

## The Visible Cost of Air

### A Worksheet to Assist in Identifying Compressed Air Saving Opportunities

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#### Overview

Can you see air? Not usually, but you can see the visible impact air has on your company's "bottom-line." Compressed air costs your company real money, usually a substantial amount of money. Compressed air is often taken for granted as a necessary cost, and is often abused and wasted. Its cost flows into the nebulous pot called, "overhead." Because of this, it tends to get squandered and misused.

There is a wealth of handbooks and "how-to" publications available on the market. However the reader may need a PhD in engineering to decipher the mountains of calculations and constants. This Fact Sheet is different in its approach and methodology. It will provide general, practical rule-of-thumb applications and recommendations. It will provide the user a simple worksheet to assist in identifying areas of opportunity that may exist at one's own facility. Once realizing this, the user may then seek additional assistance from a professional air management service provider who will assess the system and recommend equipment and determine costs.

#### Air Survey

List each compressor's horsepower: \_\_\_\_\_  
(EXAMPLE 2-50HP AND 1-25HP)

#### Cost of Compressed Air Calculation- 2 items needed

- Average cost per kWh
- Calculation of total annual compressor operating hours

a. \$0.\_\_\_\_  
(Example \$0.06/kWh)

b. \_\_\_\_\_ Total Annual Hours  
(24hrs x 7days = 8,760 hours/year)

#### Calculation:

Qty. HP x 0.746 /0.9 x Cost per kWh x Total Annual Hours = \$Annual Cost

*Example from above: 125HP x 0.746 /0.9 x \$0.06 x 8,760 = \$54,458 per year*

#### Work Area

\_\_\_\_\_ x 0.746/0.9 x \_\_\_\_\_ x \_\_\_\_\_ = \$ \_\_\_\_\_

*Note: If operating less than one 30HP compressor return on investment, improvements may be hard to justify. Longer return on investments is typical on small systems.*

## Compressed Air Survey Questionnaire

**Check any conditions listed below that apply**

**1. Does the plant have multiple compressors with no sequencing or controls to automatically start and/or stop compressors based on the demand in the plant?**

**Yes**    **No**

*Compressors that are sequenced, automatically turn on/off based on demand...a huge savings potential versus manual operation.*

**2. Does the plant have open air blowing of compressed air for parts clean up or cooling or vacuum generation?**

**Yes**    **No**

*Besides a safety concern, open-end tubes waste large amounts of air.  
Recommendation: replace with high-efficient safety nozzles that reduce air consumption up to 40-50% and substantially reduce noise levels. Or utilize high-volume, low-pressure air blowers instead of compressed air.*

**3. Does the plant have a known Leakage/ Waste problem?**

**Yes**    **No**

*During a quiet time, turn up compressor to maximum setting and listen for leaks or use ultrasonic leak detection equipment that will identify leaks in noisy environments. Then fix those leaks!*

**4. Is the compressor operating at a higher pressure at the discharge of the compressor and lower pressure at the point of use?**

**Yes**    **No**

Work Area

Compressor Pressure Setting: \_\_\_\_\_ vs.    PSI Needed: \_\_\_\_\_

*(EXAMPLE: Compressor air pressure setting: 120 PSIG vs. actual needed 90 PSIG in plant*

Rule of Thumb:

Extra "just-in-case" compressed air costs an additional 5% energy for every additional 10 PSIG increment. This costs money!

**5. Is the plant experiencing a water problem due to liquid water in the air system... creating rust, scale and maintenance problems?**

Yes  No

*Water rusts air tools, contaminates painting systems and rusts piping. Keep water in the water lines, not the air lines.*

**6. Are air dryers currently in use?**

Yes  No

**Refrigerated or Regenerative (circle one)**

*Not to be confused with after-coolers, which typically is part of the compressor system. Dryers remove the remaining water after-coolers pass. Regenerative systems require additional energy to "regenerate" the desiccant, but produces dryer, higher quality air.*

**7. Is compressor heat reclamation currently in use?**

Yes  No

*Waste heat is not always a waste, but can be reclaimed for other uses. This heat can be recovered and reused to heat water, air, etc.*

**8. Compressor Operations and Maintenance: (All strongly Recommended)**

**Is there a maintenance program in place?**

Yes  No

**Is the Air filter clean and regularly changed?**

Yes  No

**Is the After cooler / Air Dryer Condenser clean?**

Yes  No

**9. Loaded vs. Unloaded Hours- Compressor Utilization \_\_\_\_\_%**

Calculation

Total Loaded Hrs./Total Operating Hrs x 100 = Loading Utilization %

Example: 6,000hrs/10,000hrs x 100= 60%

Work Area

\_\_\_\_\_ Loaded Hrs / Operating Hrs x 100= \_\_\_\_\_%

Higher percentages equates to higher utilization. Compressors consume energy even when not making (loading) air.

**10. Is the pipe size adequate for the compressor's output?**

**Yes**  **No**

If the compressor output is unknown, estimate compressor output as follows:

\_\_\_\_\_ x 5 = \_\_\_\_\_ CFM (not exact but close for this comparison)

Work Area

\_\_\_\_\_ HP x 5 = \_\_\_\_\_ Compressor CFM vs. \_\_\_\_\_ CFM Capacity of Pipe

Compressor CFM should be less than capacity of pipe; otherwise situation creates a restriction, an example, "like blowing through a straw."

Table of Pipe Capacities

1" Black Iron Pipe	109 CFM
1.5" Black Iron Pipe	245 CFM
2" Black Iron Pipe	436 CFM
2.5" Black Iron Pipe	680 CFM
3" Black Iron Pipe	980 CFM
4" Black Iron Pipe	1744 CFM

**11. Is there adequate air storage?**

**Yes**  **No**

General Estimation

\_\_\_\_\_ HP x 5 = \_\_\_\_\_ Compressor CFM

Then, \_\_\_\_\_ Compressor CFM x 5 = \_\_\_\_\_ gallons of recommended storage

The Dept. of Energy recommends the above storage for load/no load energy savings. Don't consider the "air in the pipes" as storage. It will provide only a split-second of air supply. Storage pays for itself in maximizing the efficiency of the entire air system.

**12. Does the plant utilize a flow or pressure controller, stabilizing pressure at +/- 1 PSID through out the plant?**

**Yes**   **No**

*Equipment is available (called Intermediate Controllers) that enable a facility to run varying pressures to multiple locations, thereby eliminating one plant-wide pressure. This offers additional energy savings potential by generating only what's needed.*

**CONTACT INFORMATION**

Assistance with identifying compressed air savings opportunities from ISTC personnel in offices located across Illinois. Please visit [www.istc.illinois.edu](http://www.istc.illinois.edu) for local contact information.