PERMAWELD PVT LTD

HOW MUCH COMPRESSED AIR DOES A LARGE PROCESSING PLANT LOSE?

Introduction

Many years ago, detailed studies of hundreds of industrial sites were done by the U.S. Department of Energy and it found that only 50% of all the compressed air produced in the average plant is used wisely. The other 50% is consumed through higher airflow caused by high pressure (called artificial demand), lost through inappropriate use, and wasted by general leakage. The average leakage level was found to be between 20 and 30 percent of the total. Experienced leak auditors will tell you some plants waste far more than average, with leakage levels of over 80% not uncommon.

It is very common to see industrial plants with extremely tight maintenance budgets and a shortage of maintenance staff. As a result, routine maintenance falls by the wayside and only priority breakdown maintenance is done. Leakage management becomes a lower priority because the wasted compressed air flow typically does not cause any immediate problem unless it becomes extreme.

Many times, there is no regularly scheduled leakage management program programmed into the plant work management system. The major opportunity to save energy is in the prevention of leaks in the compressed air system. Leaks frequently occur at air receivers, relief valves, pipe and hose joints, shut off valves, quick release couplings, tools and equipment.

Air leakages through different size orifices

Compressed air is a very costly way to transmit energy to industrial machines and processes. It usually takes between seven and eight horsepower (hp) of input energy to produce one hp of work at the end use. This high cost also makes it very costly to waste compressed air. For a compressed air system running at its peak efficiency, 24 hours/day, seven days a week, consuming electricity worth 5 rupees per kilowatt hour, even a leak sized at 1/16th of an inch, which is a hole smaller than the head of a match, will consume over 70,000 rupees worth of electricity per year.

The table below gives the amount of compressed air wasted for different orifice sizes and pressure.

Table 1.3.a. Discharge of air (CFM) through orifice

barG	0.5mm	1mm	2mm	3mm	5mm	10mm
0.5	0.06	0.22	0.92	2.1	5.7	22.8
1.0	0.08	0.33	1.33	3.0	8.4	33.6
2.5	0.14	0.58	2.33	5.5	14.6	58.6
5.0	0.25	0.97	3.92	8.8	24.4	97.5
7.0	0.33	1.31	5.19	11.6	32.5	129.0

Cost of compressed air leakage

The table below shows the cost involved for various sizes of leak in a typical processing plant. Any expenditure spent on stopping leaks would be paid back through energy saving.

Table 1.3.b. Cost of Air Leakage		
Orifice Size mm	**kW Wasted**	***Cost of Air leakage (Rs/year)**
0.8	0.2	8000
1.6	0.8	32000
3.1	3.0	120000
6.4	12.0	480000

**based on Rs. 5/kWh; 8000 operating hours; air at 7 barG*

Best practices for leakage assessment

In conducting leak assessments following steps come up when researching the practices of the best performing industrial plants.

Baseline & Monitor

The best plants keep track of their leaks with flow meters and can identify where they are at and how much they have saved each time they do their leakage assessments.

Detect, Document & Fix

Carry out regular compressed air leak audits say once a year using a reliable ultrasound leak detector instrument. The leaks are all tagged, documented, and recorded in a database so the location can be easily found again and the required parts for repair procured. The database will provide an ongoing record of the trouble locations and the financial savings, which is available for staff and management. In all cases, a successful program requires someone to take responsibility for the follow-up of the leakage repair.

Verification

Excellent leakage reduction programs ensure the results of the leakage repair is captured by some sort of easy to use monitoring system, with real savings calculated. This can go a long way in proving to management the benefits of spending the staff time in repairing the leaks. The monitoring systems can also serve as a catalyst to further efforts. If the plant leakage level is regularly monitored, and a significant change is detected, emergency detection and repair efforts can be initiated.

Permaweld an expertise in leak detection

Permaweld with more than 13 years of experience in compressed air leak detection services is the right option one can consider for plant's leak detection task. Looking at the numbers below, it is nearly impossible for one to rule out Permaweld.

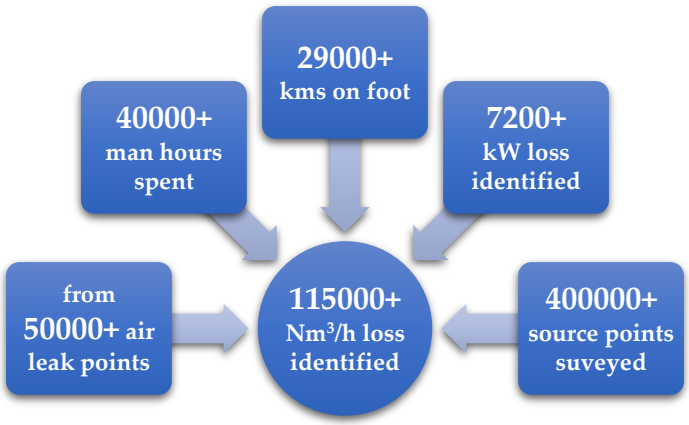

Fig 1.3.a. Air leak survey data from process industries

The above data came from 100+ audits performed by Permaweld at various industrial levels. Approximately 4 lakh potential source points like threaded joints, flange joints, elbows etc., has been surveyed. These critical source points due to friction from high velocity compressed air goes into wear and tear, eventually forming into leak points. There will be thousands of such points in an exceptionally large processing plant.

If you ever thought of which source point is most vulnerable to air leakage, then the following graph will be helpful which is the breakup of 50000+ air leak points identified by Permaweld till date.

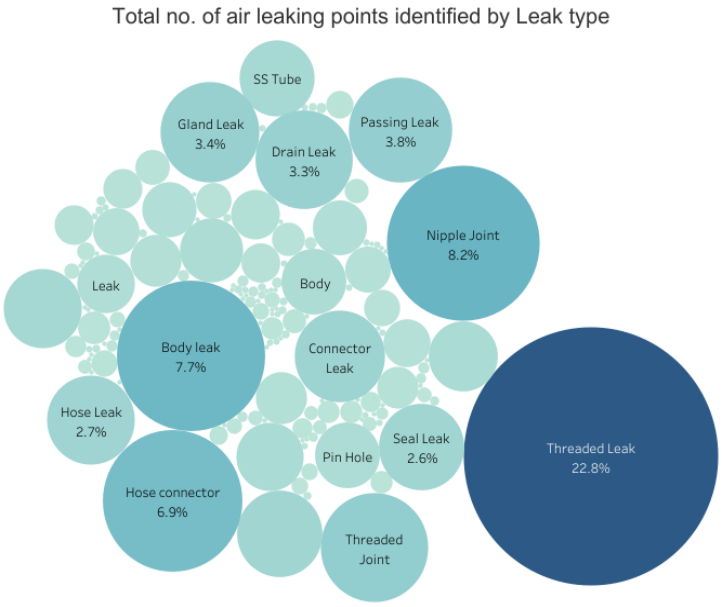

Fig 1.3.b. Leak percentage from different source points

We saw earlier that the big orifice size leakages contribute more to total air loss compared to small orifice leakages. Generally, a plant may suffer from 10% big leaks of total leaks, but 10% big leaks contribute to 60-70% of compressed air loss. Below graph gives clear explanation on different categories of leak and its losses.

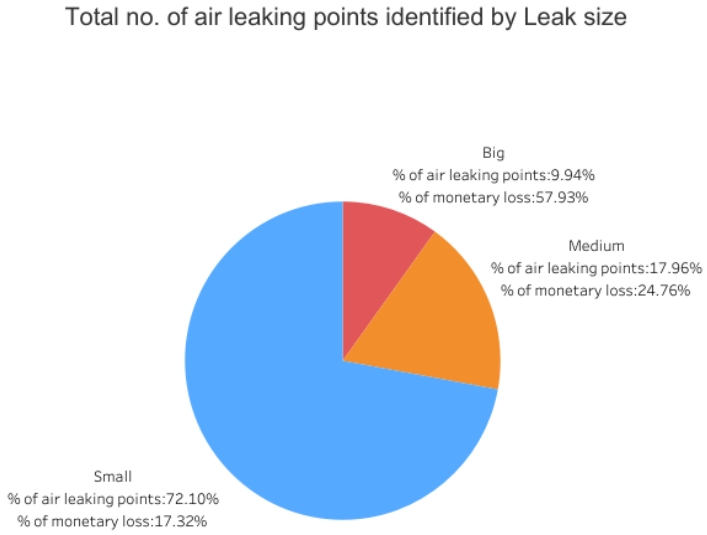

Fig 1.3.c. Impact of Big Leaks over Small Leaks

New leaks emerge every day in an extremely large processing plant. It is a never-ending factor. Keeping this in mind, doing a compressed air leak survey every year mandatorily will keep the losses under control. If you wonder how much it will benefit an organization by doing periodic audits, then you may have to look the below graph.

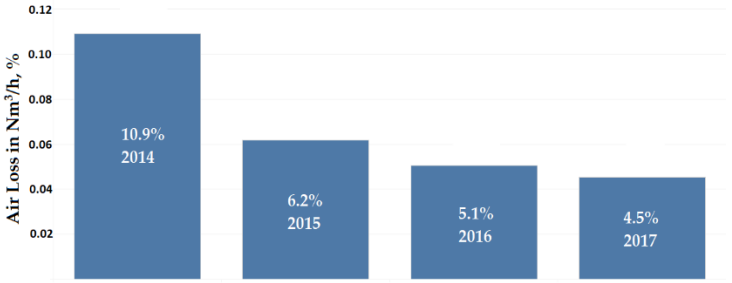

Fig 1.3.d. Reduction in air leak % after successive audit

Conclusion

In summary we know that compressed air is an expensive utility to waste. Most compressed air systems have a significant number of leaks that reduce system efficiency and increase costs. High system pressure and poor air compressor efficiency can further increase the electrical bill.

Key to managing system waste is to do regular compressed air leakage assessments. Capturing a baseline, carefully finding and documenting leaks, and ensuring they are quickly repaired is an important part of plant maintenance. Verifying the savings gained through your efforts can inform management their money is well spent.

- *Maxwell Dennis*
Energy Auditor, BEE