PAYBACK GUIDE
FANS & BLOWERS

ZENER

Energy Savings

Air handling equipment consumes enormous quantities of energy, and deserves some thoughtful consideration by those who manage profits and, therefore, desire to save more money through energy management. The purpose of **this** cost justification guide is to provide a practical tool for management so that an estimate of annual savings can be made. Unlike a computer generated payback analysis, this guide allows the user to see where the numbers come from and how the Zener AC Drive stacks up against other flow control methods.

Methods of Flow Control

An air handling system will be engineered for 100% design flow, but many times could operate with less flow. Let's say that 50% flow is required sometime. What are the options? See Figure 1.

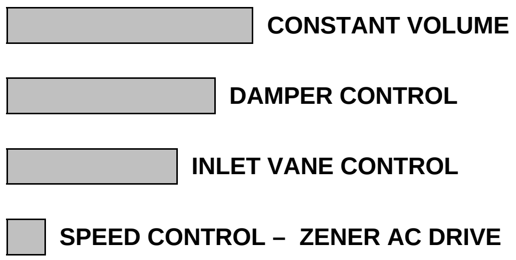


FIGURE 1 ENERGY USED AT 50% FLOW

Some observations about these methods:

A. Constant volume wastes energy.
B. Dampers may be noisy and have limited turn down.
C. Inlet vanes restrict flow even when wide open.
D. The Zener AC Drive has the ability to resize the fan to exact needs through speed control. It also reduces fan noise while at the same time saving the most energy. Does this justify the extra cost?

Figure 2 shows fan energy required vs. flow for the various methods of flow control. These curves indicate substantial reductions in fan energy through speed control.

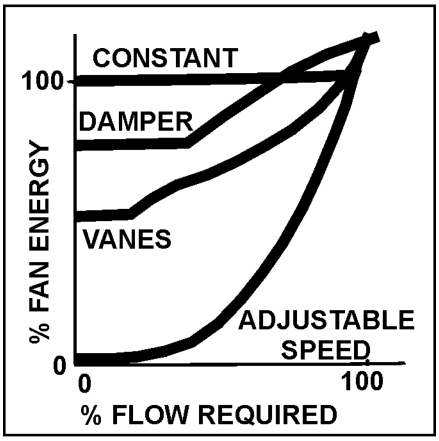


FIGURE 2

Calculating Payback

When the installed cost of Zener AC Drive must be justified through energy savings, there are several pieces of information required. The most obvious are:

A. Fan HP (not motor HP)
B. Cost of electricity (including demand and power factor penalties).
C. Installed cost of Zener AC Drive.

Some less obvious are:

D. Hours/year from 0 – 60% flow – Range A.
E. Hours/year from 60 – 80% flow – Range B.
F. Hours/year from 80 – 100 % - flow – Range C.

See Figure 4, which illustrates that savings in each of the flow ranges indicated in D, E and F above are relatively constant in any one range, but are substantially different one range to another. Improved accuracy of payback calculations will result from an estimate of hours/years in each flow range.

Follow the instructions on page 3 to determine payback on your fan system.

Example

An existing variable air volume system uses dampers to regulate flow. The fan HP has been determined to be 20 HP and cost of electricity (including demand charges) is low 5c/KWH. The building is in operation 10 hours per day, 300 days per year, and the duty cycle is as described in Figure 3. Refer to page 3.

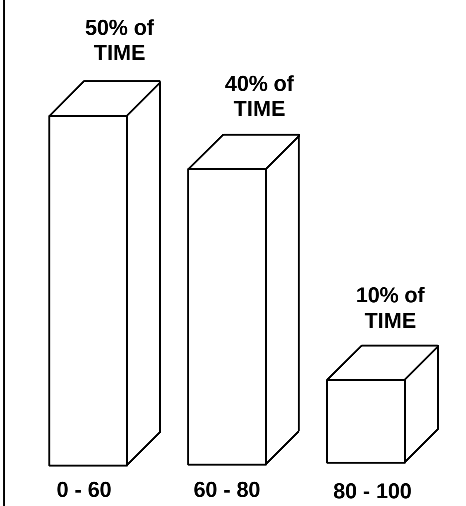


FIGURE 3

1. The savings index S.I. = 1.00 (1500) + 0.80 (1200) + 0.55 (300) = 2,625
2. Savings/Year = 0.746 (20) (0.05) (2625) = $1,958.25

Costs were as follows:

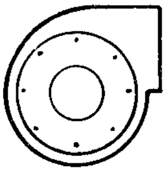
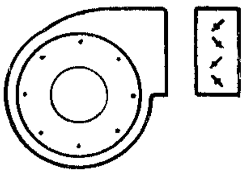
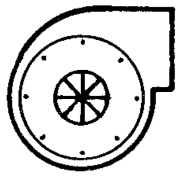
Equipment less 10%	$3,500.00
Installation	250.00
Engineering	000.00
Total Cost	$3,750.00

Payback = $\frac{\$3,750}{\$1,958}$ = 1.9 years

COMPARE ZENER AC DRIVE TO YOUR SYSTEM.
FOLLOW THESE FOUR EASY STEPS.

1. Pick your existing system and calculate your savings index (S.I.) based on the hours/year for the required flow range.

HRS A : hours/year at 0 - 60 % Flow
HRS B : hours/year at 60 - 80 % Flow
HRS C : hours/year at 80 - 100 % Flow

CONSTANT VOLUME	VARIABLE VOLUME - DAMPER	VARIABLE VOLUME - VANE
		
1.30 x HRS A = ______	1.00 x ______ HRS A = ______	0.65 x ______ HRS A = ______
1.00 x HRS B = ______	0.80 x ______ HRS B = ______	0.55 x ______ HRS B = ______
0.60 x HRS C = ______	0.55 x ______ HRS C = ______	0.35 x ______ HRS C = ______
TOTAL ______ S.I.	TOTAL ______ S.I.	TOTAL ______ S.I.

2. Calculate savings/year using this formula:

0.746 x ______ HP① x ______ $/KWH x ______ S.I. x ______ $/Yr. Savings

3. Estimate Costs

Equipment:	Zener AC Drive, Meters etc	______
Installation:	estimate 8 man hours	______
Consultation Fee:		______
Total Cost		______

4. Calculate Payback

______ Total Cost ÷ ______ $/Yr. Savings = ______ Years

① HP is fan HP required for design flow

Additional Cost Justification

Energy savings alone may justify the installation of a Zener AC Drive, however, there are even more savings to be realised through:

1. Reduced mechanical wear and associated maintenance.
2. Reduced power "demand charge" because the motor is started softly with no inrush current.
3. Improved power factor.
4. Probable reduction in the amount of air that must be conditioned (cooled, heated, dehumidified, etc.)

You Have Made The Best Decision

Variable speed is the best method of flow control and the Zener Ac Drive motor speed control will give you superior performance. Why?

1. Lowest power comsumption
2. Lowest installed cost.
3. Least maintenance (saves wear and tear on the fan too).
4. No inrush current (starting).
5. Highest (near unity) power factor.
6. Local sales, service, and application specialists.

Development of S.I.

The savings index, S.I., is calculated number based on savings hours per year and is derived from the curves in Figure 4. Theses are typical power vs. flow curves that are based on the % power required by a fan to produce design flow i.e. 100% design flow requires 100% power at the fan input shaft. These curves, and the S.I., are based on a fan which is 10% oversized. Fans are usually oversized because:

a. filters clog and leaks develop
b. design engineers are conservative
c. the next smaller fan could not meet the design flow requirements

All curves are based on the use of an AC motor with 90% efficiency at full speed, full load and typical reductions in efficiency for reduced load.

The savings, in % power, between the Zener AC drive curve and, for instance, the damper control curve, were measured at 0, 60, 80 and 100% flow. This allowed calculation of an average saving figure in each flow range, which could be multiplied by the number of hours per year in that flow range.

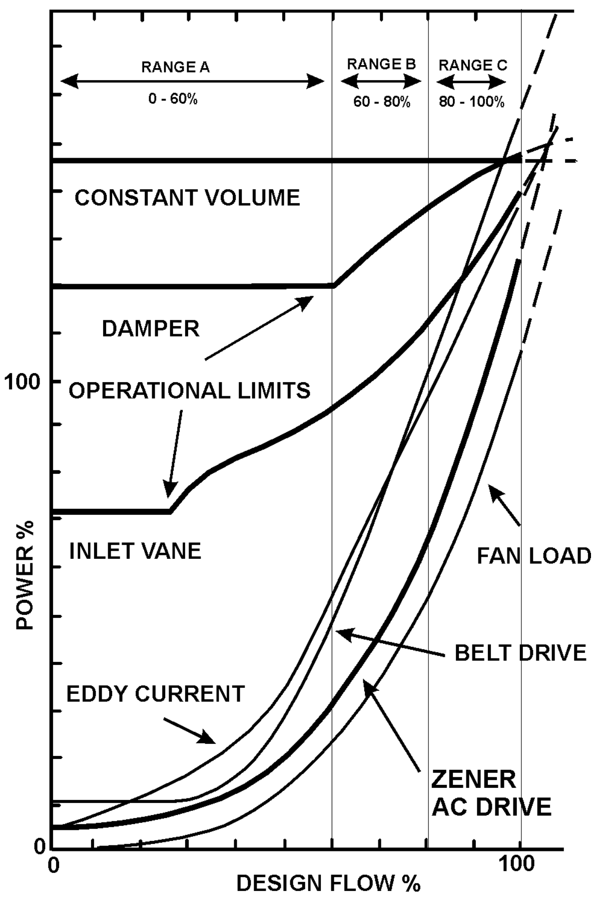


FIGURE 4

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