



WHY PRESSURE REGULATION MATTERS IN ROTARY SCREW AIR COMPRESSORS

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Sullair S-energy Series compressor with Variable Speed Drive

Rotary screw air compressors are the workhorses of industrial operations, providing a reliable supply of compressed air to support tools, machinery, and production lines. But without proper air pressure regulation, even the best systems can become inefficient, costly, or prone to breakdowns.

In this blog, we'll explain how pressure control impacts the performance and efficiency of rotary screw compressors and why optimizing this often-overlooked setting can lead to gains in energy savings, uptime, and equipment life.

What Is Air Pressure Regulation in Rotary Screw Compressors?

Pressure regulation refers to the control of compressed air pressure as it exits the air compressor and enters your facility's distribution system. In rotary screw compressors, this is handled through internal mechanisms such as inlet modulation valves, variable speed drives (VSDs), and pressure setpoints.

Think of pressure regulation like cruise control for your air system. Instead of constantly accelerating

and braking, your system delivers only the amount of air required, keeping your production consistent while minimizing energy waste.

Benefits of Proper Pressure Regulation

1. Improve Energy Efficiency in Your Compressed Air System

Compressed air is one of the most expensive utilities in a manufacturing facility. According to the U.S. Department of Energy, energy costs can account for over 70% of a compressor's total lifecycle cost¹. Additionally, for every 2-psi increase in pressure, energy consumption can rise by approximately 1%. By setting your rotary screw compressor to the lowest pressure required for your processes, you reduce both energy consumption and operational costs.

2. Extend the Life of Equipment

Excess pressure strains downstream components like hoses, valves, tools, and actuators. This leads to premature wear and frequent maintenance. Regulating air pressure protects your equipment and reduces unnecessary repairs.

3. Maintain Stable Performance on the Production Floor

Pressure fluctuations can cause serious performance issues, such as inconsistent air tool torque or automated system defects. Maintaining consistent air pressure ensures a steady, predictable output across your facility.

4. Reduce Artificial Demand in Compressed Air Systems

The U.S. Department of Energy defines artificial demand as the excess air consumed when your system operates at a higher pressure than what your processes actually require¹. This typically happens with unregulated equipment or to compensate for system leaks and pressure drops. Rather than boosting performance, extra pressure causes more air to escape through leaks or flow unnecessarily through end-use equipment. This leads to wasted energy, increased compressor cycling, and higher wear

and tear. Maintaining appropriate system pressure and using point-of-use regulators reduces artificial demand and improves overall system efficiency.

Signs Your Compressed Air System May Have a Pressure Regulation Issue

Not sure if your system is properly regulated? Watch for these common symptoms:

- Frequent short cycling or restarts
- Fluctuating air pressure at tools or machines
- Inconsistent tool performance or product defects
- High energy bills from compressor operation
- Excessive noise or vibration in the air system

Best Practices for Managing Pressure in Rotary Screw Compressors

In many facilities, different tools and processes require different air pressures. Relying solely on a high system-wide setting often wastes energy and causes excessive equipment wear. Best practices focus on managing pressure at the overall system level and individual points of use.

Conduct Air System Audits

Regularly evaluate your compressed air system to identify actual pressure requirements and detect areas of over-pressurization. Audits can also help uncover leaks, pressure drops, and other hidden inefficiencies.

Set Realistic Pressure Targets

Adjust the system-wide setpoint to the lowest pressure that still meets the needs of your most demanding application. Even a slight reduction in system pressure can result in measurable energy savings and reduced compressor load.

Use Proper Air Storage

Install appropriately sized air receivers to buffer demand fluctuations and minimize compressor cycling. Proper storage helps maintain stable pressure even during peak usage periods.

Install Point-of-Use Regulators

Individual processes or machines may require lower pressures than the central system. Installing point-of-use regulators allows you to fine-tune pressure for each application, protecting sensitive equipment, reducing artificial demand, and improving overall energy efficiency.

The Power of Proper Pressure Control

In rotary screw air compressor systems, pressure regulation plays a key role in maximizing performance, controlling costs, and protecting equipment. If your system runs at a higher pressure than needed, you're likely wasting energy and accelerating wear.

Slight pressure setting adjustments or a professional air system audit can deliver long-term savings and more stable operation. Contact your authorized compressed air service provider for expert support and ask about pressure optimization options.

SOURCE: U.S. Department of Energy & Compressed Air Challenge. (2012). Improving compressed air system performance: A sourcebook for industry (3rd ed.).

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