Minnesota Technical Assistance Program

COMPRESSED AIR LEAKS IN FOOD MANUFACTURING

Overview

Compressed air is commonly used in manufacturing facilities for powering a wide range of equipment and processes. Despite its importance and ubiquity, compressed air systems are prone to leaks, which can lead to significant energy losses and operational inefficiencies.

Common Compressed Air Applications

- Air-actuated valves to control fluid flow
- Maintenance tools (e.g., pneumatic drills)
- Packaging equipment to ensure proper sealing
- Product transfer (e.g., air blown into pipes to push residual liquid products)

MnTAP staff typically use an ultrasonic leak detector to determine the location of compressed air leaks in a facility. These handheld devices detect high-frequency sound waves produced by air escaping under pressure. They filter out background noise while enabling pinpoint leak identification and accurate tagging for repair. The ultrasonic leak detector outputs a decibel (dB) reading. This dB reading and the system pressure can be used to calculate air loss in cubic feet per minute (CFM) based on reference charts, such as this one supplied by UE Systems for their line of ultrasonic leak detectors. For example, a leak with a decibel reading of 20 dB and a system pressure of 150 PSI corresponds to a leak rate of 1.34 CFM. From there, the effective power loss, energy savings, and cost savings can also be calculated.

Dairy Product Manufacturing Example

NAICS Code: 3115**
Industry Sector: Dairy Product Manufacturing
EPA Region 5

Energy savings:
6,100 kWh

Cost savings:
$360

Status:
Implemented

During a visit to a dairy processor, MnTAP staff identified a compressed air leak at the air compressor storage tank in the raw milk storage area. Based on a gauge pressure of 110 pounds per inch and the air compressor being in constant operation, MnTAP staff estimated a leak size of 1/16 of an inch, which would consume approximately 6,100 kilowatt-hours (kWh) of energy and $360 annually. At MnTAP's recommendation, the facility fixed the leak by repairing the connection and is performing routine inspections on any equipment using compressed air for leaks.

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About MnTAP

The Minnesota Technical Assistance Program (MnTAP) is a confidential, no-cost, and non-regulatory program at the University of Minnesota that provides technical assistance focused on pollution prevention to organizations in Minnesota.

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Commercial Bakery Example

NAICS Code: 3118**
Industry Sector: Bakeries and Tortilla Manufacturing

Energy savings:
11,790 kWh

Cost savings:
$1,190

Status:
Under Review

MnTAP visited a commercial bakery where compressed air was used in several locations. Using an ultrasonic leak detector, MnTAP staff identified three compressed air leaks at their site visit and was able to estimate the potential energy savings of fixing them based on the average specific power of the air compressors.

Many of the compressed air lines at this facility were in the ceiling and inaccessible to MnTAP staff. However, by fixing these leaks above, the facility would save 11,790 kWh and $1,190 each year. MnTAP also recommended an annual compressed air audit to be carried out by the facility or by a third-party contractor.

Produce Processing Facility Example

NAICS Code: 3114
Industry Sector: Specialty Food Manufacturing

Energy savings:
26,000 kWh

Cost savings:
$3,300

Status:
Under Review

At a produce processing facility, MnTAP observed a total of 24 compressed air tubes with an approximate inner diameter of 1/16 of an inch. All tubes had regulators that ranged in pressure from 40 to 60 pounds per square inch (psi). Their average was around 50 psi, which would result in a discharge of 3.66 cfm per tube or a total discharge of 88 cfm (calculated using this table from the Engineers Edge website). MnTAP reviewed the specifications of the facility air compressors and determined that at its maximum efficiency, the main compressor has a specific power of 19.27 kilowatt (kW) or 100 cfm (calculated using Performance Data Sheets from the Quincy Compressor). The facility's average electricity rate is $0.0922 per kilowatt-hour (kWh) with a monthly average of $161 per kW. Consequently, the current system of compressed air conveyance uses a minimum of 84,000 kWh per year, and this results in a draw of 17 kW and costs approximately $10,000 annually.

Low-flow nozzles, which could use as little as 2.5 cfm at 80 psi, could be tested at one point on the conveyance line to determine viability. If compatible, installing nozzles would reduce the power draw of conveyance from 17 kW to approximately 12 kW, resulting in an annual reduction in energy use of 26,000 kWh and cost savings of $3,300. The cost of the nozzles would be around $2,100 with a payback period of seven months. Rebates may be offered by local energy utilities, especially when nozzle replacement is coupled with a compressed air audit by a utility-approved vendor.

Conclusion

These examples show how even small compressed air leaks can lead to significant energy and cost savings when addressed. Facilities that repaired air leaks saw annual savings ranging from a few hundred to several thousand dollars. Simple actions, like repairing fittings or installing low-flow nozzles, often had paybacks in under a year. Regular audits and proactive maintenance are key to reducing energy losses.