



## SOLUTIONS FOR BUSINESS

# Compressed Air: Tame Your Most Expensive Utility

What you need to know about compressed air and its impact on your operations

Compressed air is expensive to produce and often used inefficiently. Roughly 80% of compressed air energy production is lost as waste heat. In addition, about half of the remaining compressed air energy is wasted through leakage, artificial demand and improper application. **Rebates are available for variable-speed drive controls (up to \$70/hp) and a system audit (up to \$5,000 for evaluation/implementation).** Discover how you can get the most from your compressed air system below.

### Compressed Air Behind the Scenes

To produce compressed air, ambient air is squeezed into a much smaller volume of space with reciprocating pistons (like your car engine) or long counter-rotating helical screws. This causes both the air temperature and air pressure to rise. In many cases, switching to pneumatic operations may be a good decision.

#### Pneumatic tool advantages

- Produces more torque and higher revolutions per minute
- Lower purchase price
- Safer to operate, especially in wet or explosive/corrosive environments
- Smaller in size and lighter
- Less affected by dirt (especially useful for grinders)
- Does not overheat or burn out during a stall
- Less breakdowns and longer life

### Quick Tips

Get the most from your compressed air

- Conduct a compressed air audit to identify energy waste
- Fix air leaks (they account for 20 to 30% of compressor output)
- Find leaks: Listen by ear, observe by eye or use ultrasonic listening equipment
- Avoid inappropriate uses
- Keep system pressure low
- Use lubricated two-stage compressors for the greatest efficiency
- Reduce system cycling with additional storage capacity
- Place air compressors in cool areas
- Plan for future demand and tie-ins

## Which of These is Your System?

Below are a few common types of air compressors:

- Two-stage lubricant-cooled rotary screw compressors are expensive, but significantly more efficient. They typically contribute oil content to system air.
- While two-stage compressors are more efficient, they have higher initial costs than single-stage.
- Single-stage reciprocating compressors have low upfront costs and high maintenance costs. They have the lowest air quality and tend to be loud and vibrate more.
- Lubricated air compressors use oil to reduce friction and seal air paths. Oil-free compressors run dry and provide the highest quality system air, typically for medical or pharmaceutical applications.
- Air compressors can be air or water-cooled. It is easiest to recover waste heat from air-cooled compressors. Water-cooled compressors are more efficient, but also more expensive.

**If your system is greater than 20 years old, consider redesigning it with more efficient components.**

## Operating a Compressed Air System

To maximize energy savings, proper application and operation of your compressed air system is key:

- **Stop inappropriate uses:** These include open blowing, aerating, material transport and cooling. Switch to motors, blowers and mechanical actuators to accomplish the same function.
- **Keep pressure low:** Reducing system pressure by 10 psi saves 8 to 10% in energy consumption.
- **Minimize pressure drops:** Use large diameter distribution piping and hoses (3/4-inch diameter hose for >3 hp tools or >50-foot hose lengths).
- **Fix air leaks:** A 1/32-inch leak in a 90 psi system costs approximately \$185 annually.
- **Recover waste heat:** Air-cooled compressors offer high recovery efficiencies, providing warm air of 100°F or more for use in other processes.
- **Choose the right piping:** Use aluminum or copper distribution piping rather than black iron or PVC to avoid blockage from contaminant build-up.
- **Reduce short-cycling:** Use proper-sized air receivers and no-loss drain valves.
- **Use master sequencing controls:** For multiple units, combine baseload compressors with a VSD trim unit.

## Start saving today.

For more ideas and to learn what rebates are available, call the Solutions for Business team at (866) 277-5605, email us at [aps.solutionsforbusiness@dnv.com](mailto:aps.solutionsforbusiness@dnv.com) or visit [aps.com/businessrebates](http://aps.com/businessrebates).

## Compressed Air Costs

### Total System Costs

Convert horsepower output to electrical power input in kilowatts (kW). Then multiply by the run time (hours) and the electric rate (\$/kWh). Use the following calculations:

$$\text{Operating power input (kW)} = \text{horsepower output (hp)} \times 0.746/\text{efficiency}$$

$$\text{Cost of operation} = \text{power input (kW)} \times \text{time (hours)} \times \text{energy costs (\$/kWh)}$$

### Example Calculation

A 40 hp compressor running 4,000 hours per year with a motor efficiency of 85%.

$$\text{Operating power input (kW)} = 40 \text{ hp} \times 0.746/0.85 = 35 \text{ kW}$$

$$\text{Cost of operation} = 35 \text{ kW} \times 4,000 \text{ hours} \times \$0.06/\text{kWh} = \$8,400$$

### Air Leak Costs

Repairing leaks is the first step to reducing costs. Identify the size of the air leak hole and the system pressure. The specific power of the system is the kW power input of an entire compressor package for every 100 cfm of compressed air output. If unknown, assume 24 kW/100 cfm.

$$\text{Annual leak cost} = \text{leak rate (cfm)} \times \text{specific power at pressure (kW/100 cfm)} \times \text{operating hours} \times \text{energy costs (\$/kWh)}$$

As you can see in the table below, only one 1/4-inch leak at 125 psi will cost you over \$15,000 every year (\$1,280 per month).

$$\text{Annual leak cost} = 122 \text{ cfm} \times 24 \text{ kW} \div 100 \text{ cfm} \times 8,760 \text{ hours} \times \$0.06/\text{kWh} = \$15,390$$

Leak Rate, CFM			Annual Leak Costs		
Leak Size	90 psig	125 psig	Leak Size	90 psig	125 psig
1/16"	5.7	7.7	1/16"	\$720	\$970
1/4"	92	122	1/4"	\$11,600	\$15,390
3/8"	207	275	3/8"	\$26,110	\$34,690