would be completely eliminated. (A large pipe organ extensively voiced on 30" WP or greater can create equivalent sound levels of several thousand watts of amplification!) — The power required to fill a stadium.

For years leading speaker manufacturers have used acoustical tests to evaluate their products. Amplifier manufacturers are using the latest methods to constantly produce products with greater power and fidelity.

Research has been responsible for the vast improvements in reproduced sound over recent years.

Until now, there has been no reliable method to determine the pow-

er of any given pipe in a rank, short of actually building it.

It is the purpose of my column to make these latest test results known to those involved in the building, reconstruction and design of pipe organs.

**A note of warning:**

The hearing hazard that applies to rock fans also applies to us if adequate caution is not taken.

Those working in or touring organ chambers, particularly those of large, high pressure instruments, will experience sound levels from 15-25 DB higher than those in the auditorium. Depending on the individual instrument, this can put chamber levels as high as 120-130 DB during full-organ passages! These levels compare to being on stage during a rock concert. Obviously, the use of ear protection cannot be over-emphasized for large installations where chamber tours are made during the playing of the organ.

My next article will give a detailed look at scaling practices, how they evolved, and how to achieve tonal balance in a rank. □

## Vestal Press Issues Their New Catalog

The Vestal Press, one of America's best-known publishers and distributors of hobby publications through mail order, has just issued its 15th catalog.

According to owner Harvey Roehl, mail-order firms do business about in proportion to the quality of the catalogs and sales literature they distribute, so each year the Vestal Press tries to do better — and this catalog for the first time now has a full-color cover, featuring a picture of a beautiful European Gavioli fairground organ.


The Vestal Press got its start in 1961 by publishing how-to-do-it books and pamphlets in the then-new hobby of player piano collecting. Today it enjoys the distinction of dominating a world-wide market in this field, encompassing all types of automatic musical instruments — music boxes, carousel organs, orchestrons (mechanical orchestras), reproducing pianos (player pianos that play with full artistic fidelity), violin-playing machines, and all sorts of odd music devices.

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Mr. Roehl suggests that hobbies are the "safety valves" that take us away from our daily worries. In a world that's full of frustrations, his firm is doing its best to help people get acquainted with many fast-growing hobbies that will help them get their minds off their troubles for a while!

Readers are invited to send \$2 (refundable with any order) for this fascinating new catalog, and are promised complete satisfaction or money will be instantly returned.

WRITE: The Vestal Press, Dept. B, Box 97, Vestal, New York 13850. □



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*Theatre Organ*

"Sponsored by the San Jose Chapter of the American Guild of Organists, he gave a display of musicianship that must be heard, live, to fully appreciate. He had them in the palm of his hand."

*Tab's and Drawbars*

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