Donaldson Company

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Organization Background

Donaldson Company, Inc. was founded in 1915 by Frank Donaldson Sr. to sell air filters for tractors. The company grew and specialized in engine and industrial filtration systems for many different business sectors. In 1962, Donaldson moved its headquarters to Bloomington Minnesota, and it continues to employ 1,250 people in Minnesota. The company has also grown internationally with 12,500 employees and 140 facilities located across 44 nations around the world.

My summer internship with MnTAP and Donaldson was an excellent opportunity. With guidance from professionals in the field with industry experience, I was able to learn a lot about manufacturing and gain real-life engineering skills. I am very grateful to the MnTAP staff and to all members of Donaldson who helped contribute to a positive internship experience." ~ SI

Project Background

Donaldson performs testing on air oil filters that remove oil from compressed air. This takes place in the compressed air lab, which has several compressors operating according to testing requirements at the time. Testing on these filters requires the compressors to always operate at maximum loading, as the pressure of the air must remain constant to meet the International Organization for Standardization (ISO) testing standards.

Once testing is complete, the compressed air is currently being vented into the atmosphere. The project team was interested in exploring whether some of this air, or its associated energy value, could be harnessed for reuse. This project seeks to identify options to recapture or reuse this air to save energy and reduce costs at Donaldson

Incentives To Change

Donaldson has 2030 Environmental and Social Ambitions, including a goal of 42% carbon reduction in alignment with science-based targets from the Intergovernmental Panel on Climate Change. The compressed air lab uses 950,000 kWh/yr per year in energy. This is a substantial source of compressed air energy, which could be harvested for energy generation or reused to help Donaldson reach its carbon reduction goals.

SOLUTIONS

Link the Lab and House Compressors

The lab compressed air that is currently being vented could instead be connected to the main house compressor lines to feed the main house compressed air. To achieve this, pressure downstream of testing should be regulated to ensure the test compressors never turn off. Installing a pressure regulator or digital valve between the test lines and the house lines could ensure the test compressors experience a consistent pressure drop to maintain dependable test conditions. This project tried maintaining the system pressure with a large pressure relief valve, but that valve's pressure control capabilities were not accurate enough for this purpose. Instead, Donaldson should further explore a digital valve or pressure regulator valve to allow for this venting and to connect the house and lab compressed air systems. The maximum achievable energy savings for this suggestion is 480,000 kilowatt-hours (kWh) per year with an annual cost savings of $48,400. On top of this, connecting the compressed air systems may deter the purchase of new house air compressors, which would lead to additional savings.

Solutions

Install an Energy Recovery System

An alternative to reusing the lab compressed air is to install an energy recovery system with a gas turbine and a generator to convert the compressed air back into energy. The gas turbine would be added at the exhaust of the vented air, and the generator would connect to the main power grid. This would allow for energy to be recovered from the vented air while also ensuring that the filter testing is uninterrupted. The potential savings for this solution is 570,000 kWh per year or an annual cost savings of $57,000. This solution also does not require new valve testing, as the air will still be consistently released downstream to maintain consistent test conditions.

Fix Air Leaks

It is recommended that Donaldson performs an air leak audit and fixes air leaks. After a brief air leak audit of certain sections of Donaldson's Bloomington campus, around 7,700 kWh or over $770 worth of leaks per year were found. Performing a deeper air leak audit to find and mark all the leaks throughout the Bloomington campus could yield additional savings for Donaldson.

"Sanat brought enthusiasm to his work at Donaldson, tackling an opportunity in our Compressor Lab. His project centered around finding a second use for the energy lost in compressed air, an often-overlooked but significant area of potential energy savings. By working closely with various stakeholders and navigating their concerns, Sanat was able to gather data, conduct tests, and build relationships within the company—all within the short span of the summer internship. His efforts resulted in a concept that we can now use to justify future implementation."

~ Hans Wucherpfennig
Donaldson Company, Inc.

Recommendation	Annual Reduction	Annual Savings	Status
Link the Lab and House Compressors	484,000 kWh	$48,400	Investigating
Install an Energy Recovery System	570,000 kWh	$57,000	Recommended
Fix Air Leaks (20% of facility assessed)	7,700 kWh	$770	Recommended

MnTAP Advisor: Jon Vanyo, Senior Engineer