

Next Generation Controls

& VARIABLE SPEED DRIVE BLOWERS



Higher Standards—Greater Value

OPTIMIZE YOUR APPLICATION



Gardner Denver's next generation controls and variable speed drives optimize efficiency with your new or existing Hoffman® and Lamson® blower installations.

Next Generation Controls

Our control solutions are engineered with the newest technologies, yielding more cost effective, flexible, and robust systems that save you money. Customer Benefits include:

- SCADA ready panels, web prepared with Ethernet communications standard, and multiple PLC platforms.
- Go meter less and control flow with speed utilizing Gardner Denver's proprietary flow control algorithms and VFD's.
- Greatly reduce electrical installation costs by using skid mounted quick disconnect sensors, high speed communication protocols and pre-engineered data and power cables.
- Automate monitoring to provide historical and real-time data for predictive maintenance and increased uptime, reducing maintenance costs and simplifying analysis.

Gardner Denver utilizes the most current communication protocols and hardware available to minimize the amount of cabling and wiring which reduces installation and maintenance costs while providing advanced diagnostics and precise system control.

Variable Frequency Drives

VFD control may offer a more efficient method of flow control compared to valve throttling. The primary energy consumers at wastewater treatment plants are blowers. Reducing blower power consumption leads to direct operating savings. VFD technology has been improving and maturing, leading to lower pricing cutting edge technology. Today, capital VFD costs are a more favorable investment with an earlier payback. Gardner Denver can develop the appropriate selection and control scheme unique to the respective Hoffman or Lamson blower to realize those savings.

More Green – Upgrade Installations with VFD's

There are tens of thousands of Hoffman and Lamson blowers installed in wastewater plants throughout the world. An upgrade of the control system can offer extensive savings on annual operating and maintenance costs. Little or minor revisions may be required on the blower to provide significant savings versus purchasing all new capital equipment. The multistage blower is a proven and robust technology for the rugged and reliable service expected for this industry.

Factors for successful VFD control selection must be carefully evaluated. The control logic and necessary



instrumentation must be in place for optimal operation and sequencing. As the original equipment manufacturer of Hoffman and Lamson blowers, only Gardner Denver can offer the necessary specific programming for optimized control without the additional requirement of an expensive flow measuring device. An inlet butterfly

valve is often still recommended in conjunction with a VFD to further maximize power savings.

A sufficient rise to surge should be selected for the blower. This will provide the best flexibility in flow control. Otherwise, the value of the VFD can be significantly minimized.

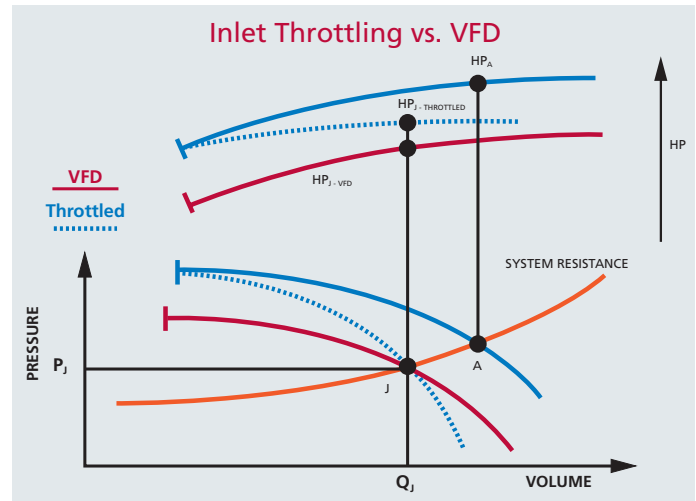
Whether considering a VFD or not, a comprehensive review of the process flow demands for an extended period of operation allows for optimizing the blower selection as well as the number of units. Gardner Denver offers the largest range of blowers, and along with our application experience, we are best positioned to assist in determining the optimal blower model and whether or not a VFD is beneficial.

Consideration of VFD's and other variable speed blower technologies must include full air-to-wire power consumption and maintenance cost when understanding the full investment and potential payback over the lifetime of the equipment. Multistage blowers routinely operate over 20 years with minimal replacement and wear of parts. Other variable speed technologies require major component replacement after 2 to 5 years of operation due to high operating temperatures.

How to Evaluate Savings of VFD vs. Throttling

The incoming wastewater changes from day to day as current demand on the system fluctuates. The density of the blower air supply and relative humidity vary during the day as well. As the density changes, the oxygen content in a given volume of air also changes. Therefore this is an additional consideration in controlling the blower volume delivered to the process. Typical sites utilize multiple blowers in parallel operation to best handle the variable volume. Individual blowers are then controlled to further meet precise flow requirements. One common method of blower control is throttling with a butterfly valve located in the inlet piping to the blower.

A multistage blower will operate at the point of the curve that is equivalent to the system resistance. In the figure shown, Point A is the initial full design volume and pressure point for the blower. This assumes the blower is completely unthrottled and operating at the full motor speed.



Assuming the process then requires a lower flow (Q_j) and pressure (P_j), the blower can be throttled to that point (J). Point $HP_{j-THROTTLED}$ indicates the resulting horsepower.

A more optimal method of blower control is utilizing a VFD. In this case, the blower speed is lowered from the full motor RPM to achieve the same point, J. However, the horsepower curve is more favorable compared to the throttled curve.

Therefore, horsepower consumption is lower with the VFD (HP_{j-VFD}) than inlet throttling ($HP_{j-THROTTLED}$) while both methods are providing the same flow and pressure.

By lowering only the unit speed and not throttling, the blower output decreases while the optimal efficiency remains the same as it was at full speed. On the other hand, while inlet throttling also decreases the output, it decreases the efficiency as well.

Therefore, the horsepower consumption with a VFD is lower than with inlet throttling. The specific savings can vary and depend on many factors such as the shape of the blower curve and the level of volume/pressure fluctuation required.

In fact, if the blower curve is not selected appropriately and/or is not compatible to the system resistance curve over an extended period of operation, the savings may be negligible, particularly versus the initial investment of the VFD or other variable speed blower technologies.

Performance Data

HOFFMAN / LAMSON VARIABLE SPEED DRIVE

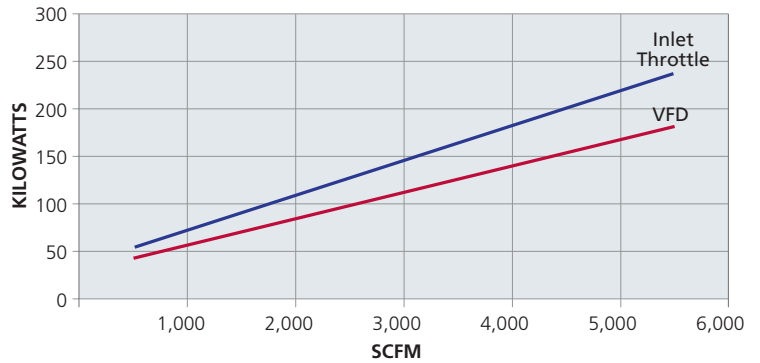
Power Consumption (kW) VFD vs. Inlet Throttling

Inlet Air Temperature	100°F	65°F	30°F
Typical Seasonal Fluctuations	20%	60%	20%
6,000 SCFM (12.5%)*	245	238	246
	243	211	197
5,000 SCFM (12.5%)*	217	185	188
	218	186	172
4,000 SCFM (25.0%)*	163	162	161
	162	141	131
3,000 SCFM (25.0%)*	135	135	140
	124	107	99
2,000 SCFM (12.5%)*	82	82	84
	81	70	66
1,000 SCFM (12.5%)*	53	53	56
	47	43	42

Assumptions:
 1. Three 2,000 SCFM blowers @ 8 PSIG
 2. 3% loss for VFD
 3. 5% loss for motor
 *Typical flow demand fluctuations

 Inlet Throttled
 VFD

VFD Performance Curve




- VFD offers an annual 14% savings in energy usage versus inlet throttling in example shown based on weighted average of specified conditions.
- Blower must be properly selected so performance curve is optimal for VFD. Otherwise savings will not be achieved.
- Blowers must be properly controlled and sequenced to maximize energy use.
- Other variable speed blower technologies require cooling provisions due to high operating temperatures and have additional losses as a result.

Gardner Denver®

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Specifications subject to change without notice.

 Please recycle after use.

