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WASTE REDUCTION

Waste Reduction

This paper is part two of a four-part collection of white papers created to address four crucial aspects of the pharmaceutical industry. Success in the pharmaceutical industry requires attention to detail on a microscopic level. This paper provides readers with crucial information for diagnosing potential compressed air system leaks and reducing energy waste from leaking compressed air systems. Not surprisingly, an increase in the leak's diameter is matched with an increase in production costs, which can become significant over the course of a year. Understanding how to recognize the sign of a compressed air system leak is essential for minimizing the effects of leaks and preventing unnecessary costs.

THE COST OF LEAKS

Compressed air is costly. A compressed air system leak is even costlier. It is a reality of the pharmaceutical industry that all compressed air systems have leaks. Generally speaking, leaks are commonly found in joints and connection areas of the system such as pipe joints, disconnects and thread sealants. Other common leak locations include manufacturing equipment, couplings, hoses, tubes and pressure regulators. Untreated leaks allow moisture to ingress into the compressed air system. When air is escaping out of the compressor due to the leak, moisture is being simultaneously sucked into the compressor, putting clean, dry air at risk. Leaks also affect the compressed air system by causing a drop in overall system pressure from air escaping through the holes, which forces the compressed air system to utilize more energy to maintain the same level of productivity. While the exact increase in energy costs varies by the compressed air system, a reliable estimation can be determined using the table for compressed air through an orifice. Simply identify the size of the orifice and the pressure at which is escaping, and the table will return a flow value, usually in cfm. Consider most compressors are delivering approximately 5 to 6 cfm per kW and you can calculate how much that leak costs annually using this formula:

CFM/5.5 (kW) x # hours per year x power costs ($/kW-hr) = cost of the leak in $/year

DETECTING LEAKS

Leaks are unavoidable. The real question is how many leaks does the system have? The best tool to combat a drop in energy efficiency and spiked operation costs is learning to conduct leak assessments. Air leaks are near impossible for the naked eye to detect, so alternative methods are required to locate them. A simple stroll through the plant to listen for the distinct hissing sound associated with leaks is an effective way of detecting larger leaks.

For the more common leaks undetectable to the human ear, an ultrasonic acoustic detector will pick up the high-frequency hiss of a less-noisy, yet costly, system leak. Ingersoll Rand provides ultrasonic leak detection services utilizing tags for visual identification of the waste due to leaks. Additionally, Ingersoll Rand provides a full report with cost estimates due to leaks as well as a prioritization list for addressing the worst leaks first.

As an alternative, an effective self-assessment method for detecting leaks is brushing soapy water on suspect areas to reveal the air leaks. While a reliable method for identifying leaks, it is not the most expedient.

Pressure (psig)	Diameter of Orifice (inches)					
	1/32	1/16	1/8	1/4	3/8	1/2
35	0.70	2.81	11.3	40.5	101	180
40	0.77	3.10	12.4	49.6	112	198
45	0.85	3.38	13.5	54.1	122	216
50	0.92	3.66	14.7	58.6	132	235
60	1.06	4.23	16.9	67.6	152	271
70	1.20	4.79	19.2	76.7	173	307
80	1.34	5.36	21.4	85.7	193	343
90	1.48	5.92	23.7	94.8	213	379
100	1.62	6.49	26.0	104	234	415
110	1.76	7.05	28.2	113	254	452
120	1.91	7.62	30.5	122	274	488
125	1.98	7.90	31.6	126	284	506

LEAK ASSESSMENT REMEDIATION AND BEYOND

Internally inspecting the plant for leaks is a viable option, and hopefully, the previous paragraph provides several ideas for implementing routine leak assessments in regular maintenance rounds. However, consulting an external expert to run a professional compressed air system assessment on a monthly basis has its own benefits. In addition to measuring energy consumption and output of a compressed air system, an auditor can measure air loss as a result of leaks, as well as test for additional, hidden areas of waste. These routine leak assessments can also reveal larger problems in the system. For example, if a leak is located, repaired, and then recurred, it can point to an overall system issue, such as corroding materials or worn components, allowing plant managers the opportunity to resolve the root cause.

Identifying leaks is only the beginning of the solution. Once leaks are detected in the system, the plant manager needs to determine how to efficiently resolve the problem without impacting production. After assessing loss and performance issues due to system leaks and identifying leaks throughout the compressed air system, an assessment engineer can provide a more comprehensive report of waste

contributors with a recommended course of action and suggest the best direction for dealing with the areas of waste in a timely, cost-efficient manner. With extensive experience and expertise in the industry, an assessment engineer can significantly reduce waste in a compressed air system beyond the cost of leaks.

CONCLUSION

Reducing energy consumption due to leaked air is essential for effective production in pharmaceutical applications. Partner with a knowledgeable industry leader in compressed air system auditing like Ingersoll Rand to improve the operation of your facility and reduce overall product costs. Ingersoll Rand understands that leaks are unavoidable and offers a comprehensive leak assessment program to help customers improve the efficiency, reliability, and quality of their compressed air systems. The next paper in the series will focus on system predictability and predictive maintenance methods you can use to ensure your system stays up and running all year round.

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