

**- Centrifugal Fans -**

**Energy Savings / VFD Payback Analysis**

The energy savings potential for your fan based system when upgrading to **US Drives Variable Frequency Drives (VFD's)** is dependent upon several factors. Some of which are the original design philosophy of the system, the flow modulation method, system duty cycle, and your cost of electricity.

If the original design philosophy was to design for the worst case maximum flow condition for a future requirement or the designer used the usual 20% oversizing criteria, your potential for savings is very good. If, however, expansions have occurred over time and the system is near full flow capacity, your potential for savings may be limited.

The existing flow modulation method used on the system will determine the potential for energy savings when using VFD'. The savings potential is quite large if there is no modulation present as in the case of **Constant Volume** or **Uncontrolled** systems. **Outlet Damper** controlled systems use less energy than those using constant volume but the savings potential when using VFD's is still quite high. Systems using **Inlet Guide Vanes** are even more energy efficient than the above methods, but still leave the possibility for savings. Figure 1 illustrates the system curves for the above mentioned flow control methods.

The **Duty Cycle** of your system (where the system operates and for how long) will also affect potential savings. If, for instance, the system tends to operate close to the **Design Point** for the majority of the time, the savings potential through speed control is limited. On the other hand, if the system is operating at reduced flows for extended periods of time, the potential savings by using VFD's is great.

Obviously, the cost of electricity plays a major role in your consideration of whether motor speed control makes economic sense. If the rate of electricity is \$0.02 per KWHr, the chances are slim that you'll be able to cost justify a Variable Frequency Drive for your system. However, if the electricity rate is \$0.10 per KWHr or higher, you can expect to show fast paybacks for virtually any system.

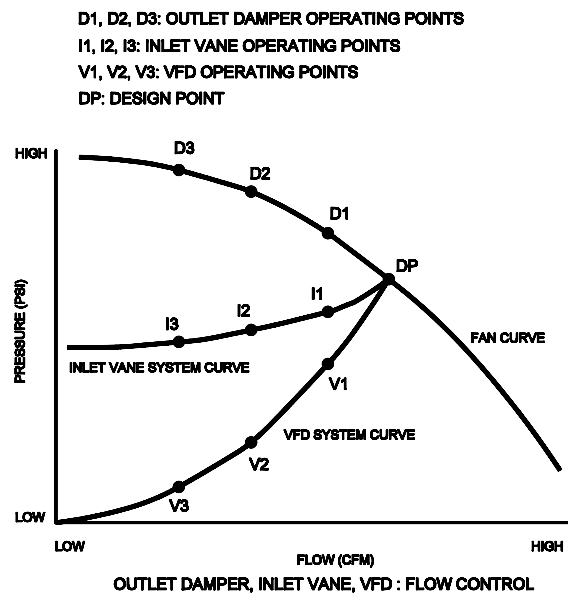
Table 1 gives an indication of the energy savings realized by applying **US DRIVES VFD's** to building fans. Although each system has its own characteristics, (fan curve, fan efficiency, design point, duct losses, motor efficiency, etc.) the typical savings expected on different motors can be estimated.

**Table 1**  
**Typical \$ Saved Per Year On HVAC Building Fans\***

	Constant Flow	Output Damper Control	Inlet Vane Control	With US Drives VFD
30 HP	None	\$3,200	\$9,000	\$15,200
50 HP	None	\$5,400	\$15,000	\$25,400
100 HP	None	\$10,800	\$30,000	\$50,800
250 HP	None	\$27,200	\$75,400	\$126,600
400 HP	None	\$43,400	\$120,600	\$202,400

\*Based on a conservative \$.10 per kilowatt hour and 8000 hours of operation per year.

The information necessary to run a VFD Payback Analysis for your fan system is indicated on the "Centrifugal Fans Energy Savings Program Data" sheet (Doc. # 3010).



**Figure 1.**

ENERGY SAVINGS PROGRAM DATA

- Centrifugal Fans -

Energy Savings / VFD Payback Analysis

CUSTOMER DATA:

DATE: \_\_\_\_\_

CUSTOMER NAME \_\_\_\_\_

PROJECT NAME \_\_\_\_\_

CITY \_\_\_\_\_ STATE/PROV. \_\_\_\_\_ ZIP/POSTAL CODE \_\_\_\_\_

CONTACT \_\_\_\_\_ PHONE # \_\_\_\_\_ FAX \_\_\_\_\_

APPLICATION PARAMETERS:

DATA

FAN EFFICIENCY ..... \_\_\_\_\_ %

DESIGN FLOW ..... \_\_\_\_\_ CFM

DESIGN PRESSURE ..... \_\_\_\_\_ PSI

..... \_\_\_\_\_ IN. OF WATER

MOTOR HP ..... \_\_\_\_\_ HP

MOTOR VOLTAGE ..... \_\_\_\_\_ VOLTS

MOTOR EFFICIENCY ..... \_\_\_\_\_ %

COST OF ELECTRICITY ..... \_\_\_\_\_ /KWH

METHOD OF CONTROL (SPECIFY 1, 2 or 3) ..... \_\_\_\_\_ SELECTION

1: UNCONTROLLED  
2: OUTLET DAMPER  
3: INLET VANE

DUTY CYCLE (SPECIFY 1 or 2) ..... \_\_\_\_\_ SELECTION

1: USE TYPICAL DUTY CYCLE AND SPECIFY TOTAL OPERATING HOURS/YEAR \_\_\_\_\_ HOURS  
2: USER SUPPLIED (SEE BELOW)

DUTY CYCLE DATA:

OPERATING POINT	1	2	3	4	5	6	7	8	TOTALS
% FLOW	_____	_____	_____	_____	_____	_____	_____	_____	_____
HOURS	_____	_____	_____	_____	_____	_____	_____	_____	_____

**US Drives, Inc.**  
 2221 Niagara Falls Blvd.  
 PO Box 281  
 Niagara Falls, NY 14304-0281 USA  
 Tel: 716-731-1606 Fax: 716-731-1524