

Prof. Ing. Dario Pozzetto

Department of Engineering and Architecture – University of Trieste

Via Valerio, 10 – 34127 Trieste – Tel: 040.558.3805 / 7982 Fax: 040.558.3812

E-mail: pozzetto@units.it

INDUSTRIAL PLANTS II

Chapter one (part two):

**Piping – Fluid distribution plants – Dimensioning of
compressed air plant in an industry**

**DOUBLE DEGREE MASTER IN
“PRODUCTION ENGINEERING AND MANAGEMENT”**

**SEAT OF PORDENONE
UNIVERSITY OF TRIESTE**

Dimensioning of compressed air plant in an industry

The company considered

The company performs precision machining third parties.

It's specializes in machining by chip removal and works on the production of small and medium series aimed at different markets, including also the automotive market.

The company also carries out the mechanical assembly which, however, have a bearing on the volume of marginal activities. The ATECOFIN classification is as follows: Activity Code 25.62.00, general mechanical engineering.

The plant will be fitted with two saws, five multi-pallet horizontal machining centers vertical four centers, four lathes, three adjustments and other machine tools dedicated to minor odd jobs (drills, grinders).

Dimensioning of compressed air plant in an industry

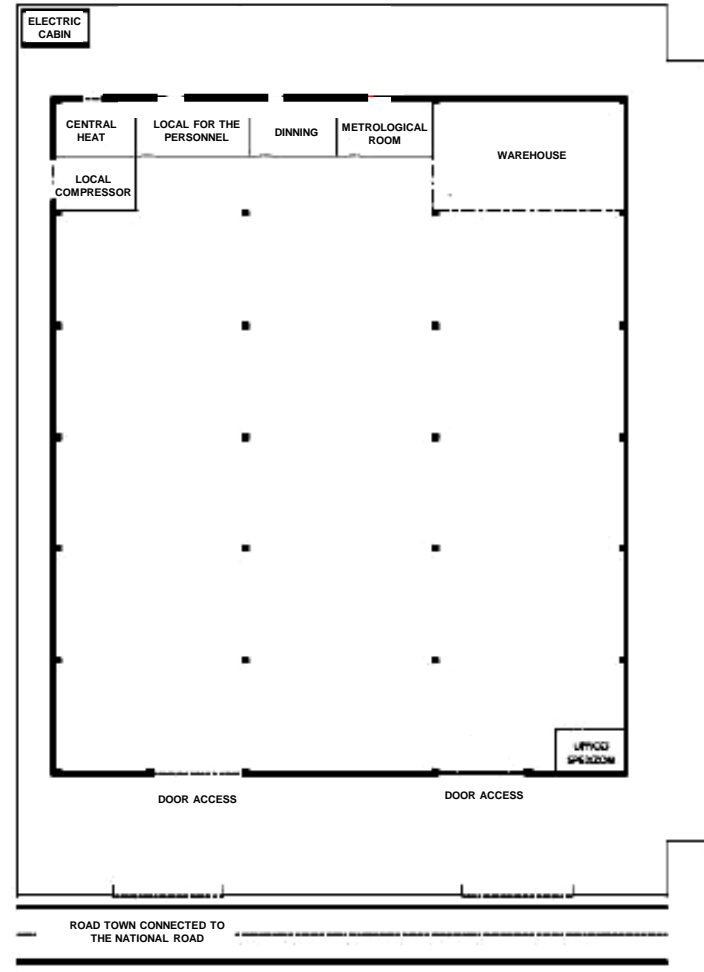
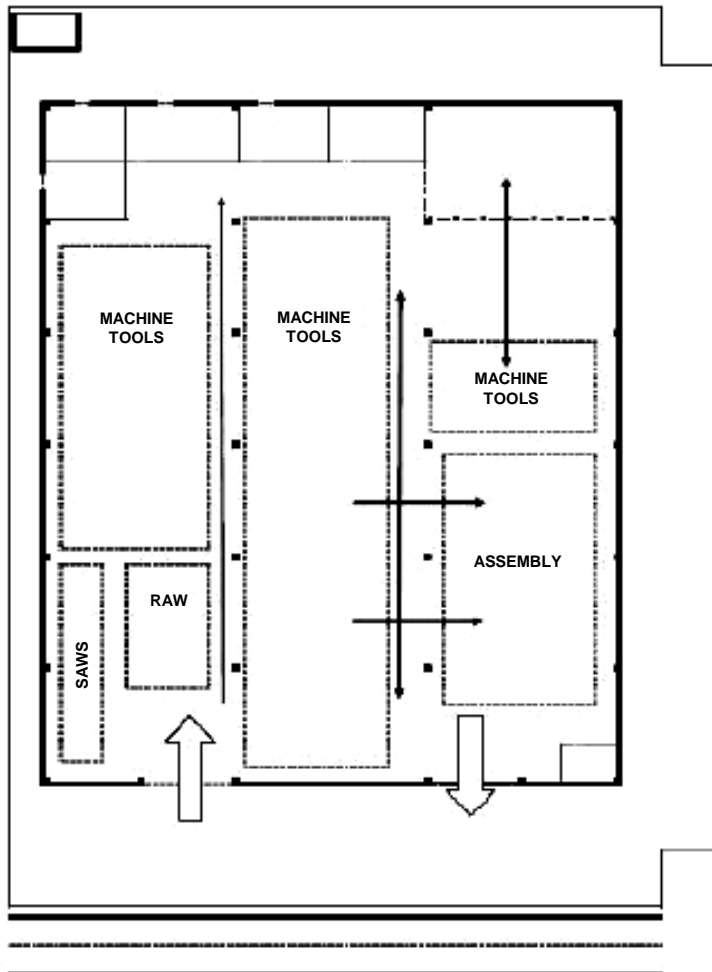
The company considered

The processes are organized by lot, the individual workpieces are unlikely to exceed 50 kg, 100 kg ever, the internal movement is organized on pallets and bins, there is no need a bridge crane, except in the area of saws for operations handling of rough round or billet.

The process flow is as follows: purchase of raw materials and the design details, cutting rough machining processes, heat treatment and surface finishing of parts, assembly, packaging and shipping.

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The compressed air serves for the supply of tools screwdrivers and removal of processing residues on the pieces.

The distribution of compressed air will be guaranteed by means of a ring (with tubes of diameter 32 mm) placed under chain wire with decreased central and derivations on workstations. The solution has the advantage that, since it is a closed circuit, allows a greater balance to use points and also makes possible the cutting of parts of the system subject of any modifications or maintenance, without having to totally stop the availability of compressed air.

The ring itself has a certain volume and is therefore able to act as a buffer tank, thus helping to maintain a constant pressure, especially when there is a request or sudden consisting of air.

Dimensioning of compressed air plant in an industry

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The predicted compressed air system includes two rotary compressors CSC 60/8 screw with a power of 45 kW, can provide 7790 dm³/min of compressed air at a pressure of 8 bar.



Dimensioning of compressed air plant in an industry

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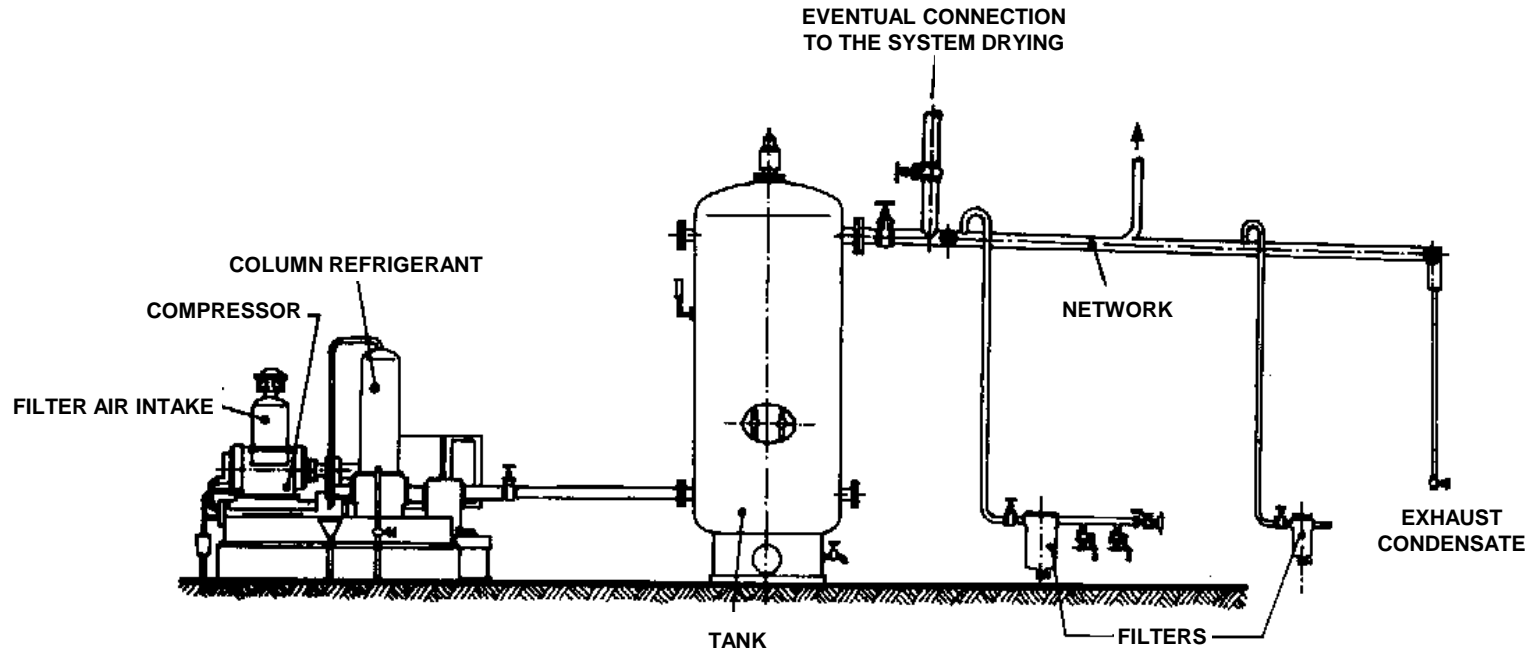
The two compressors are used in rotation for redundancy necessary and to be ready to support any peaks in demand for compressed air. The system also provides a refrigeration dryer DLX.140, with a power of 2.64 kW capable of treating 13,900 dm³/min of compressed air at a pressure of 16 bar.

Even the plant dryer is displaced in the compressor compartment, while the radiator for heat dissipation is placed on an opening on the external structure of the shed.

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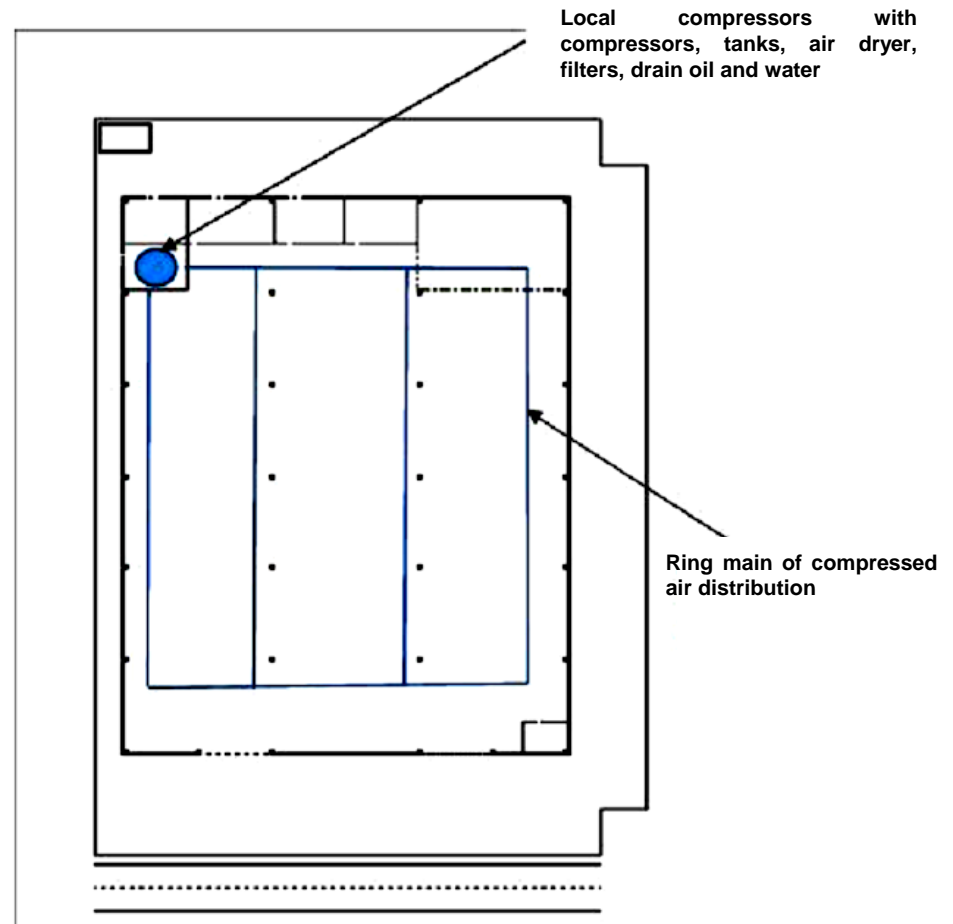
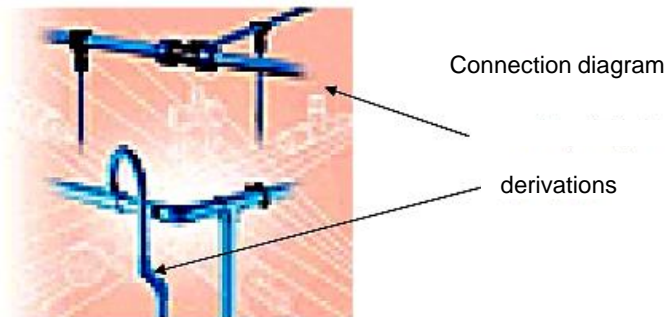
Complete the equipment of the compressor room galvanized two tanks each of 900 dm³ (figure), with safety valve 1" and 30,000 dm³/min.



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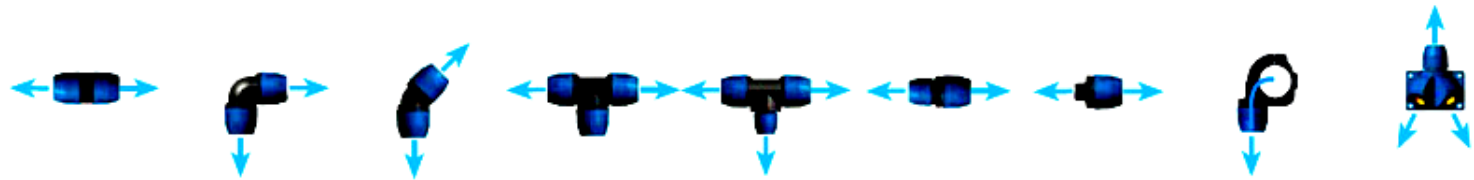
Considering an average of 20 stations in the system of access to compressed air (figure) and average use less than $1 \text{ m}^3/\text{h}$ can be expected to total requirements of less than $30 \text{ Nm}^3/\text{h}$. The connection diagram of the leads to the main ring is:



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The planned facility will have a main ring of the total length of 240 meters. The effective length, I will have to be increased by the presence of corners and other types of fittings depending on the pipe diameter in mm (table).



	QLMAPA	QLGO90PA	QLGO45PA	QLTEPA	QLTRPA	QLRIDPA	QLMNPA	QLDERPA	QLAPL
16	0,1	0,7		0,1			0,1		2
20	0,2	1,2	1	0,2			0,2		3
25	0,2	2	1,3	0,3	1,8		0,2	2	4
32	0,3	3	1,5	0,3	2,4	0,8	0,3	3	
40	0,3	3,6	1,8	0,4	3,5	1,2	0,3	4	
50	0,4	4,3	2,1	0,4	5,5	1,6	0,4	6	
63	0,5	5		0,5			0,4	7	
80	0,7	6,4		0,5			0,4	9	

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From the analysis of the plant are present the fittings shown in the table

Type of fitting	Number	Meters/fitting per diameter D 32 mm	Meters total
Jointing fittings of the piping	10	0,3	3,0
Right angle fittings	6	3,0	18,0
Fittings at T	4	2,4	9,6
Fittings for air intake	20	0,3	6,0
			36,6

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For dimensional calculations, we assume a ring of compressed air for a total of 280 meters. The table shows that for a flow rate of 30 Nm³/h is sufficient for the main ring of the compressed air tube having a diameter of 25 mm.

SELECTION OF TUBE QLTUAL FOR THE PRINCIPAL RING
 Values referred to a pressure of 8 bar and a maximum pressure drop of 5%

Nm ³ /h	NI / min	Distance between the compressor and the utilization most distant (meters)								
		25	50	100	150	200	300	400	500	1000
36	600	16	16	20	20	25	25	25	25	32
54	900	16	20	20	25	25	25	32	32	40
72	1200	20	25	25	25	32	32	32	32	40
105	1750	25	25	32	32	32	40	40	40	50
150	2500	25	32	32	32	40	40	40	50	50
210	3500	32	32	40	40	40	50	50	50	63
270	4500	32	32	40	40	50	50	50	50	63
360	6000	40	40	40	50	50	50	63	63	63
510	8500	40	40	50	50	50	63	63	63	80
720	12000	50	50	50	63	63	63	80	80	80
1080	18000	50	63	63	63	80	80	80	80	
1260	21000	63	63	63	80	80	80	80		
1860	31000	63	80	80	80	80				
2700	45000	80	80	80						

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However, given the possibility of further expansion of the compressed air demand, caused by the installation of plants not covered by the current configuration, it is preferred to use a tube with a diameter of 32 mm.