Effective Ventilation Strategies

Ron Pariseau
Owner of Green R, Inc.
What do we want in an Efficient Ventilation System?

- We want to introduce the amount of fresh air needed for good IAQ.
  - Too much would be an energy drain.
  - Too little may not be good for the health of the homeowners.
What do we want in an Efficient Ventilation System?

We want a properly installed and maintained system.

- Where is the fresh air being introduced coming from?
- Is the fresh air being introduced into the house filtered?
- How easy is it to change or clean the filters?
- To what extent are the homeowner needed to operate the system?
- Has the installation been inspected?
- Does the homeowner understand the operation and scheduled maintenance needed to maintain the performance of the system?
What do we want in an Efficient Ventilation System?

- How do we choose the proper system?
  - What are the Pro’s & Con’s of the different ventilation systems?
  - How do we compare the efficiencies of different systems?
Always install ventilation equipment in accordance to the manufacturers instructions.
How much Fresh Air do I need?

ASHRAE 62.2p
1 cfm per 100 sq ft of floor area
+ 
(The number of bedrooms + 1)
7.5
How much fresh air is needed for a 2800 sq ft house with 3 bedrooms?

2800 x .01 = 28 cfm

+ (3+1) x 7.5 = 30 cfm

Total 58 cfm
Put thought into location of Fresh Air Intake.

- Don’t bring your fresh air in from off the roof.
- Keep ten feet away from any mechanical exhaust or manufactures recommendation.

Things to consider:

- Are you near an outside grill?
- Will cars be parked near the intake?
- Is the trash bin close to the intake?
- What kind of shrubs are located close to the intake?
- Don’t get to close to the ground.
- Don’t locate intake under a deck.
- Can the screen on the intake be easily cleaned?
Supply Ventilation Systems

The introduction of fresh air through mechanical means creating a positive pressure inside the house and causing indoor air to be exhausted through designed and undesigned holes.
Supply Ventilation Design
Pros

- We know the quality of fresh air being introduced.
- Our fresh air is filtered and conditioned.
- Excellent distribution of fresh air.
- Low cost of installation.
Cons

- We really don’t know how much fresh air we are introducing into the house.
- Since we don’t know the amount of air we are introducing we don’t know the costs associated with heating or cooling the fresh air.
  
  We can assume that the cost will be greater during the extreme heating & cooling seasons, i.e. we introduce the most air when the delta T is the greatest.
  
  The homeowner will probably have the windows open during the shoulder months.
- The thermostat is not the proper control to base our ventilation strategy on.
  
  You may get too much ventilation during the extreme heating and cooling seasons and not enough during the shoulder months.
Cons

**Maintenance issues:**

- Is there easy access to filter?
- Is the filter readily availability?
- Is the intake easily reached and cleaned?
Supply Ventilation with AirCycler

- The AirCycler is a programmable ventilation controller for Central Fan Supply Ventilation
What is the operational logic of the AirCycler program?

- Default: Ten minutes of ventilation every thirty minutes.
- If there is no call for heating or cooling in a twenty minute span the AirCycler will turn the air handler on for ten minutes.
- If it takes less than ten minutes to satisfy a call for heating or cooling the AirCycler will start a new twenty minute countdown when the air handler shuts down.
- If it takes more than ten minutes to satisfy a call for heating or cooling the model FR-V will close the damper at the end of ten minutes.
Pros

- We're closer to the ventilation rate we want to achieve.
- Low cost of installation.
- We know the quality of fresh air being introduced.
- Our fresh air is getting filtered and some conditioning.
- Excellent distribution of fresh air.
Cons

Comfort issues:
- Cold air coming out of the return
- Frequency of HVAC system running

Installation issues:
- Do you really know how much fresh air you are introducing into the house?
- Has anyone measured the amount of fresh air being introduced?
- Have you calculated the amount you need and programmed the AirCycler or just left it on the default setting?
Cons

Maintenance issues:

- Is there easy access to filter?
- Is the filter readily availability?
- Is the intake easily reached and cleaned?
- Does the homeowner know they need to periodically check the operation of the motorized damper?
Exhaust Ventilation Systems

The exhaust of stale air through mechanical means creating a negative pressure inside the house and causing outdoor air to be introduced through designed and undesigned holes.
Exhaust Ventilation Design

♦ Continuous running or intermittent fan
  ♦ Inline fan pulling from multiple locations.
  ♦ Ceiling mounted fan in bathroom or kitchen.
  ♦ Bathroom fans programmed to run intermittently.
  ♦ Range hood designed to run at a low speed continuously.

♦ Location of fan
  ♦ Do you locate your fan to exhaust air from areas kitchen or bathrooms?
  ♦ Do you locate the fan to exhaust from the central location?
Exhaust Ventilation Design

- Make sure that all combustion appliances are sealed combustion.
- Where is outdoor being introduced from.
  - Passive air inlets.
  - Infiltration through path of least resistance.
Pros

- We know how much fresh air we are introducing.
- Low initial cost.
- Works best in small areas or with multiple exhaust points.
- Option for house with limited ductwork.
Con’s

♦ Are you getting effective distribution of air being introduced.
  ♦ Are the bedrooms getting any fresh air.

♦ Where is my fresh air coming from.
  ♦ Is fresh air introduced through a designed hole or is outside air entering through random infiltration.
  ♦ This design is not recommended for houses with an attached garage.
Con’s

♦ Use of designed holes.
  ♦ Requires homeowner to operate.

♦ No conditioning or filtration of air introduced into house.
Balanced Ventilation System

The introduction of fresh air and the exhaust of stale air through mechanical means in equal quantities, resulting in a negligible effect on the pressure inside the house.
Balanced Ventilation Design

- Balanced ventilation equipment
  - Mixing boxes
  - Recovery Ventilators
    - HRV vs ERV
- Ducting balanced ventilation systems
Return - Return Ducted ERV

- Simplest and Least effective ducting design.
- Need to run the fan continuously to effectively distribute fresh air.
- This results in an energy drain and possible humidity problems.
Totally ducted ERV

- This is the ideal design but it has its restraints.
- Design the ductwork for minimal resistance.
- Don’t overextend the duct layout, you will sacrifice the performance of the equipment.
This is my recommendation for the most effective duct design for an ERV.

- Pull the exhaust for the ERV from the return plenum of the HVAC system and independently duct the fresh air supply.
Pro’s

- This is the most efficient system.
- You have the greatest control of the amount of fresh air you are introducing and stale air you are exhausting.
- Tempering of fresh air with recovery core.
Pro’s

- We know the quality of fresh air being introduced.
- Our fresh air is getting filtered.
- Good distribution of fresh air.
- Some manufactures have maintenance alerts on wall controls.
Con’s

- This is the most expensive system to install.
How do I compare the performance of ERV’s from different manufactures?

Home Ventilation Institute

www.hvi.org

Certified Products Catalog

Section 3 HRV’s & ERV’s
Total Recovery Efficiency (TRE): The total energy (enthalpy) recovered minus the supply fan energy and the preheat coil energy, divided by the total energy (enthalpy) exhausted plus the exhaust fan energy. This calculation corrects for the effects of cross-leakage and external purchased energy for fans and controls. It is used principally to predict and compare energy performance.

+95°F Supply Temp.: Cooling values for one or both of 50 CFM and 117 CFM will be listed according to the ability of the equipment to meet the test conditions(2). Outdoor air conditions are +95°F, 50% R.H., indoor air conditions are +75°F, 50% R.H. Total Recovery Efficiency (see below) is given in place of Sensible Recovery Efficiency (see below) as the latter value is not relevant for cooling load applications.
What to look for when evaluating ERV’s:

TRE – Total Recovery Efficiency
- Combination of both sensible and latent recovery
- Most manufactures list only sensibly recovery

Airflow Performance
- What should my effective airflow be taking into account the duct design?

Does it have a defrost cycle?
Hybrid Ventilation Systems

- Integrated exhaust and supply fans.
- Whole house dehumidifiers that have a fresh air duct.
  - It is important to understand the different controls and have ventilation cycle as a default.
Efficiency of the Ventilation System.

- The efficiency of any one of these ventilation systems is first predicate to its installation.
  - All systems need to be inspected and tested to insure they are installed and working properly.
- A scheduled maintenance program is critical to the continuing efficiency of any ventilation system.
  - A maintenance program needs to be provided to the homeowner as well as instruction on the operation of the system.
Efficiency of the Ventilation System.

- The design of the system is critical to the efficiency of the system.
  - Calculate the amount of fresh air needed.
  - Pick a good source of fresh air to introduce.
  - Choose a proper ventilation control.
# Ventilation Cost Analysis

## Cooling

<table>
<thead>
<tr>
<th>City</th>
<th>VLI total</th>
<th>CFM</th>
<th>COP</th>
<th>Cents/kwh</th>
<th>Ventilation Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta</td>
<td>24.27</td>
<td>45</td>
<td>2.5</td>
<td>7.5</td>
<td>$32.76</td>
</tr>
</tbody>
</table>

## Heating

<table>
<thead>
<tr>
<th>City</th>
<th>VLI heating</th>
<th>CFM</th>
<th>AFUE</th>
<th>Cents/Therm</th>
<th>Ventilation Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atlanta</td>
<td>61</td>
<td>45</td>
<td>80</td>
<td>77</td>
<td>$90.16</td>
</tr>
</tbody>
</table>

## Electrical Consumption

For a year:

<table>
<thead>
<tr>
<th>Power Consumption, Watts</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>$49.28</td>
</tr>
</tbody>
</table>
Effective Ventilation Strategies

Ron Pariseau
Owner of Green R, Inc.