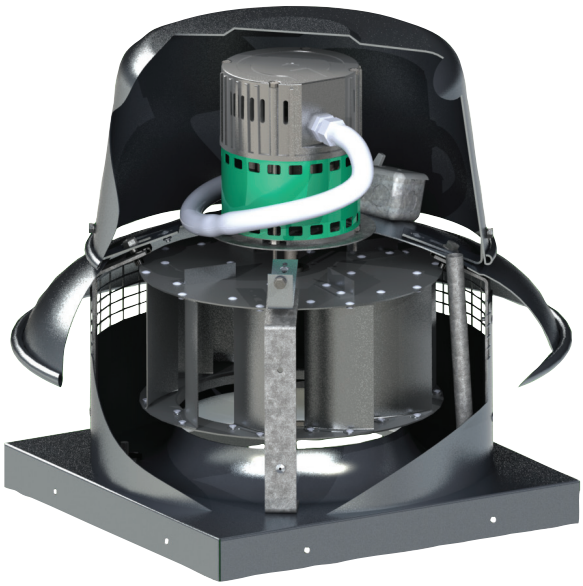
Demand Based Ventilation
with eRED Constant Pressure System



Soler&Palau
Ventilation Group

With a globally recognized presence in the ventilation industry, S&P owns and operates locations in Spain, Portugal, France, England, Holland, Belgium, Germany, Italy, Latvia, Austria, Mexico, Colombia, Australia, Indonesia, Malaysia, Singapore, Thailand, Philippines, Taiwan, China ,the United States and Canada. S&P also possesses one of, if not the most expansive distribution networks in the world.

Concern and awareness of the Environment is one of the core philosophies of S&P. The environmental impacts of our manufacturing practices, product life cycle, and end-of-life disposal are carefully monitored. Our future calling implicates us deeply in the legacy that we are going to leave to our children. S&P is the only company of the sector ISO-14001 certified for Environmental Management, proof that we are good stewards of our environment and resources.

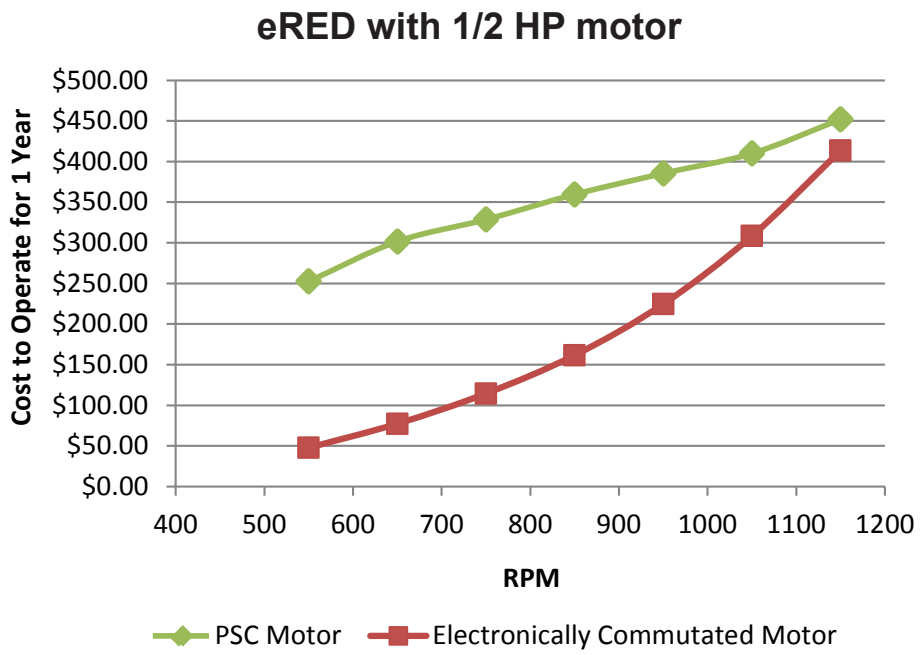
It is certainly not breaking news, but Energy is scarce and expensive. One of the principal challenges of manufacturers of all electrical equipment is to produce devices that are much more efficient, reducing consumption without sacrificing performance. S&P, a world leader in the ventilation market, has anticipated this future by presenting the Energy Efficient Ventilation System (EEVS) concept in the European market and we are expanding this trend to our North American operations with the introduction of the eRED as the most logical start.

Demand Based Ventilation is a concept that S&P has been aggressively promoting abroad for several years. We have been closely watching the North American market during this time, waiting for the appropriate time to extend the application to this market.

It is obvious that now is the time to actively promote Demand Based Ventilation practices. The eRED with ECM and various control options is the logical first step. We will show you how this product will save you money while offering several additional benefits that are realized with demand based applications.

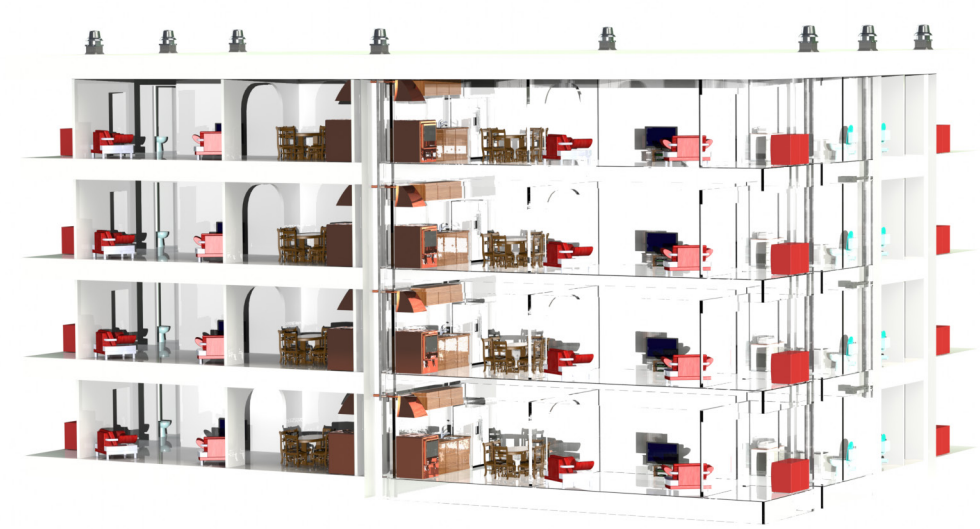
The foundation of the eRED – the motor:

With increased attention on energy efficiency, our industry is evolving to more efficient motors with reduced energy consumption. It is no secret that traditional permanent split capacitor single phase motors lack the efficiency that can be achieved with EC (electronically commutated) motors.

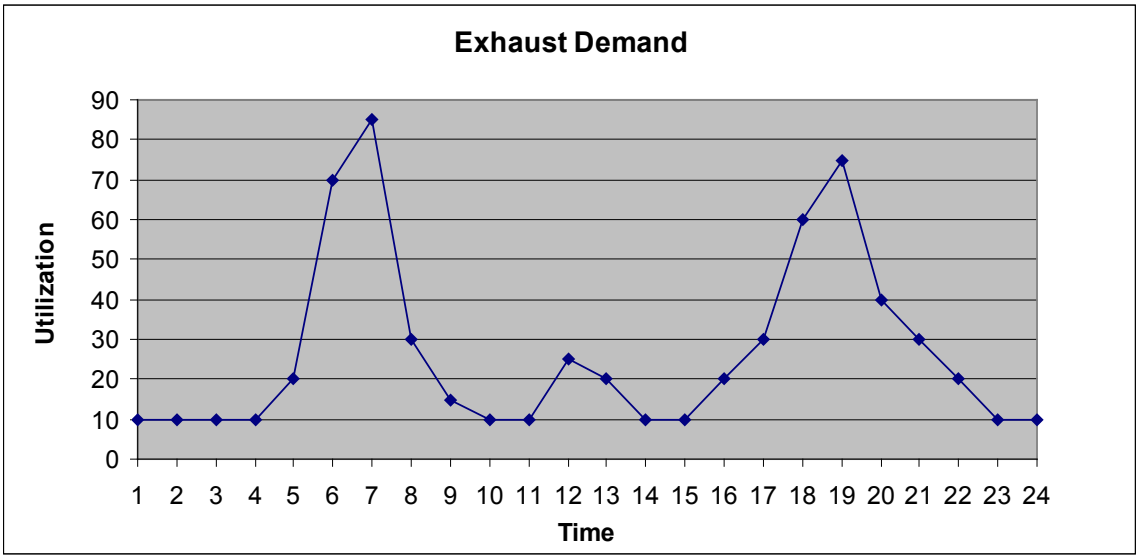


PSC motors, at best, operate at approximately 65% efficiency. Once the speed of these motors is reduced, the performance quickly deteriorates to the 20-30% range. Even with fractional horsepower motors, significant energy savings can be realized when the eRED ECM, with up to 90% efficiency, is employed.

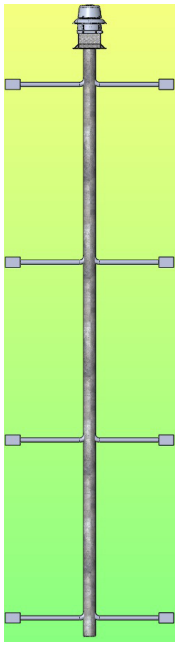
eRED Constant Pressure System for Multi-level Residential Applications.



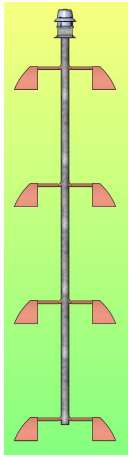
The average residential dryer, kitchen, or bathroom exhaust system operates only a fraction of each day, however, the traditional central exhaust systems that support the dwellings may operate at 100% 24 hours/day.



The average number of occupants in each US residence in 2010 was 2.6 people. Canada is consistent with an average in 2010 of 2.5 residing in each dwelling. If we assume that the run time of the bathroom exhaust fan is 30 minutes per day per occupant, the demand in North America is 1.3 hours each day (.5 hours x 2.55 occupants). Corresponding demand on central exhaust is only 5.4% of a 24 hour period.



The average household washes and dries 6-8 loads of laundry per week. If each load dries for 1.5 hours, the daily demand on the central exhaust system is only 6.25% (1.5 hours per day).



Demand created by cooking activities varies significantly based upon the habits of the household, but let's assume that the most active scenario is 3 meals each day. Breakfast, 30 minutes, lunch, 20 minutes, and 45 minutes for dinner. We can all agree that this is higher than average, but the intent is to show the savings that can be realized even under the most aggressive scenario. 95 minutes per day of cooking activity equates to a demand of 6.6% each day on the central system.

Where the traditional central exhaust system is designed to handle the peak exhaust demand continuously, the S&P Constant Pressure system only exhausts what is needed, precisely when needed. This substantially decreases the energy consumption of the system.

System Operation

eRED fan with ECM

Control Panel

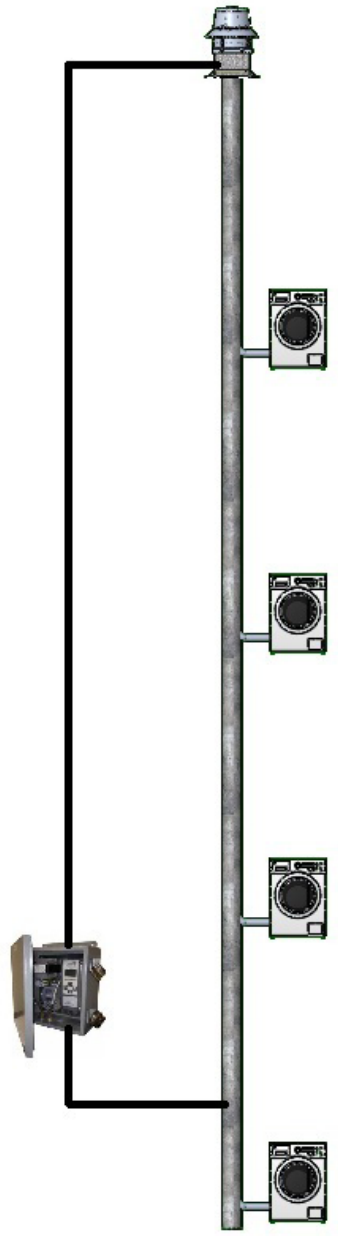
The S&P Constant Pressure system includes all of the control devices needed for the demand based system. The control components are installed in a NEMA 3R enclosure to simplify and reduce the field installation requirements.

The NEMA 3R enclosure includes the 115/230V to 24V transformer, pressure transducer, and control module. The power from the transformer to the pressure transducer and control module are pre-wired to further simplify the installation process.

The self-sealing pressure tap is supplied loose for field installation with ¼" ID flexible tubing. The enclosure is fitted with an external barb and breather vent to ensure the pressure differential is measured accurately for optimal system performance.

The control module supplied with the S&P Constant Pressure system is undoubtedly the simplest manufacturer supplied control to program. The four-button touch pad user interface and digital display set the stage for the simple set-up.

Although the system is set-up for pressure, the control module is provided with an additional two inputs if you wish to monitor other conditions for other applications (i.e. – temperature, humidity, CO2, etc.)



The S&P Constant Pressure System monitors the pressure in the common shaft. As the appliances within the building are energized, the static pressure in the duct increases. The increase in pressure is communicated to the central exhaust fan and the speed is automatically increased to accommodate the increased demand. As more appliances are energized or de-energized, the system automatically adjusts the speed of the fan so that only the demanded volume of air is extracted.

Let's look at some specific comparisons to see how the energy savings stack up.

Common exhaust systems have the potential for significant losses of conditioned air. When the exhaust system is fully operational with limited, or even zero demand, conditioned air is being wasted.

When the traditional exhaust system is sized, the sum of the capacity of each appliance in the system is stacked approximately as follows:

Range hood – 150 cfm (based on a 3-foot range, this is 50% of the HVI recommended rate)
Clothes Dryer – 150-200 cfm, (we will use 150 in the calculations)
Bathroom – 50-100 cfm, (we will use 50 in the calculations)

Where it is not uncommon to size the system at 100%, utilization profiles may allow systems to be developed to exhaust 60—70% of the rated output of the appliances. We will use 65% keeping in mind that we are using best case scenarios for the traditional system and conservative case scenarios for the demand based system. This will clearly show the savings potential.

If we take an 8 story apartment building with 8 two bedroom two bath units on each level and calculate the constant versus demand based ventilation exhaust rates, we find the following:

Constant Exhaust – 65% rated output.

Each of the 64 units contain: one 150 cfm clothes dryer, 50 cfm per bathroom (100 cfm total for 2 baths), and 150 cfm for the range hood. The total capacity of each unit is 400 cfm.
(400 cfm) x (64 units) x (.65 rated output) = 16,640 cfm

(16,640 cfm) x (60 min/hour) x (24 hours/day) = 23,961,600 cubic feet of air.

Demand Based System

With the demand based system, the required airflow will be significantly reduced.

Since each unit averages 7 loads of laundry per week, the demand per unit in 24 hours is:
(90 minutes) x (150 cfm) = 13,500 cubic feet

Now we consider the range hood exhaust worst case scenario of 30 minutes for breakfast, 20 minutes for lunch, and 45 minutes for dinner - 95 minutes/day.
(95 minutes) x (150 cfm) = 14,250 cubic feet

For the bathrooms and average occupancy of 2.55 and 30 minutes of bathroom fan run time per person – 77 minutes.
(77 minutes) x (50 cfm) = 3,850 cubic feet

Total per unit – 31,600 cubic feet per day

Total air exhausted by the complex – 2,022,400 cubic feet/day

The difference between the two systems is substantial. 21,939,200 cubic feet of air is unnecessarily exhausted! That is 238 cfm of air that is being exhausted from each dwelling unnecessarily.

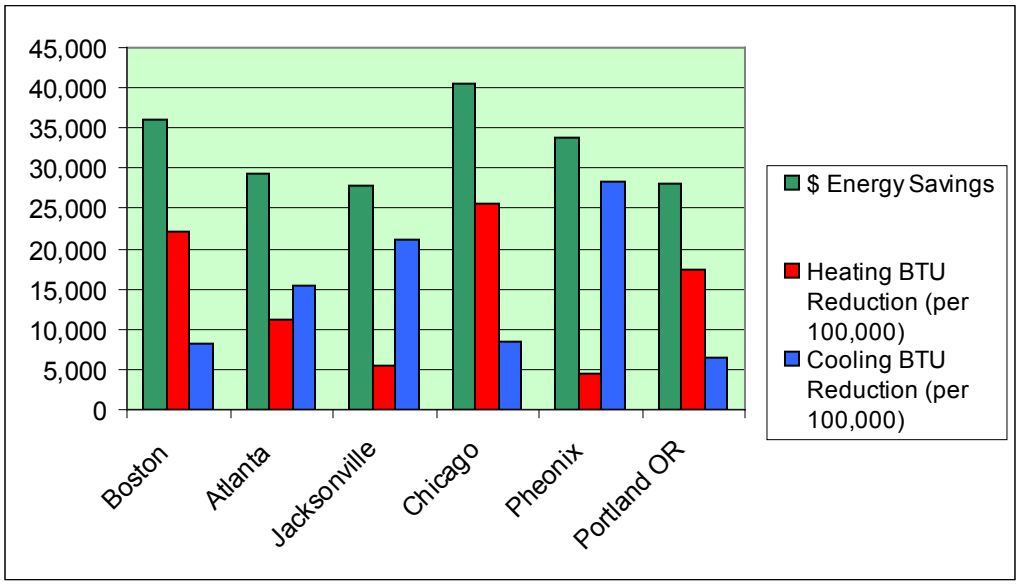
In relation to air handling, this excess 238 cfm adds .595 tons of load to each unit when we use the industry average of 400 cfm/ton. The actual cost savings will vary depending on the geographic region, but on average, 43% of each residential energy bill is attributed to heating or cooling equipment.

Here are some regional examples of the savings that can be realized based upon the following assumptions and regional weather data:

For the dollar savings assume heating fuel is natural gas at $1.00 per therm and 80% efficient furnace and AC with $0.13/kWh and 13 SEER

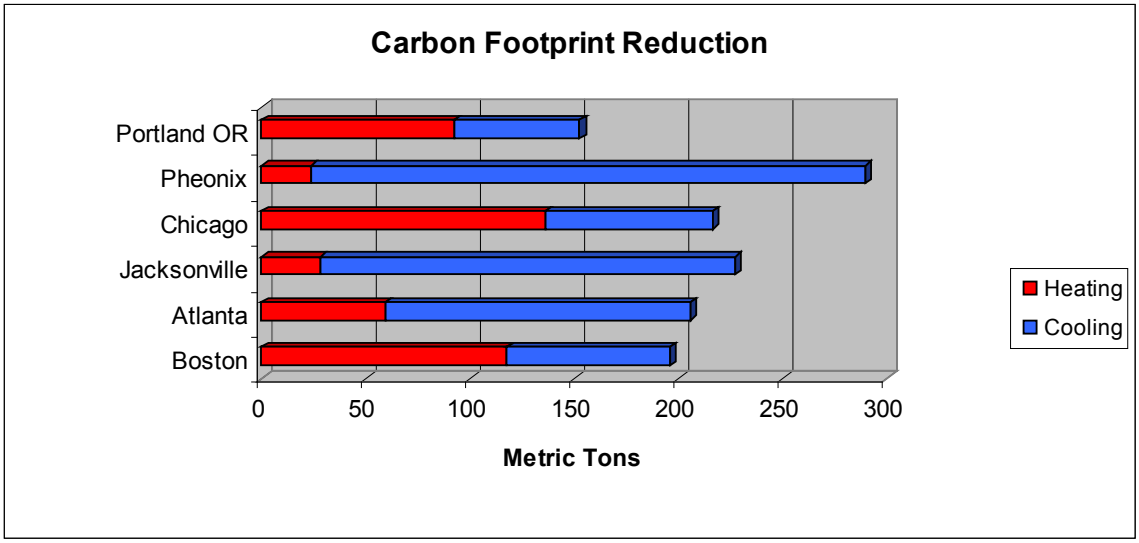
City	Heating Degree Days	Cooling Degree Days	Annual Heating Savings BTUs	Annual Heating Savings	Annual Cooling Savings BTUs	Annual Cooling Savings	Annual Savings per Unit
Boston, MA	5630	2093	34,731,245	$434.14	12,911,633	$129.12	$563.26
Atlanta, GA	2827	3928	17,439,650	$218.00	24,231,675	$242.32	$460.32
Jacksonville, FL	1354	5347	8,352,772	$104.41	32,985,429	$329.85	$434.26
Chicago, IL	6498	2154	40,085,902	$501.07	13,287,940	$132.88	$633.95
Phoenix, AZ	1125	7151	6,940,080	$86.75	44,114,233	$441.14	$527.89
Portland, OR	4400	1621	27,143,424	$339.29	9,999,884	$100.00	$439.29

Ok, now let's add some perspective with total annual energy savings for 1 year.



Carbon footprint is also substantially reduced. The following graph utilizes the following assumptions for natural gas and coal fired energy generation:

- 100,000 BTU Coal generated power creates 20.8 lbs CO2.
- 100,000 BTU Natural Gas energy creates 11.7 lbs. CO2.



It is certainly clear that the eRED and Constant Pressure Control system offer substantial energy savings, and although the acquisition cost of the system is higher, the savings quickly supersede the initial investment.

It is obviously clear after review of this information that Demand Based applications with energy efficient motors offer substantial savings opportunities. Keep in mind that there are multiple opportunities with similar demand based applications even with traditional 3-phase motors. The cost of VFD's has significantly reduced over the past several years and 1-Phase input, 3-Phase output VFD's are available. We will be introducing additional application brochures that describe how these systems can be used with virtually any sized fan that S&P offers, that employ motors 1HP and greater, and where EC Motors are not currently available.

If you have specific application questions or ideas, please contact us and we will be eager to assist.

S&P USA, Inc.
6393 Powers Ave.
Jacksonville, FL 32217
p: 800.961.7370
f: 800.961.7379
www.solerpalau-usa.com

S&P Canada, Inc.
5600 Ambler Drive
Mississauga, ON L4W 2K9
p: 866.733.0233
f: 866.358.5346
www.solerpalaucanada.com

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