THE NOVEO-AIR™ VENTILLATION CONTROLLER AT CANADEL: SPECTACULAR ENERGY SAVINGS!

CANADEL[1] of Louisville, QC designs and manufactures wood furniture in a variety of styles, colors and finishes, Figure 1.

Figure 1 : Examples of CANADEL's production

The furniture finish is comprised of the application of a lacquer/stain and clear coat finish in liquid type industrial paint booths. To ensure air each paint booth is equipped with its own ventilation system. The exhausted air must be replaced with fresh external air supplied by a rooftop air make up unit. The fresh air must be heated in winter to the set shop temperature. Up until recently, control of the paint booths' air exhaust was an all or nothing situation. The paint booth operator would engage the booth's ventilator at full power at the start of his work shift and stop it at the end. Because spray finishing takes place only 30-40% of the time rather than continuously, there is a significant amount of energy was wasted by the ventilator, creating an unnecessarily high demand of energy required to heat fresh from the air make up system.

NOVEO Technologies[2] of Montreal, QC (Canada) has developed an innovative ventilation controller, Figures 2a, 2b, that generates substantial energy savings. A high efficiency motor whose speed is modulated by a variable frequency controller drives the fan. The ventilator only starts when the operator activates his paint gun. The system then exhausts air at full speed until the paint gun is deactivated. Fan speed is then decreased in stages to zero, as long as spraying has not resumed. The percentage of the ventilator's exhaust speed and time delays are fully programmable by the user. Furthermore, a VOC (volatile organic compound) sensor triggers the ventilator and modulates its flow rate if the concentration of VOC's monitored rises above a threshold value.

Figure 2a: Paint booth with **NOVEO-AIR™** controller

Figure 2b: Noveo AIR ™ control panel

By evacuating air only when necessary, the **NOVEO-AIR™** controller decreases the volume of air exhausted, thereby the amount of energy required to heat the make-up air.

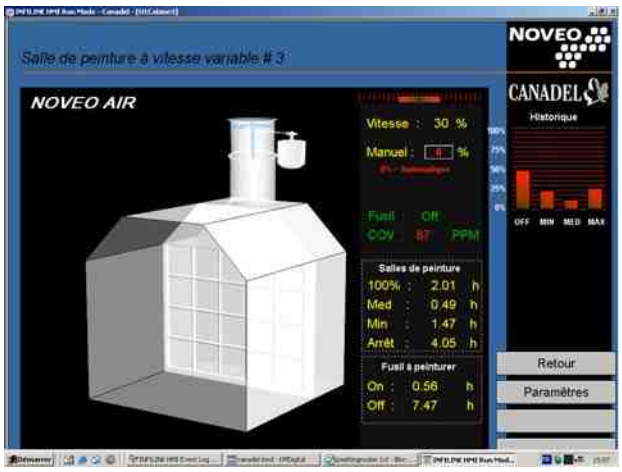

Figure 3: NOVEO-AIR™ controller interface showing fan activity

Communication between the Canadel's building management system and the **NOVEO-AIR™** systems takes place via the BACnet protocol, using **NOVEO-AIR™**'s integrated communication ports.

Canadel installed its first controller in December 2005 and, building on the success obtained (energy saved), was going forward in May 2006, toward general implementation with 42 units installed out of a total of 53 paint booths.

NOVEO Technologies, with financial assistance of GAZ METRO and the IERDP[3] of Natural Resources Canada, mandated the NGTC to evaluate the energy savings obtained through use of their controller.

NGTC made measurements over two days on a typical application, retouching booth paint booth #2 of plant #4. Flow rate was measured using a Pitot probe calibrated by hot wire anemometer. Power was measured using a hook-on amp meter. During the first day, the booth was operated as it had before installation of the **NOVEO-AIR™** controller, i.e. it was in manual mode and the fan continuously on, Figure 4a. The controller was activated the second day, Figure 4b.

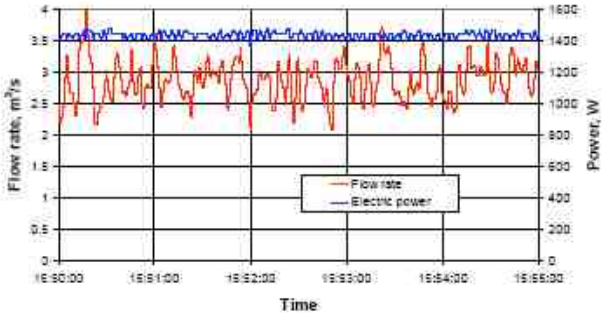

Figure 4a: Typical data without **NOVEO-AIR™**

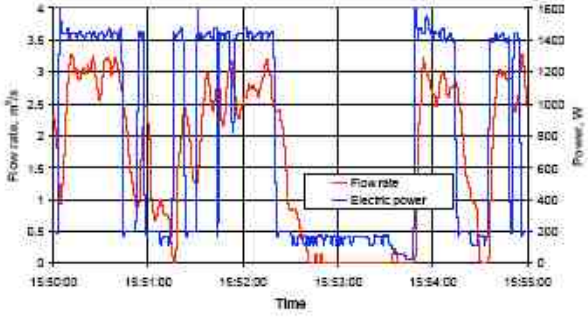

Figure 4b: Typical data with **NOVEO-AIR™**

The comparison of energy consumption was based on 250 days/year operation, 9.5 hours per day, and 4992 C degree C-days per year in the Louisville[4] area. It was assumed that the electricity consumption and contribution to peak load of the make-up air unit were equal to those of the paint booth fan. The unit energy costs were of $0.56/m^3 for gas, 4.2¢/kWh for electrical energy and $13.08/kWh electrical power-month.

Energy consumption for paint booth ventilation	**Without NOVEO-AIR™**	**With NOVEO-AIR™**	**Absolute Savings**	**Percent Savings**
Make-up air heating, m^3 gas	12254	4848	7406	60.4%
(*Cost*)	*$ 6862*	*$ 2715*	*$ 4147*	
Electrical energy, kWh	6814	2542	4272	62.7%
(*Cost*)	*$ 286*	*$ 107*	*$ 179*	
Electrical power, kW-month	34.4	17.5	16.9	49.2%
(*Cost*)	*$ 450*	*$ 229*	*$ 222*	
TOTAL energy, GJ	**484.6**	**191.2**	**293.5**	**60.6%**
(*Cost*)	***$ 7598***	***$ 3050***	***$ 4548***	***59.9%***

Table 1: Annual savings generated by **NOVEO-AIR™** controller for a 2.2 kW (3 HP) paint booth

The energy savings identified in Table 1 clearly show the effectiveness of the controller and its value as a sustainable industrial innovation. Payback of a typical investment is between 1-2 years.

It stands to reason that the energy savings:

- Are higher in a colder climate;
- Increase with the intensity of the usage of the plant (two/three shifts, 7 days/week operation, etc.);
- Are higher in larger sized paint booths. The tested booth had ventilation of 3HP power, but Canadel has several 5HP booths and a few at 10HP booths.

For operators, the **NOVEO-AIR™** controller improved comfort by reducing noise level, which was measured to be 71.6dBA with the fan off vs. 81.5dBA with the fan at full speed.

The **NOVEO-AIR™** ventilation controller: an idea whose time has come!

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[1] http://www.canadel.com/gallery.php?lg=en
[2] www.noveo.ca
[3] Industry Energy Research and Development Program
http://www.canadel.com/gallery.php?lg=en
[4] Environment Canada, climate averages in Canada 1971-2000, Louisville station

