

# Rockwell Automation Mining Solution

## Compressed Air System



### Application challenges

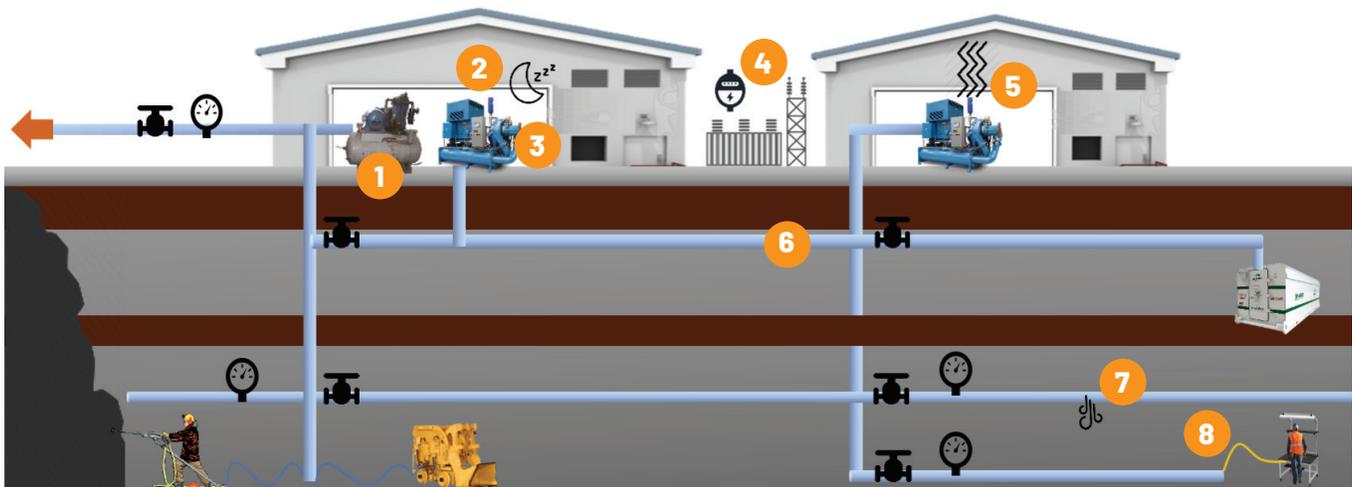
Compressed air networks are made up of several interconnected systems that each have specific compressed air requirements and operating schedules. In some areas of the system, air demand changes according to mining shifts and the presence of workers, while other areas continuously require constant air supply. The minimum network pressure can't drop below the requirements of the most demanding area.

### Compressed air systems in mining

Compressed air is used for many applications in surface and underground mines – from exploration to ore processing. In some underground mines, compressed air is a preferred energy source since it is more flexible, reliable and cost-effective than diesel or electric power.

### Compressor challenges (illustrated below)

1. Aging installations are hard to maintain and control, and there's no visibility into how each piece of the system is operating, and when a failure might occur.
2. Compressors are often run unnecessarily, 24 hours a day.
3. Varying air demand occurs throughout the production day.
4. Compressors use a lot of energy – in fact, 70% of a compressor's cost is energy.
5. Compressor surge (aerodynamic instability in axial or centrifugal compressors) results in blade fatigue or even mechanical failure.
6. It's difficult to match the compressed air supply with system demand.
7. Systems often have air leaks.
8. Excessive pressure drop results in poor system performance and excessive energy consumption.



## Our solutions

Our integrated process control/automation, motor control and analytics architectures deliver several benefits across mining operations, including compressed air systems.

As the core of our mining architectures, RAMS (Rockwell Automation Mining Solution) delivers dedicated mining functionalities that are built on standard PlantPax® systems:

- Pre-engineered content for control, monitoring and reporting
- Mining-specific functions, with dedicated control strategies for compressor controls – multi-compressor coordinated control and integrated anti-surge protection

### Multi-compressor control

Multi-compressor control significantly improves system efficiency in a distributed compressor system. The illustration to the right shows the difference that can be seen before and after applying multi-compressor control.

Our solution delivers centralized master control by applying optimization algorithms that reduce energy and maximize equipment output across the compressed air network.

Power monitoring tools provide information regarding energy usage. And built-in productivity reports deliver user-friendly insights about overall compressor system performance.

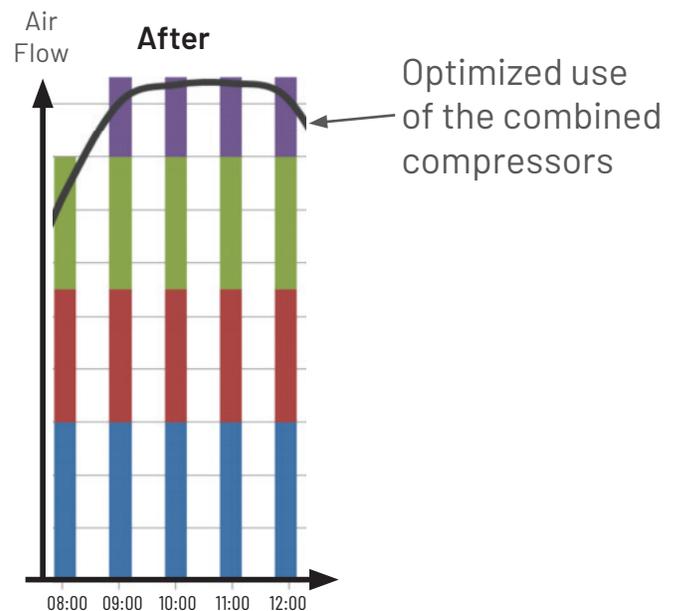
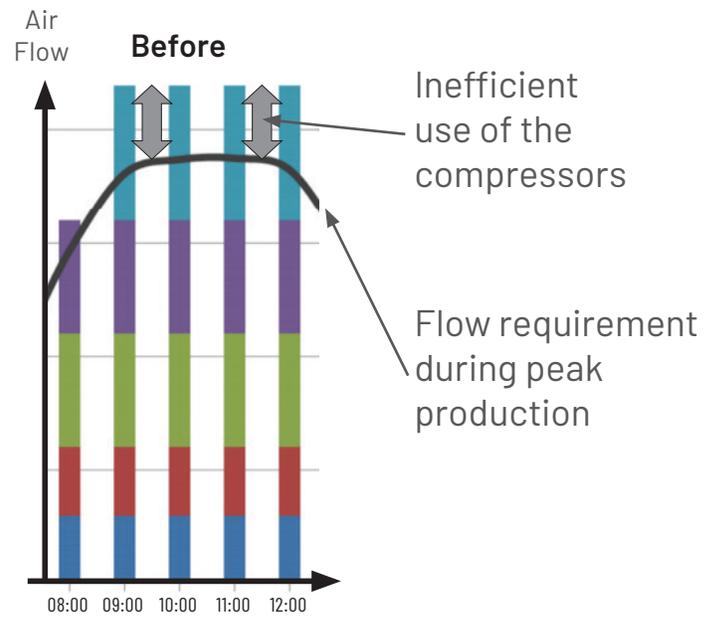
### Anti-surge control

Anti-surge valves are designed to open within three seconds of detecting a surge condition to prevent equipment failure associated with pressure spikes. Anti-surge valves are effective, but every time a valve is activated, air is released and consequently energy is wasted.

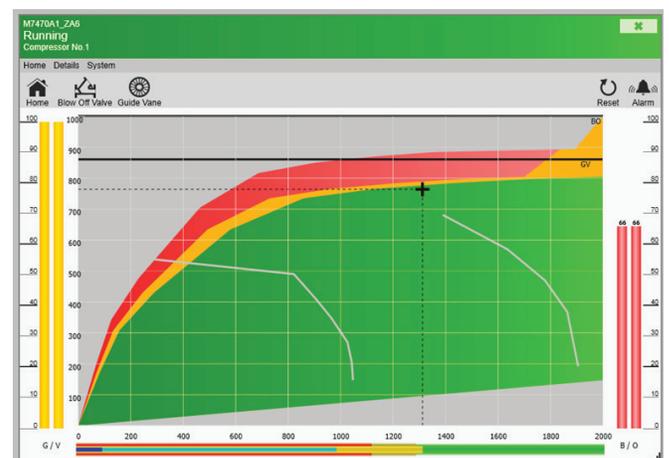
Our anti-surge control solution provides a safe and efficient way to control compressor surge. The solution is based on an advanced surge control algorithm. Instead of a universal setpoint, our solution uses a dynamic setpoint value that is a function of the compressor's operating point and surge control line values. The function understands the flow and pressure ratio associated with a surge condition – and prevents the compressor from surging by opening the anti-surge valve.

The surge line is obtained by performing a standard surge test on the compressor at different inlet valve positions. The surge points are recorded and interpolated to generate a precise surge line.

### Multi-compressor control



### Anti-surge control



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