

# CASE STUDY

## Case Study – Variable Speed Drive

**SITUATION:** A contract manufacturer produces precision aerospace components to OEM specifications. An increased demand for its quality parts forces the company to relocate to a new, larger facility and acquire additional equipment. The company purchases two, CNC lathes and one mill that allow the company to operate 24 hours a day machining quality parts. This includes a shift of unmanned, “lights out” machining overnight. Orders can vary from a few pieces to a few thousand over the course of a shift. This new machining schedule results in a significantly fluctuating compressed air demand profile for the operation. The old, 50 hp rotary screw air compressor is not designed to address the highly fluctuating demands and its constant loading and unloading makes it so loud that the company is considering building a dedicated compressor room.

**SOLUTION:** The Plant Manager and Maintenance Engineer work with a local compressed air sales engineer and they decide that the best first step is to perform a system assessment on the existing operation to determine the actual demand of the operation over the course of 24 hours. The assessment reveals that the maximum demand is 45 cfm, the average demand is 38 cfm, and the minimum demand is 22 cfm. The average power consumption of the existing compressor is 17.5 kW. Average pressure is 116 psig. The plant selects a 15 hp rotary screw compressor with a Variable Speed Drive that allows operation between 15 cfm and 60 cfm. By varying its speed in response to the air pressure in the system, the compressor automatically adjusts its supply of compressed air to match the demand of the system to maintain a stable, customer-set pressure. Since no equipment in the operation requires more than 100 psig to operate, the VSD compressor offers the opportunity to reduce the plant pressure from the existing 116 psig to 100 psig. This 16-psig reduction reduces the compressor energy consumption by approximately 8%. Accordingly, the VSD compressor will consume 9 kW to deliver the average demand of 38 cfm @ 100 psig. The VSD compressor package integrates the compressor, air filter, and air dryer into one compact cabinet. Maintenance and energy costs go down, and the new unit is much quieter in operation. The facility also invests in new distribution piping throughout the new facility, installing extruded aluminum piping with metal fittings.

**OUTCOME:** Variable Speed Drive technology is a perfect solution to highly variable demands for compressed air in manufacturing. The compressor speeds up and slows down according to air demand and stops itself in standby mode when demand drops below its minimum capability. The VSD compressor consumes only the amount of energy that is needed to deliver the required amount of compressed air to maintain a stable pressure. This makes VSD capacity control the most efficient operational mode for a rotary compressor that operates at less than its full capacity. Not only does the company enjoy a significant power cost reduction, but the VSD compressor is so quiet that the company is able to locate it directly on the shop floor. A dedicated compressor room is not required, eliminating costs for build-out and piping from a remote location. Floor space is preserved for future production expansion.

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An energy efficiency rebate from the power utility saves the company about 20% on the installed cost of the new compressor. The reduction in power consumption alone is projected to repay the capital investment of the upgrade in 19 months or less. Future savings go right to the bottom line. Additionally, the new piping system provides for easy modification as required to meet varying customer needs. Air drops are added in one-third of the time that was required with the old black iron pipe network and the new piping technology has also achieved a 30% reduction in compressed air leaks.

The chart below illustrates the energy savings that has been harvested by upgrading their old compressor equipment with new, VSD compressor technology. Always consult with a compressed air professional who can assist your selection and installation of a VSD compressor into your system. The proper application of a VSD compressor can bring years of efficiency, reliability, and productivity to most compressed air systems.

<b>15 hp VSD Compressor Payback Analysis figured @ \$0.12 kWh power cost</b>	
Compressor purchase price, installed	\$20,000
Previous compressor annual energy cost	\$19,364
VSD compressor annual energy cost	\$9,959
VSD energy savings	\$9,405
Utility provided rebate	\$5,000
Payback period (months)	19