

PRACTICAL GUIDE TO PLANNING A COMPRESSED AIR NETWORK PROJECT:

6 POINTS TO CONSIDER



TOPRING

Compressed air solutions

INTRODUCTION

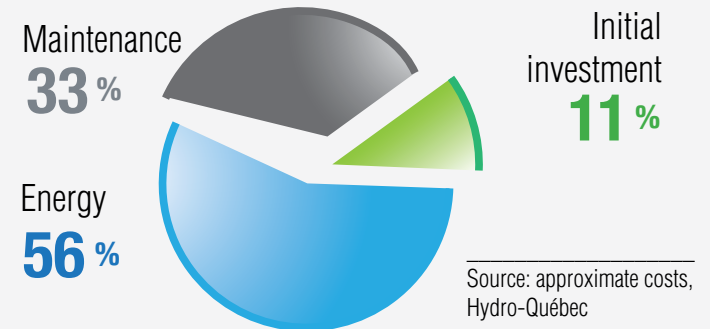
Compressed air is an important source of energy. It is used in many different industries. A properly planned compressed air network will ensure energy efficiency, reduce the costs associated with producing and distributing compressed air.

That is why selecting quality materials and adapted components is so important to limit maintenance costs and improve energy efficiency over the years of service.

Why is compressed air an advantageous source of energy ?

- > Lower operating costs than electricity
- > Clean energy - does not create dust
- > Precision - ability of regulating volume and pressure
- > Compact installation - requires less space
- > Reduced fire hazards - no sparks.
- > Centralized maintenance - directly at the compressor .

Breakdown of costs associated to compressed air system over 10 years



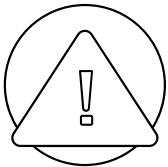
**Compressed air
accounts for about 10%
of electricity consumption
in industry**

PRIORITIES AND CHALLENGES ASSOCIATED WITH AIR NETWORKS

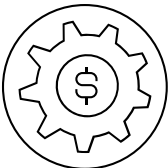
Each compressed air network project is unique because of the varying needs of users and multiple configuration possibilities. A good network design will ensure optimal results.



The main priorities



Ensure user safety



Improve efficiency to reduce operating costs



Optimize the performance of
pneumatic equipment and tools

The biggest challenges

- > **VOLUME:** Produce enough air to service all points
- > **CLEAN:** Eliminate the presence of water and other contaminants in the system
- > **AIR TIGHT:** Eliminate air leaks

6 POINTS TO CONSIDER BEFORE STARTING YOUR PROJECT

To help you to carry out a safe, efficient and performing compressed air network project, here are 6 of the most important points to consider:

- 1** In what context will the compressed air be used?
- 2** What volume of air do I need to power all pneumatic equipment and tools?
- 3** Where are the pneumatic equipment and tools located?
- 4** Which network configuration is best?
- 5** What air quality do I need?
- 6** Who will do the installation?

«The safety, efficiency and performance of the compressed air network are based on each element of the specific needs of the company, such as the application, the frequency of use, the needs for air (volume), the infrastructure of the plant, type of equipment, etc.»

***Philip Le Moyne**, Technical Advisor at Topring for 22 years*

1 IN WHAT CONTEXT WILL COMPRESSED AIR BE USED?

Before starting a project, the type of application must be determined, because each application requires different specifications (air volume, air quality).

Questions to be considered:

- > What will be the applications?
- > Which pneumatic equipment or tools will be used?
- > How often will it be used?
- > What are the conditions of the work environment?

Examples of applications by industry:



General industry

Machinery and equipment, pneumatic tools



Body shop

Paint application requiring clean, high quality air



Garage

Use of tools requiring a large volume of air (impact tools)



Tire workshop

Use of nitrogen for inflation



Machine shop

Use of blow guns for cleaning parts

2 WHAT TOTAL AIR VOLUME DO I NEED?

The total airflow required to supply all pneumatic equipment and tools must be calculated. The more workstations and equipment there will be, the higher the amount of air required. Therefore, the diameter of the air network should be large enough to deliver a sufficient quantity of air, at the required pressure for all points of use.

Questions to be considered:

- > What are my needs for compressed air?
- > How many pneumatic equipment and tools will be used?
- > What volume of air (SCFM) do they need to operate efficiently?
- > What is the required frequency of use (daily vs occasional)?
- > What will be the duration of use (continuous vs. fixed periods)?

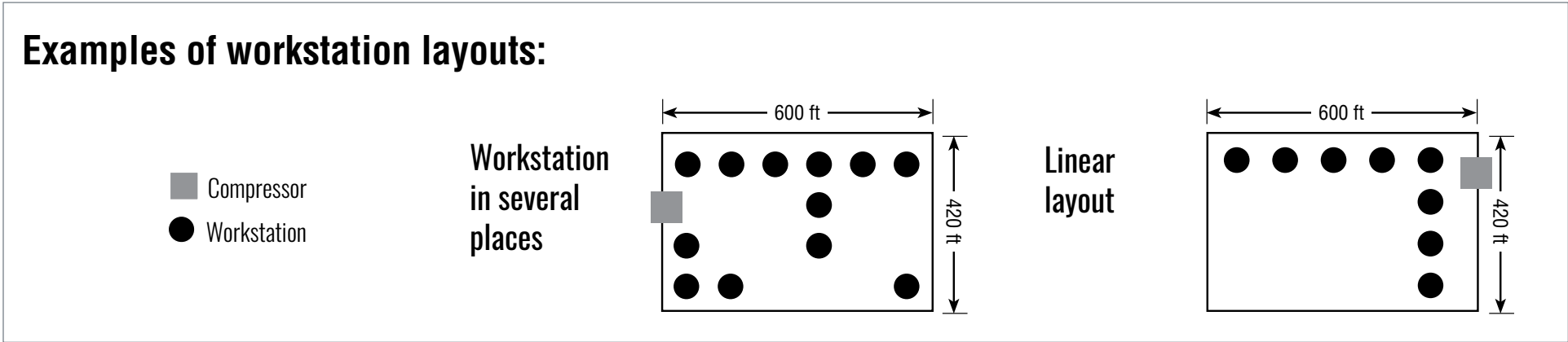


3 WHERE IS THE EQUIPMENT LOCATED?

It is important to know the layout and workflow location where the air network will be installed. This will have an important influence on the type of configuration to choose. The location of the compressor, the distance to be covered and all the required drops must be taken into account. The total length of the network, in linear feet, will dictate the diameter of the piping required for the network and its configuration.

Questions to be considered:

- > What is the layout of the plant?
- > What are the locations and layouts of each of the workstations (tools and equipment)?
- > Where will the compressor be located?
- > How far should the air network go (total distance / workshop dimensions)?
- > How many drops (descents) do I need?



4

WHICH NETWORK CONFIGURATION IS BEST?

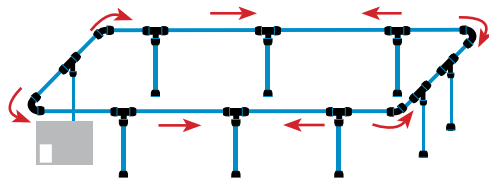
The optimal configuration of the compressed air network will depend on the layout of the plant or workshop. Closed loop networks are considered to be the most efficient configurations because they ensure optimal consistency at all points of use. The goal is to achieve a balance between the demand for air volume (flow measured in SCFM) and the required pressure (in PSI). This factor will determine the optimal pipe diameter of the main line.

Questions to be considered:

- > Which network configuration is best for my situation?
- > Am I able to predict my future needs (plant expansion)?

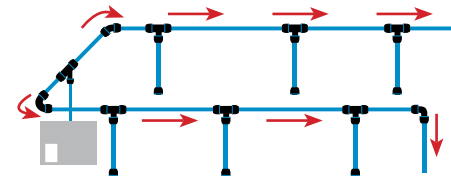
Configuration options:

Closed loop








- > Compressed air flows through several lines simultaneously.
- > Pressure and airflow are balanced throughout the network.
- > The air drops (descents) are powered by two sources.
- > Extensions can be easily added to extend the network.

Linear



It is better to opt for a linear network when a closed loop configuration is not possible. To power the air in both directions, the compressor must be located in the center of the network (from the compressor to the furthest point of use).

Air consumption of various pneumatic tools

SANDERS		Flow SCFM	IMPACT TOOLS		Flow SCFM	DRILLS		Flow SCFM
	Sanders	9.6		Miniature 1/4" ratchet	12.5		3/8" air drill	17.3
	4-1/2" angle grinder	18.4		1/4" impact gun	14.0		3/8" reversible air drill	23.8
	10 mm belt sander	18.9		3/8" ratchet	19.2		1/2" reversible air drill	26.4
	7" angle sander	29.6		Zip gun	21.9			
NAILERS/STAPLERS		Flow SCFM	POLISHING TOOLS		Flow SCFM	OTHER TOOLS		Flow SCFM
	18 gauge nailer/stapler	0.02 SCF/cycle		Orbital polisher	16.6		Riveter	0.08 SCF/cycle
	22-18 gauge stapler	0.03 SCF/cycle		3/4" impact gun	34.7		Grease gun	0.8 SCF/cycle
	Finishing nailer	0.03 SCF/cycle		1" impact gun	87.5		Caulking gun	0.1
	Roofing nailer	0.05 SCF/cycle					HVLP paint gun	9.5
	Framing nailer	0.09 SCF/cycle					Screw driver	9.6
							Gravity fed sand blaster	12.0

Indicative data according to continuous use

Guide to determine the pipe diameter (mm) required for a compressed air system

TOTAL LENGTH OF THE NETWORK (FEET)

	100'	150'	200'	250'	300'	400'	500'	600'	700'	800'	900'	1000'	1250'	1500'	2000'
5	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16
10	16	16	16	16	16	16	16	16	16	16	16	16	16	16	20
15	16	16	16	16	16	16	16	16	16	20	20	20	20	20	20
20	16	16	16	16	16	16	20	20	20	20	20	20	20	20	25
30	16	16	16	20	20	20	20	20	20	20	25	25	25	25	25
40	16	20	20	20	20	20	25	25	25	25	25	25	25	25	32
60	20	20	20	25	25	25	25	25	25	25	32	32	32	32	32
80	20	25	25	25	25	25	32	32	32	32	32	32	32	32	40
100	25	25	25	25	25	32	32	32	32	32	32	32	40	40	40
125	25	25	25	32	32	32	32	32	32	32	40	40	40	40	40
150	25	32	32	32	32	32	32	40	40	40	40	40	40	40	50
200	32	32	32	32	32	40	40	40	40	40	40	40	50	50	50
300	32	32	40	40	40	40	40	50	50	50	50	50	50	50	63
400	40	40	40	40	40	50	50	50	50	50	50	63	63	63	63
500	40	40	40	50	50	50	50	50	63	63	63	63	63	63	63
750	50	50	50	50	63	63	63	63	63	63	63	63	80	80	80
1000	50	50	63	63	63	63	63	63	80	80	80	80	80	80	80
1500	63	63	63	63	80	80	80	80	80	80	80	80	80	80	80

Data based on a closed loop network

The total airflow is the sum of each requirement of all pneumatic tools and equipment used on the network

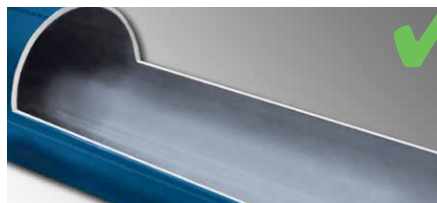
5 WHAT QUALITY OF AIR DO I NEED?

To ensure that compressed air is clean and dry, choose materials that will not corrode and treat the air properly. Untreated air will damage tools and equipment by the presence of water and condensate.

Questions to be considered:

- > What type of pipe material to choose?
- > What air quality is required for my application or industry?

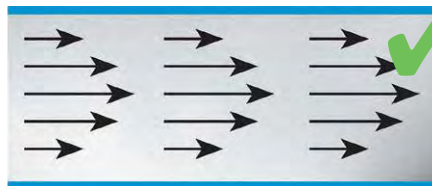
The benefits of aluminium piping (versus steel pipes):



Aluminium pipes resist corrosion and do not deteriorate.



Traditional pipes rust and accumulate contaminants.



Aluminium pipes allow air to circulate freely without any friction.



Rust causes friction and consequently an air turbulence contributing to pressure drops.

The importance of condensate treatment

- > Compressed air produced by the compressor contains water and impurities such as oil and dust. Effective condensate treatment provides clean and dry compressed air.
- > This is possible by adding filters, air dryers and drains at the compressor outlet. To allow for proper and lawful disposal of these condensates water/oil separators must be installed. Separators also reduce risks of poor air quality at the access points.



Air treatment at the application

- > Since the air requirements vary between different tools or equipment, filters, regulators and lubricators must be added to the different service points.
- > Certain types of tools or equipment require lubrication.
- > Certain applications like paint will require extremely clean and dry air.



6 WHO WILL DO THE INSTALLATION?

It is important that the compressed air network is installed by an expert who understands the rules of installation and safety.

Questions to be considered :

- > Who will install the network? Is the installer qualified?
- > Have I read the “Design and Installation Guide” for compressed air?

The advantages of installing an aluminium network:



Using lightweight aluminium pipes, reduce assembly time and effort



Compression fittings are easy to install



Easier and faster to mount than conventional pipe (reduced installation costs)

SIMULATION

Here is a simulation using the 6 points to consider before starting an air network project.

Step 1 – In what context will the compressed air be used?

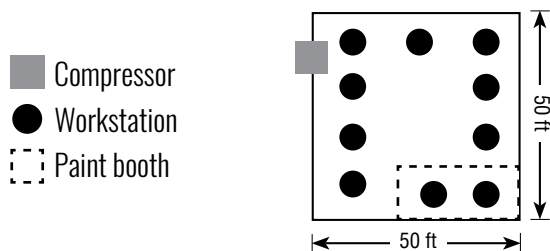
The owner of a furniture manufacturing plant wants to build a new compressed air system.

Step 2 – What volume of air do I need ?

The plan is to install 10 workstations and they have estimated that 25 pneumatic tools will be used continuously (nailers, sandblasters and spray guns).

Step 3 – What is the location of my pneumatic equipment ?

The plant is 50 feet x 50 feet. Below, the diagram of its layout.



Step 4 – Which network configuration is best?

A closed-loop compressed air network is the most optimal solution. According to the calculations, 40 mm outside diameter pipes will be required for the main network. The network will require 10 drops (descents) to feed each workstation.

Calculation of needs	25 pneumatic tools = ± 450 SCFM
	50 feet x 4 walls = 200 feet linear network
	Outside pipe diameter = 40 mm (see table p.9)

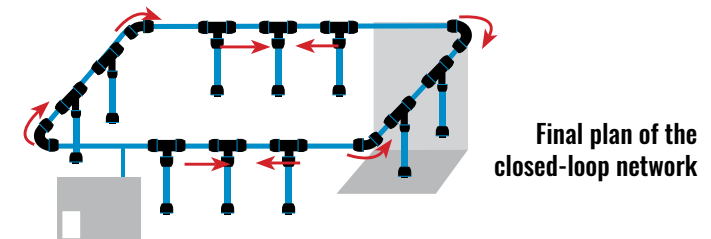
Step 5 – What air quality do I need?

To ensure the quality of finished products, the installation will require:

- > An aluminium piping system for compressed air that does not corrode;
- > A water separator and a refrigerant air dryer at the compressor outlet;
- > A water/oil separator at the compressor outlet that recovers contaminants and complies with the condensate treatment legislation;
- > Air treatment units for each application (desiccation filtration for the paint booth).

Step 6 – Who will execute the installation?

The air network will be installed by a firm of experts with relevant experience in compressed air networks and that are familiar with safety instructions.



WE CAN HELP YOU WITH YOUR PROJECT!

Topring can help you with your compressed air piping system project. We offer customized solutions, including consulting services to guide you through each step of your project. Ask our technical team for an evaluation, for more information, or simply to tell us about your project.

We also offer advanced technical resources for engineers and installers (product drawings, layout plans, evaluation tools, calculators, technical training, etc.)



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