Eliminate Permanently the use of Compressed Air (Arc 2.4233)

(The analysis below was extracted from one of the assessment reports by the Clemson University Industrial Assessment Center (IAC). This is only an example recommendation and hence, not all the background information and sources for numbers are included here.)

Est. Electric Consumption Savings	= ***426,167 kWh/year***
Est. Electric Consumption Cost Savings	= ***$28,310.27/year***
Est. Electric Demand Savings	= ***119 kW***
Est. Electric Demand Cost Savings	= ***$533/year***
Est. Total Cost Savings	= ***$28,843 /year***
Est. Implementation Cost	= ***$8,860***
Simple Payback Period	= ***3.7 months***

Recommended Action:
It is recommended that the use of compressed air be completely and permanently eliminated. Electric powered tools will be used as a replacement.

Background:
The plant has two compressors: a 100-horsepower compressor operating at 98 PSI for 5,550 hours annually and a 60-horsepower compressor operating at 98 PSI for 275 hours annually. The air is run throughout the plant to 22 air-powered hand tools and 32 hoses used for station blow-off and cleaning. The hand tools are used for 7 hours a day and the blow-off hoses are used for 5 minutes a day. The plant is charged $.06643/kWh for electric usage and $4.47/kW for electric demand.

Anticipated Savings:
By completely eliminating the compressed air system, the annual savings can be calculated as follows:

Table 1: Air Compressor Data

Air Compressor Size	Annual Operating Hours	Annual Electric Consumption	Annual Electric Consumption Cost
100 HP / 74.57 kW	5,550 hours	413,863.5 kWh	$27,492.95
60 HP / 44.74 kW	275 hours	12,303.5 kWh	$817.32
Total	**N/A**	**426,167 kWh**	**$28,310.27**

The annual *electric consumption savings* are calculated as follows

$$\text{Electric Consumption Savings (ECS)} = \text{Compressor Size} \times \text{Hours of Operation}$$

$$\text{ECS} = 74.57\ \text{kW} \times 5{,}550\ \text{hours} + 44.74\ \text{kW} \times 275\ \text{hours}$$

$$\text{ECS} = 413{,}863.5\ \text{kWh} + 12{,}303.5\ \text{kWh}$$

$$\boldsymbol{\text{ECS} = 426{,}167\ \text{kWh}}$$

The annual *electric consumption cost savings* are calculated as follows

$$\text{Electric Consumption Cost Savings (ECCS)} = \text{ECS} \times (\$0.04778/\text{kWh})$$

$$\text{ECCS} = 426{,}167\ \text{kWh} \times (\$0.04778/\text{kWh})$$

$$\boldsymbol{ECCS = \$28{,}310}$$

The estimated annual *electric demand savings, EDS*, from eliminating the entire compressed air system is determined by the following relation:

$$\text{EDS} = 74.57\ \text{kW} + 4.74\ \text{kW}$$

$$\boldsymbol{EDS = 119.3\ kW}$$

The estimated annual *electric demand cost savings, EDCS,* from eliminating the entire compressed air system is determined by the following relation:

$$\text{EDCS}=\text{EDS} \times \$4.47/\text{kW}$$

$$\boldsymbol{EDCS = 119.3 \times \$4.47/kW = \$533}$$

The *total cost savings, TCS*, associated with the elimination of entire compressed air system is determined by the following relation:

$$\text{TCS} = (\text{ECCS} + \text{EDCS})$$

$$\boldsymbol{TCS = (28{,}310 + 533) = \$28{,}843}$$

Implementation Cost:
To substitute the use of pneumatic tools, several electric tools and accessories must be purchased. Using the number of tools previously used, the same number of tools will need to be purchased. This total sum of these costs is the *implementation cost*.

Table 2: Equipment Installation Cost

Equipment to Purchase	Cost	Number of Pieces	Total Cost
Ryobi One+ Hand Tools	$150	23	$3,450
Ryobi One+ 18-volt Batteries	$50	46	$2,300
Jet-black Portable Air Blower	$1,395	2	$2,790
Ryobi 18-volt 6-bay Battery Charger	$80	4	$320
Total	**N/A**	**N/A**	**$8,860**

Implementation Cost (IC) = Cost of Equipment

IC = $8,860

Simple Payback Period:

The *simple payback period (SPP)* is the time that passes before the estimated total cost savings equal the estimated implementation cost, and is calculated by:

$$SPP = \frac{IC}{ECCS} \times 12\ months/yr$$

$$SPP = \frac{\$8{,}860}{\$28{,}843/yr.} \times 12\ months/yr$$

SPP = 3.7 Months