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HVAC CASE STUDY

Local radio station fine-tunes heating and cooling

Field test proves energy-saving power of energy recovery ventilators.

KBOO Community Radio has been broadcasting from Portland, Oregon, since 1968. The independent volunteer-powered station operates 24 hours a day, every day of the year, providing music and news to nearly 70,000 weekly listeners in Portland, Mount Hood, Corvallis, Salem, and Vancouver, Washington.

After experiencing thermal discomfort and temperature control issues, KBOO knew it was time to replace their building's aging rooftop HVAC units that had been installed more than 20 years prior.

Their research into the energy-saving and comfort benefits of more efficient units led to the discovery that efficient rooftop units (RTUs) could:

- Reduce their annual heating and cooling costs by up to 40%.
- Regulate temperatures in their production studios and media libraries.
- Enhance the comfort of staff, volunteers, and visitors.

KBOO was offered the opportunity to participate in a field test – the first of its kind in the Northwest – that would help determine which type of efficient RTU would work best for them and for similar buildings. Knowing the study would provide valuable data to inform future projects across their listener community and beyond, KBOO agreed.

Project Overview

Building Type
Single-story radio station

Year Built
1946

Project Floor Area
5,000 sq. ft.

Whole Building Gas Savings
64%

Testing the energy-saving potential of efficient RTUs.

The KBOO project explored two approaches to efficient RTUs: a custom RTU with an **integrated** energy recovery ventilator (ERV) and a standard RTU with a **bolt-on** ERV. An ERV works with the heating and cooling system to simultaneously pull in fresh outdoor air and exhaust indoor air. This process recovers energy from the exhaust air and transfers it to the incoming air, reducing the amount of energy needed to heat or cool it. An ERV also balances humidity to improve indoor air comfort.

The objectives of the study were to measure:

- Whether overall savings in the field aligned with lab research.
- How savings in the field were distributed between insulation, damper, and ERV performance.
- Whether a bolt-on has the same performance as an integrated ERV.

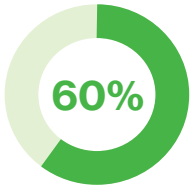
For this field test, two of the KBOO building's three standard RTUs were replaced with efficient RTUs, with the third RTU left in place.

CONVERSION SUMMARY

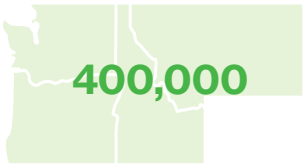
Previous Equipment	New Equipment
Unit A: 5-ton packaged rooftop unit	Unit A: 5-ton custom rooftop unit featuring: • ERV (78% sensible effectiveness) • Outside air economizer • Double-walled construction with R7 insulation • Variable-speed electronically commutated (EC) motor fan • Low-leakage dampers
Unit B: 4-ton packaged rooftop unit	Unit B: 5-ton baseline rooftop unit with bolt-on ERV (76% sensible effectiveness)

Source: Northwest Energy Efficiency Alliance

RTUs by the Numbers*



of commercial buildings use RTUs



RTUs in the Northwest

Up to **40%**

reduction in HVAC energy use

Real-world proof of ERV excellence.

The engineering team collected minute-by-minute data on the new RTUs from November 2023 through June 2024 to better understand their real-world performance. Their findings confirmed the predictions from their modeling.

Compared to the HVAC equipment KBOO installed more than 20 years prior, the efficient RTUs and associated ductwork repairs resulted in:

- **Significantly reduced heating load**
- **Improved unit operational efficiency**
- **Reduced unit infiltration**
- **Reduced leakage and wasted heat**

RTU	Field-Measured ERV Effectiveness	Heating Load Reduction
Unit A: Integrated ERV	82%	19%
Unit B: Bolt-On ERV	80%	23%

The engineers concluded that efficient RTUs can achieve considerable energy savings in the real world, as their research suggested. ERVs provided the highest energy savings, with Unit A's insulation and low-leakage dampers contributing further savings. The bolt-on ERV on Unit B also achieved high energy savings, demonstrating its capability for certain buildings and installation contexts.

By upgrading their RTUs and participating in the field study, KBOO continued its long tradition of community education while significantly reducing energy use and improving their building's air quality and comfort.