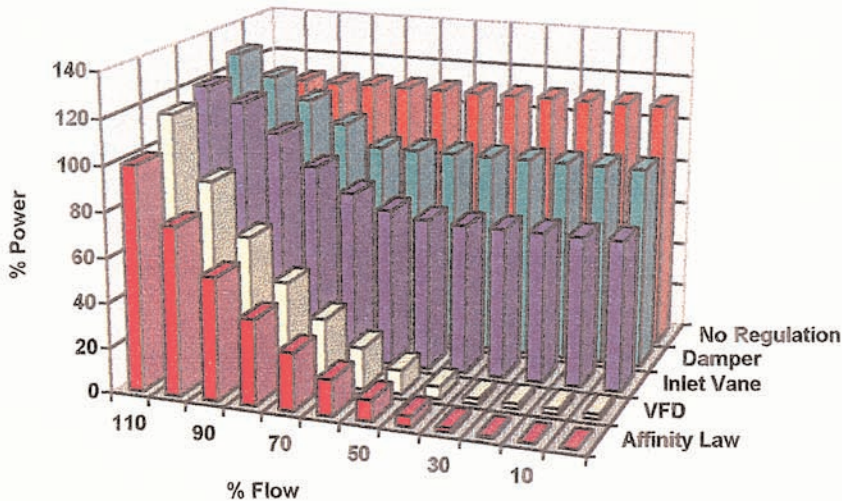




ELECTRIC MOTORS, GEARMOTORS AND DRIVES

Estimated Savings With Variable Speed Fans

It's easy to estimate the savings in electrical energy dollars that can be saved by converting from constant speed fans to variable speed fans with variable frequency drives. The Affinity Laws tell us that Fan HP increases by flow³. Common sense tells us that flow can often be decreased.



This bar graph shows the Affinity Law, an airfoil fan with a VFD, an airfoil fan with inlet vanes, a forward curved fan with outlet dampers, and a constant flow unit. Fans are often oversized 10% or more, just to insure proper system control. Thus, 100% design flow may often be much lower than rated flow.

Constant flow fans will waste energy in a variable air volume system. Note that fans with a damper are usually forward curved, and that this combination requires the most power at maximum flow. A backward inclined airfoil fan with inlet guide vanes is more efficient, but the vanes restrict flow, and require additional power. Variable speed allows for unrestricted flow and reduced power requirements.

Electrical Power vs. Required Air Flow

There are three steps required for determining estimated annual savings:

1. Choose formula A, B, or C depending on whether the existing system has no regulation, dampers, or inlet vanes.
2. Fill in estimated hours per year at low flow (below 2/3 flow) and high flow (above 2/3 flow). Calculate the "Flow Factor" which recognizes the increased rate of savings at low flow.
3. Transfer this value into formula D, fill in the required information for fan brake horsepower at maximum flow, and the cost of electricity in \$/kWh, and calculate the estimated savings.

Existing Flow Control Method	Hours at Low Flow	Hours at High Flow	Flow Factor
A. No Regulation (constant flow):	0.94 x _____	+ 0.53 x _____	= _____ h
B. Discharge Damper:	0.76 x _____	+ 0.45 x _____	= _____ h
C. Inlet Guide Vanes:	0.46 x _____	+ 0.29 x _____	= _____ h
<p>D. Savings: _____ BHP x 0.746 kW/HP x _____ \$/kWh x _____ h = \$ _____</p> <p style="text-align: center;">Fan BHP Power Cost Flow Factor Estimated Savings</p>			