Minnesota Technical Assistance Program

COMPRESSED AIR ENERGY EFFICIENCY IN MEAT PROCESSING

NAICS Code: 3116**
Industry Sector: Animal Slaughtering and Processing
EPA Region 5

Introduction

Meat processing can be an energy-intensive manufacturing sector. Many facilities require energy for heating, cooling, conveyance, processing, packaging, and frozen storage. Energy can either be directly consumed by the system (e.g., a conveyor belt using electricity) or by a support system (e.g., a boiler using electricity to produce steam for pasteurization). Collectively, these operational costs can add up, and many improvements, such as replacing one's chiller system with a more efficient model, can be cost prohibitive.

A mechanical system that frequently has low-cost opportunities for optimization is compressed air. Replacing compressed air systems with alternatives, such as blowers, pneumatic devices, or servos, is among the most effective strategies for boosting efficiency and can reduce a facility's energy use by up to 90%. However, these alternatives can be expensive and disrupt production. Easier and quicker ways to improve efficiency include running compressed air only when needed and adjusting the flow rate to meet the minimal requirements for systems to operate.

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.

Meat Processing Example

An animal processing facility approached MnTAP for ways to improve its energy use. During a visit, MnTAP staff members observed how compressed air was heavily utilized throughout production to aerate tanks, brine, package, and more. While onsite, MnTAP identified four opportunities to reduce compressed air use through system substitution and the installation of controls.

1. Switch from Compressed Air to Blowers in the Packaging Area

Dry cleanup means physically removing waste and byproducts from equipment and floor before pre-rinsing, washing with appropriate detergent, and rinsing. When waste and byproducts are collected before being processed by a rendering company, less effluent waste, which is high in BOD and TSS, can be hosed down and discharged as wastewater.

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Energy Savings:
50,000 kWh

Cost savings:
$9,000

Status:
Implemented

to 10,000 kWh and annual costs by $18,000.

Following MnTAP's analysis, the facility elected to replace half the compressed air use with a blower, for a total implemented annual savings of 50,000 kWh and $9,000.

2. Install Shut-off Valves on Brining Guns at the Brining Area

Energy Savings:
2,300 kWh

Cost savings:
$360

Status:
Implemented

Employees use compressed air to inject brine into the meat. These two brining guns continue to blow compressed air even when employees are off duty, such as before and after work hours or during lunch and breaks. Based on the operational schedules, MnTAP staff members calculated that these off-duty periods amounted to approximately 1,300 hours per year. By installing shut-off valves for employees to turn off compressed air when not working, this could save the facility an estimated 2,300 kWh and $360 per year.

3. Reduce Compressed Air Use for Blowing Away Excess Packaging

Energy Savings:
150,000 or
60,000 kWh

Cost savings:
$16,000 or $4,200

Status:
Proposed

The facility uses compressed air to blow away excess packaging, and this continues to operate even when production is not running. Replacing the compressed air with a blower or fan would be the most effective solution and has projected energy savings of 150,000 kWh and associated cost reduction of $16,000 annually. Alternatively, installing a shut-off valve could be a more cost-effective and straightforward solution; this approach would still reduce consumption by 60,000 kWh and $4,200 per year.

4. Install a Timer on Compressors

Energy Savings:
2,300 kWh

Cost savings:
$360

Status:
Implemented

An analysis of annual runtime revealed that the compressors ran about 600 hours longer each year than the actual production time required. An interview with the maintenance manager help identified delays in start-up and shut-down processes as the cause. Installing timers to align compressors' operating time more closely with production hours can save an estimated 2,300 kWh and $360 per year while minimizing startup and shutdown tasks.

Conclusion

All industrial facilities must manage energy consumption and operational costs. However, low-cost energy efficiency improvements exist, which can reduce energy use and operating costs while minimizing any implementation expenses on the bottom line. Compressed air system inspections, leak detection, and engineering controls can help facilities match their energy use with their production needs. The implemented recommendations above helped the facility save almost 55,000 kWh of energy and $10,000 while maintaining its high production standards.