

Make-up Air Helps Make Good Coffee at Nestlé



With successful brands like Perrier, Buitoni, Carnation and dozens of others, the Swiss food giant Nestlé is one of the world's largest makers of food and beverage products. Perhaps the most well-known beverage Nestlé makes is that dark, delicious drink that most of us can't seem to make it through the day without – coffee.

Roasting coffee beans (coffee “beans” are actually the seeds of coffee cherries) requires an exacting process in which carefully measured batches of coffee beans are heated in large, horizontal, rotating drums to precise temperatures. Temperatures for roasting range from 193°C (380°F) to 218°C (425°F) depending on the desired roast.

During roasting, coffee beans give off strong aromas and fumes. In the Nestlé coffee processing and packaging plant in Toronto, these aromas and fumes, along with excess heat, are vented to the outdoors by an array of powerful exhaust fans. However, not long ago there was a problem that impeded this function; the symptoms varied depending on the time of year.

During the warmer months, a build-up of heat from the roasting ovens often made working conditions uncomfortable for the employees in the coffee packaging area adjacent to the roasting ovens. Although exterior doors were kept open, most of the potentially cooling air supplied by this ad hoc ventilation system by-passed the packaging area as it was sucked up by the powerful exhaust fans.

During the winter months, when the plant doors are kept closed, the situation became far more complex. The most noticeable problem was a build-up of aromas and fumes inside the plant. It was apparent that the exhaust fans were not performing as they should.

Another problem had to do with the ovens. Burner operation was affected due to a drop in the oxygen supply. The first attempts to remedy this situation involved adjusting the burners for the reduced oxygen levels, which also meant adjusting the speed at which the coffee beans could be roasted, which in turn affected production levels and made product quality more difficult to assure.

The heating systems were also effected. With insufficient supply air, the plants heaters were overworked and under-performing. To complicate matters, cold air from

the outside was seeping into the building, creating cold spots around the plant's interior perimeter.

All of the aforementioned problems were the result of one thing: insufficient air supply for the exhaust fans. The exhaust system was designed to expel huge volumes of “process” air. As a general rule, for every cubic foot of air that is expelled from a building, a cubic foot of fresh air must be added or the exterior air pressure becomes greater than the interior air pressure and the building becomes a vacuum. Under such a negative pressure condition, exhaust fans, and any other air-dependent

Coffee Facts

Coffee has been in use since about 900 A.D. It was first used as a stimulant, a wine, and as a medicine.

The first "coffee break" on the moon took place at 7:27pm, July 20, 1969. It was just before the first historic moonwalk that an astronaut on the Eagle spacecraft radioed Houston control to say, "If you'll excuse me a minute, I'm going to have a cup of coffee."

A coffee tree produces only 1-1.5 pounds of coffee per year. This represents approximately 2,000 hand-picked cherries to result in one pound of roasted coffee.

Coffee is second only to oil as the largest commodity in dollar volume in international trade.

In Finland each person – man woman and child – consume more than 22 pounds of coffee a year This means that a family of four will drink about 15 cups a day.

Johann Sebastian Bach was so taken by the romance of the beverage, he wrote his "Coffee Cantata" and in it hailed coffee as "the most precious of blisses...."

A pound of tea, on average, has nearly twice the caffeine of a pound of roasted coffee. But a pound of tea yields about 160 cups, while a pound of coffee makes only about 40 cups. The net result is that a cup of tea contains roughly one-quarter the caffeine in a cup of coffee.

Caffeine content is nearly identical in all shades of roasts of coffee. In fact, it is slightly less in a very dark roast. Caffeine content is directly related to the altitude at which the coffee is grown. The higher the altitude, the less caffeine. Therefore; gourmet coffees are naturally lower in caffeine than typical supermarket canned coffee.

equipment cannot function properly. During the summer, the exhaust fans in the Nestlé plant received sufficient supply air via the open doorways, but the heat was still an issue. During the winter the lack of ventilation caused a negative pressure condition. A solution that solved both problems was needed. Four Seasons was asked to find the solution.

It was evident that what the plant needed was air and lots of it. The question was exactly how much; so an engineer was sent to survey the plant and perform the necessary calculations. Four Seasons then used those calculations to design and install a rooftop-mounted make-up air unit and air distribution system.

The makeup air unit supplies fresh air to an overhead distribution duct which directs the air into the plant.

During the summer months the unit provides cool, fresh air to keep the employees in the packaging area cool and comfortable. During the winter, the system supplies the necessary volumes of efficiently heated air to avoid a negative pressure condition.

The addition of the make-up air system has had positive results all around: the exhaust fans, heating systems and oven burners operate properly and efficiently while coffee production remains high and product quality is assured. As an added bonus, the expense associated with burner adjustment was eliminated. Now that's something that *any* bean counter at Nestlé can appreciate.

Power Venting Improves Efficiency and Safety of Heating Equipment

Safely venting the exhaust gasses from a boiler, furnace, unit heater or other piece of fuel-burning HVAC equipment is important for two main reasons: 1) it causes the products of combustion to properly exit the system, and; 2) it affects the quantity of combustion supply air that enters the unit for combustion, which effects system efficiency.

Old-style heating equipment uses a process called atmospheric venting in which products of combustion flow through at what is essentially atmospheric pressure. The force moving these gases results from the difference in density between the vent gases and the surrounding air. As the temperature difference between the surrounding air and the vent gases increases, the force causing gas movement increases. Because atmospheric venting is passive and relies on the inherent ventilation effect it is often inadequate under many circumstances.

Power venting was one of the first changes made to improve equipment efficiency and is standard on most heating systems today. Power venting uses a small blower to force or induce the movement of flue gases through the unit, generally under positive pressure.

There are two methods of power venting: *forced draft* and *induced draft*. Forced-draft units use a blower to move air into the combustion chamber and allow by-products to flow out through the venting system. Induced-draft units utilize a blower to pull air through the combustion area and move the gases out the vent.

Power venting solves the drafting problems caused by:

- Undersized chimneys
- Negative building pressures
- Long horizontal vent connectors
- Down drafts
- Cold equipment starts
- Restrictive heat exchangers/combustion chambers



Power venters come in different sizes for different equipment, and are designed to either force or induce draft, depending on the heating equipment. Many models combine the motor, blower and vent hood into one unit.

Types of equipment using power venters:

- Boilers/Furnaces
- Unit Heaters
- Water Heaters
- Modular Boiler Systems
- Bakery Ovens
- Factory Processes

Improved Safety

Power venters have built-in safety controls, including a pressure switch that senses when the motor is drawing air and a purge timer that will not allow the burner to run if the venter motor fails. Post purge control keeps the venter running after the burner has shut off to cool the firebox down and remove any

residual exhaust gasses.

Power venters are inexpensive to install, completely automatic in operation, and they can be adjusted for the specific job requirement. With higher efficiency and improved safety, power venters are a logical upgrade for many types of older heating equipment.