

Energy Savings Estimator for Centrifugal Fans & Pumps

Calculate the Benefits!

Compare Variable Frequency Drive (VFD) performance to other methods of volume control (based on motor output or shaft horsepower).

Here's how to make this quick and simple analysis.

Step 1. Convert motor HP to kW:

$$\underline{\hspace{2cm}} \text{ HP} \times .746 = \underline{\hspace{2cm}} \text{ kW}_1$$

Step 2. Multiply the Variable Frequency Drive Power Ratio (from Table below) times kW₁ from Step 1:

$$\underline{\hspace{2cm}} \text{ Ratio} \times \underline{\hspace{2cm}} \text{ kW}_1 = \underline{\hspace{2cm}} \text{ kW}_2 \text{ (using VFD)}$$

Step 3. Multiply the power ratio of the control method now being used (see table below) times kW₁ from Step 1:

$$\underline{\hspace{2cm}} \text{ Ratio} \times \underline{\hspace{2cm}} \text{ kW}_1 = \underline{\hspace{2cm}} \text{ kW}_3 \text{ (method now being used)}$$

Step 4. Subtract Step2 kW₂ from Step 3 kW₃:

$$\underline{\hspace{2cm}} \text{ kW}_3 \text{ minus } \underline{\hspace{2cm}} \text{ kW}_2 = \underline{\hspace{2cm}} \text{ kW}_4 \text{ (savings using VFD)}$$

Step 5. Multiply Step 4 kW₄ savings times hours per year of operation times cost per kWhr of electricity:

$$\underline{\hspace{2cm}} \text{ kW}_4 \times \underline{\hspace{2cm}} \text{ Hrs} \times \$ \underline{\hspace{2cm}} / \text{kWhr} = \$ \underline{\hspace{2cm}}$$

(Annual savings using VFD **)

Example: A 60HP fan motor is now operating 24 Hrs per day (or 8760 Hrs per year) riding the fan curve for variable volume control and the local utility charges \$0.12 per kWhr:

$$\text{Step 1. } 60 \text{ HP} \times .746 = 44.76 \text{ kW}_1$$

$$\text{Step 2. } .32 \text{ Ratio} \times 44.76 \text{ kW}_1 = 14.32 \text{ kW}_2$$

$$\text{Step 3. } .94 \text{ Ratio} \times 44.76 \text{ kW}_1 = 42.07 \text{ kW}_3$$

$$\text{Step 4. } 42.07 \text{ kW}_3 - 14.32 \text{ kW}_2 = 27.75 \text{ kW}_4$$

$$\text{Step 5. } 27.75 \text{ kW}_4 \times 8760 \text{ hrs} \times \$0.12/\text{kWhr} = \underline{\underline{\$29,170}}$$

Annual savings!

Fans at 60% of maximum flow*		Pumps at 70% of maximum flow*	
Ratio	Flow control method	Ratio	Flow control method
0.32	Variable Frequency Drive	0.41	Variable Frequency Drive
0.69	Inlet Guide Vane	0.83	Discharge Valve
0.94	Discharge Damper	1.00	Bypass Valve
0.94	Ride the Fan Curve	1.00	No Control
1.00	Bypass Damper		

* The Power Ratio Data is a conservative assumption based on HVAC applications which have shown that fans and pumps operate, on average, at 60% and 70% of maximum flow rate respectively.

** Remember, this result is only an estimate based on averages and assumptions. You should also consider additional savings to be gained from VFD application over and above the electricity rate, such as power factor improvement to .98 and reduced demand charges.