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HVAC CASE STUDY

Research Firm Engineers a Smaller Energy Footprint

Firm's new office came with old technology.

Ecotope, an energy efficiency engineering and research firm in downtown Seattle, outgrew their office space and decided to lease the third floor of a 3.5-story mixed-use building. The building's existing heating and cooling equipment featured an all-electric, variable air volume (VAV) rooftop unit (RTU) with electric resistance terminal heat in the individual zones, including open office areas, conference rooms, a shared breakroom and a server room.

At more than 100 years old, the building featured an uninsulated brick exterior and inefficient aluminum-framed double-pane windows that combined with an inefficient existing HVAC system to generate significant energy waste. "The existing system wasn't going to cut it for us from an efficiency perspective," said Jonathan Heller, president of Ecotope.

> "What people don't always realize is that just because a system isn't broken, it doesn't mean there isn't a great deal of benefit in replacing it to save energy and increase the building's value."
>
> *— Jonathan Heller, President, Ecotope, Inc.*

Project Overview

Building Type
Office

Project Floor Area
5,911 sq. ft.

Energy Utility/Program
Seattle City Light

Total Project Cost
$16.18 per sq. ft.

Annual Reduction in GHG Emissions
42%[1]

Reduction in Total Building Energy Use
42%

HVAC upgrades downsize energy waste.

Prior to moving in, Ecotope worked with the property management company to replace the existing HVAC system with state-of-the-art HVAC technologies that would reduce their energy footprint. They landed on the very high efficiency dedicated outside air system (very high efficiency DOAS) approach.

DOAS separates heating and cooling from the ventilation system to allow for optimal control of each of these critical building functions. Building on the DOAS concept, the very high efficiency DOAS approach includes heat recovery ventilation and focuses on increased equipment efficiency and optimized system design. This approach has proven to yield significant energy savings in new and existing commercial buildings while also providing:

- **Increased occupant comfort**
- **Improved indoor air quality** due to filtered 100% outside air being brought into the space
- **Lower energy bills** because the very high efficiency HRV allows for a smaller heating and cooling system that runs less often
- **Saved roof space** through system downsizing and reduced ductwork
- **Precise temperature and humidity control**

Results

Since upgrading to the new and efficient HVAC system, energy use has declined by 42% for the firm's third-floor office space. The project is also expected to significantly reduce peak demand up to 38% in summer and 56% in winter. In addition to the cost savings and improved comfort, the project resulted in a reduction of 15 metric tons (42%) in greenhouse gas emissions (GHG) annually.[1]

CONVERSION SUMMARY

Pre-existing HVAC system:	1x 14-ton electric resistance RTU
New HVAC system:	1x Mitsubishi VRF 1x Ventacity VS1000RT HRV

reduction in total HVAC energy use

reduction in building energy use

"These upgrades not only live up to our energy efficiency standards, they give our team a comfort level that is easily adjustable with operable windows and individual thermostats for each zone."

— Jonathan Heller
President, Ecotope, Inc.

[1] Reported GHG emissions reduction is based on the following assumptions: 1) 11.7 pounds of CO_2 per therm of natural gas saved, 2) 0.91 pounds of CO_2 per kWh avoided (Source: Northwest Power and Conservation Council's latest report from 2018 on avoided CO_2 rates in the Northwest).

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