

# FAQs

## Frequently Asked Questions – Variable Speed Drive

**Q: How do I know if my application is a good fit for a Variable Speed Drive (VSD) compressor? Will the manufacturer just say “yes”?**

**A:** A compressed air system assessment performed on your existing system will determine if a VSD compressor can provide the energy efficiency that you desire. This system assessment should include a review of the demand profile, the available storage, and the operating environment. In short, you should never invest in a VSD product without the manufacturer showing you a very clear pay back analysis and verifying that the operating environment is compatible with a VSD installation.

**Q: How exactly do they work?**

**A:** The VSD concept monitors system pressure and simply changes the speed of the airend to match the supply of the compressor to the demand in the system to maintain a stable, customer-set pressure. Airend speed is controlled by varying the speed of the drive motor as a function of varying the power frequency that is applied to the motor. The advanced VSD electronic controls allow the delivery pressure to be maintained within a  $\pm 1.5$  psig band instead of the traditional 10–15 psig band that is required for typical load/no-load and modulating compressors. As system pressure decreases from the target pressure, the VSD electronics increase the frequency of the power to the drive motor, which increases the speed of the airend, resulting in an increase in supply sufficient enough to raise the system pressure to the target pressure. The reverse happens when system pressure rises, signaling that the supply is greater than demand and pressure is rising. The frequency converter in the VSD system performs a “soft” start/stop by automatically controlling both inrush current and acceleration/deceleration levels, which greatly reduce amperage draw peaks. Soft starts and smooth transitions help to protect electrical and mechanical components from the stresses that can shorten the life of an air compressor when it is operated in load/unload or stop/start conditions.

**Q: Tell me a little bit about how they have changed since their introduction to industry?**

**A:** Compressor manufacturers have developed airends that are specifically designed to operate in VSD compressors. This is in contrast with legacy VSD compressor designs that simply placed standard, fixed-speed airends with a VSD motor. VSD airends provide for a “sweet spot” that encompasses a wider range of tip speeds to provide more efficient compression across a variety of speeds. Manufacturers have worked with the drive manufacturers to improve the reliability of compressors operated with VSD drives. Modern VSD compressors have the ability to cancel electrical interference which allows them to operate in harsher power-quality environments, which were often problematic for legacy VSD compressors.