Design and piping layout of industrial compressed air systems

Industrial applications of compressed air range from food processing to beverage production to operations for natural gas recovery and transportation. Considering that compressed air is integral to the success of various production processes， it is vital that it meets the required usage specifications.

The key to achieving a high quality compressed air supply is to create and implement an optimized compressed air system plan. This article will consider all aspects of design and piping layout to properly produce and transport compressed air that is free of impurities.

How to Layout a Compressed Air Piping System

The effectiveness of an air compressor system is determined by the way its components are installed. To achieve optimum efficiency， system operators need to consider the various installation variables and avoid common mistakes that impede satisfactory process performance.

Key Factors in Industrial Compressed Air System Design

Piping design for compressed air systems requires engineers to consider the following four important factors.

Elevated water vapor/wet gas levels

Sharp piping angles

Obstacles that impede compressed air flow

Choice of piping materials

Ignoring these factors will result in a significant reduction in the efficiency of the finished air system.

Water vapor/moisture

In the process of compressing air， the generation of water vapor is an unavoidable by-product. Water vapor comes from the moisture in the ambient air used as a feedstock for compressed air production.

Excess moisture can damage certain types of piping because it accelerates the onset of corrosion. In addition， rusted pipes can form oxides that can be dislodged from the pipe walls into the circulating compressed air， leading to blockages. Overall， the efficiency of the system is reduced.

Effective measures to eliminate moisture from compressed air piping include the use of drying towers， air cooling units and moisture filters. These methods will pull water vapor out of the compressed air system and protect its components from damage.

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Sharp pipe angles

The presence of sharp bends in the piping of a compressed air system can slow down the flow rate and thus reduce the pressure of the supply air. Air flowing through these sharp bends can become turbulent， which reduces the flow rate of the fluid and therefore requires the compressor to work twice as hard to compensate for the pressure being discharged from the system.

Minimizing the amount of turbulence in the air compressor piping can be accomplished by installing gentler bends in the piping. A bend between 30 and 45 degrees will allow the operator to achieve maximum efficiency.

Obstacles to compressed air flow

The lumen of compressor piping can become blocked after wall corrosion and the accumulation of other particulate impurities. Flow obstructions in the air compressor line setup can be detected by changes in pressure readings at various points in the pipeline. A high pressure reading will be obtained before the obstruction and a lower reading will be obtained downstream of the obstruction.

Overcoming obstructions requires the installation of an air filter and regular maintenance of the compressor piping.

Selection of Piping Materials