RenewAire®
Energy Recovery Ventilation

NET PRESENT VALUE FOR RENEWAIRE ERV IS $18,500+ FOR 10 YEARS AND $32,000+ FOR 20 YEARS AT AN INITIAL INVESTMENT OF $2,650

ERVs generate considerable savings via energy-efficient operations and reduced loads, while enhancing indoor air quality

By Nick Agopian

As buildings become more airtight due to better construction methodologies, the need for more effective ventilation is critical. Without it, internally generated contaminants accumulate and cause deficient indoor air quality (IAQ), which leads to significant health problems for occupants. Deficient IAQ is a serious problem, especially considering:

- On average, Americans spend 90% of their time indoors
- The Environmental Protection Agency (EPA) found that indoor air is two to five times — and occasionally more than 100 times — more polluted than outdoor air
- The EPA ranks indoor air pollutants as a top-five environmental health risk

Indoor-air contaminants are plentiful and come from different sources. These contaminants consist of dust mites, mold, humidity, carbon dioxide, radon, formaldehyde, phthalates and other toxic gases and vapors, to name a few. Their origins are varied, but many of them are off-gassed from sources inside a building, such as construction materials, furniture, fabrics, carpets, cleaning supplies and even indoor occupants and their activities, among others.

It's clear that an effective ventilation system is essential in order to clean out these contaminants and provide higher-quality indoor air, but it's also important to find a solution that's as energy-efficient and cost-effective as possible. How can you decide whether such a capital investment makes financial sense or not? Start by understanding the value provided by the equipment over the long-term by figuring out its Net Present Value (NPV).

NPV Overview

NPV is a calculation that compares the amount invested today to future incoming cash flows after they are discounted by a specified rate of return.[1] A positive net present value is desired as it indicates that the projected earnings generated by a project or investment (in present dollars) exceeds the anticipated costs (also in present dollars).[2]

Below is the NPV formula:

$$NPV = \sum_{t-1}^{T} \frac{C_t}{(1+r)^t} - C_0$$

Where:
C_t = net cash inflow during the period t
C_0 = net initial investment cost
r = discount rate
t = number of time periods (years)

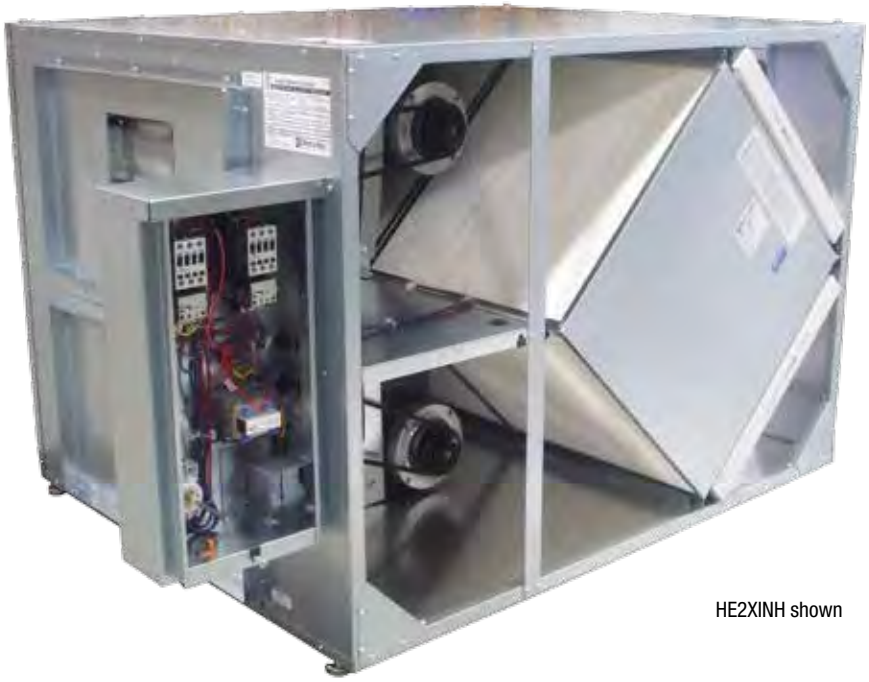
[1] Accounting Coach; What is NPV?; http://www.accountingcoach.com/blog/npv-net-present-value

[2] Investopedia; Net Present Value – NPV; http://www.investopedia.com/terms/n/npv.asp

NPV for a RenewAire Energy Recovery Ventilator (ERV)

The first step in determining the NPV is to identify the net cash inflow as represented by energy savings generated by the ERV when compared to conventional equipment. We'll use the HE2XINH ERV, which has a typical airflow range of 500-2,200 CFM and is one of RenewAire's most popular commercial units. For this exercise, we'll use an airflow rate of 1,500 CFM with a geographic location of the southern Midwest, such as Kansas City, MO. This is represented below:

Energy Savings for RenewAire HE2XINH ERV Compared to Conventional Equipment 100% Runtime at 1,500 CFM in Southern Midwest	
Item	**Values**
Number of months (heating)	**6 months**
Number of months (cooling)	**6 months**
Annual degree days (heating, with a base of 65°F) *Note: A degree day is a unit used to determine the heating and cooling requirements of buildings, representing a fall (heating) or rise (cooling) of one degree below (heating) or above (cooling) a specified average outdoor temperature.*	**5,000 degree days per year**
Annual degree days (cooling, with a base of 55°F) *Note: See above for definition of a degree day.*	**1,500 degree days per year**
Annual ventilation load savings in BTUs (heating)	**136,080,000 BTUs per year**
Annual ventilation load savings in BTUs (cooling)	**40,824,000 BTUs per year**
Annual energy savings in $ (heating) *Note: These savings factor in runtime, fan horsepower differential and Seasonal Energy Efficiency Ratio (SEER) of an ERV and a conventional heating system.*	**$1,701.00 per year** *Note: The above savings are based on current average national prices of natural gas at $1.00 per therm.*
Annual energy savings in $ (cooling) *Note: These savings factor in runtime, fan horsepower differential and Seasonal Energy Efficiency Ratio (SEER) of an ERV and a conventional A/C system.*	**$530.71 per year** *Note: The above savings are based on current average national prices of electricity at $0.13 per kWh.*
Annual demand savings in $ (heating and cooling) *Note: This is the savings generated by the ERV as a result of reducing the load during peak daytime operation and avoiding peak electricity demand charges.*	**$277.81 per year** *Note: The above savings are based on current average national demand charges of $10.00 per kW per month.*
Total annual energy savings	**$2,509.52 per year**



HE2XINH shown

How is over $2,500 of annual energy savings possible? It's generated by RenewAire's static-core ERV technology that optimizes energy efficiency by preconditioning outside air coming in with the energy of the exhaust air going out. This energy that would otherwise be wasted is used to temper the air, resulting in significantly reduced heating and cooling loads and decreased capital equipment needs and costs. All this adds up to major energy savings.

After understanding the energy savings, the next step is to determine the ERV's net initial investment cost to the end user, which is the building owner. This is done by taking the cost of purchasing and installing the ERV, then subtracting the costs of conventional ventilation and A/C systems that were made obsolete by using the ERV. The below chart outlines the net initial investment cost of a RenewAire ERV compared to conventional equipment:

RenewAire HE2XINH ERV Net Initial Investment Cost Compared to Conventional Equipment	
Item	**Values**
Up-front cost to the end user for installing the ERV *Note: The up-front cost to the end user for installing the ERV is the initial cost that the end user pays to install the ERV, which is based on an assumption of approximately $6.50/CFM, rounded up. Subtracted from this amount are the costs of conventional ventilation and A/C systems that the end user avoided having to pay by installing the ERV. This is explained below.*	**$10,000.00** *Note: For the HE2XINH, at a CFM rate of 1,500, the cost is $6.50 x 1,500 = $9,750.00, which is then rounded up to $10,000.00.*
Subtract the avoided cost of a conventional ventilation system *Note: This cost is avoided by installing an ERV as opposed to a conventional system.*	**-$1,500.00** *Note: A conventional ventilation system cost is assumed to be approximately $1.00/CFM, and the above amount is determined by multiplying $1.00 by 1,500 CFM, equaling $1,500.00*
Subtract the avoided cost of a conventional A/C system *Note: This cost is avoided by installing an ERV as opposed to a conventional system.*	**-$5,850.00** *Note: A conventional A/C system cost is assumed to be approximately $1,500.00/ton, and the above amount is determined by multiplying $1,500.00 by the amount of A/C downsizing achieved by an ERV, which in this case is 3.9 tons, equaling $5,850.00.*
Net initial investment cost to end user for installing an ERV *Note: $2,650.00 is derived by taking the up-front cost of $10,000.00 and subtracting from it the costs of the conventional ventilation system ($1,500.00) and the conventional A/C system ($5,850.00) that the end user avoided having to pay by using an ERV.*	**$2,650.00** *Note: $2,650.00 is derived by taking the up-front cost of $10,000.00 and subtracting from it the costs of the conventional ventilation system ($1,500.00) and the conventional A/C system ($5,850.00) that the end user avoided having to pay by using an ERV.*

Before delving into the next section, it's worth understanding what the above numbers mean for the ERV payback period. With an initial investment of only $2,650.00 due to the savings from not having to purchase conventional ventilation and A/C systems, and annual energy savings of $2,509.52, the simple payback period for the HE2XINH ERV is just 1.05 years. This is represented below:

RenewAire HE2XINH ERV Simple Payback Period Compared to Conventional Equipment	
Item	**Values**
Simple payback period	**1.05 Years** *Note: This amount is derived by dividing the net initial investment cost of $2,650.00 by the annual energy savings of $2,509.52.*

The next step is to select the discount rate, as well as the time period. We'll use two different discount rates: the current 10- and 20-year fixed rates since we'll be looking out 10 years and 20 years. We've selected these time periods because we offer an industry-leading 10-year warranty on our ERVs' static cores, and our ERVs typically last for over 20 years. The below chart outlines the discount rates and the time periods:

Discount Rates & Time Periods	
Item	**Values**
Discount rate 1 (current 10-year fixed rate)	**3.125%**
Discount rate 2 (current 20-year fixed rate)	**3.750%**
Time period 1	**10 years**
Time period 2	**20 years**

At this point, we have all the information we need to determine the NPV of the ERV, including the net cash inflow (energy savings), net initial investment cost, discount rates and time periods. All of this data is summarized in the below chart:

NPV Data for RenewAire HE2XINH ERV Compared to Conventional Equipment	
Item	**Values**
C_t (net cash inflow during the period t) *Note: This is the amount of annual energy savings generated by a RenewAire HE2XINH ERV compared to conventional equipment.*	**$2,509.52**
C_o (net initial investment cost) *Note: This is the net initial investment cost of a RenewAire HE2XINH ERV to the end user after the costs of conventional ventilation and A/C systems are subtracted from the up-front installation cost.*	**$2,650.00**
r (discount rates) *Note: Annual compounding will be incorporated.*	**3.125% (current 10-year fixed)** **3.750% (current 20-year fixed)**
t (period in years)	**10 years** **20 years**

The final step is to enter the numbers into the equation and determine both the 10-year and 20-year NPVs of the RenewAire HE2XINH ERV:

NPV for RenewAire HE2XINH ERV Compared to Conventional Equipment	
10-Year Time Period	
NPV inputs	**2,509.52/(1+0.03125)* [this is the energy savings with a 10-year fixed rate] x 10 [this is the time period] - 2,650.00 [this is the net initial investment cost]** **Annual compounding is incorporated.*
10-year NPV	**$18,620.80** *Note: See Appendix A below for a calculation table.*
20-Year Time Period	
NPV inputs	**2,509.52/(1+0.0375)* [this is the energy savings with a 20-year fixed rate] x 20 [this is the time period] - 2,650.00 [this is the net initial investment cost]** **Annual compounding is incorporated.*
20-year NPV	**$32,222.80** *Note: See Appendix B below for a calculation table.*

In Sum

It's clear that a RenewAire ERV is not only worth the initial investment with a simple payback of about year, the ERV will provide consistent and considerable value for many years to come. A minimal initial capital investment will result in decades of energy savings, while at the same time enhancing IAQ by providing cleaner and healthier indoor air — a win-win for building owners, engineers, contractors and building occupants alike.

Nick Agopian *is Vice President of Sales and Marketing at RenewAire, a pioneer in enhancing indoor air quality in commercial and residential buildings of all sizes through high-efficiency, enthalpic-core, static-plate ERV systems. For more information, visit: www.renewaire.com.*

Appendix A

The following table outlines the calculations for a 10-year NPV:

10Y NPV	HE2XINH ERV	10Y Net
Year	**Cost / Savings**	**Present Value**
0	-$2,650.00	-$2,650.00
1	$2,509.52	$2,433.47
2	$2,509.52	$2,359.73
3	$2,509.52	$2,288.23
4	$2,509.52	$2,218.89
5	$2,509.52	$2,151.65
6	$2,509.52	$2,086.44
7	$2,509.52	$2,023.22
8	$2,509.52	$1,961.91
9	$2,509.52	$1,902.46
10	$2,509.52	$1,844.81
Future Savings	$22,445.20	N/A
Required Return		3.125%
NPV of Savings		**$18,620.80**

Appendix B

The following table outlines the calculations for a 20-year NPV:

20Y NPV	HE2XINH ERV	20Y Net
Year	**Cost / Savings**	**Present Value**
0	-$2,650.00	-$2,650.00
1	$2,509.52	$2,418.81
2	$2,509.52	$2,331.39
3	$2,509.52	$2,247.12
4	$2,509.52	$2,165.90
5	$2,509.52	$2,087.61
6	$2,509.52	$2,012.16
7	$2,509.52	$1,939.43
8	$2,509.52	$1,869.33
9	$2,509.52	$1,801.76
10	$2,509.52	$1,736.64
11	$2,509.52	$1,673.87
12	$2,509.52	$1,613.37
13	$2,509.52	$1,555.05
14	$2,509.52	$1,498.85
15	$2,509.52	$1,444.67
16	$2,509.52	$1,392.45
17	$2,509.52	$1,342.12
18	$2,509.52	$1,293.61
19	$2,509.52	$1,246.86
20	$2,509.52	$1,201.79
Future Savings	$47,540.40	N/A
Required Return		3.750%
NPV of Savings		**$32,222.80**