Four Seasons
CONTROLLED CLIMATES LTD.

PilotLight

A newsletter for the valued customers of Four Seasons Controlled Climates Winter 2000

The threat of Airborne Contaminants in manufacturing facilities

What you can do to safe-guard your employees, your equipment... and your profits.

PLUS : FSCC Book Centre • Power Venters • Electronic Ignition • Steam Humidifiers...and more!

CASE STUDY

Make-up Air Helps Make Good Coffee at Nestlé

With brands like Perrier, Buitonni, 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 popular beverage Nestlé makes is that dark, delicious drink that most of us can't seem to make it through the day without—coffee.

Roasting: an exacting process

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

An exhausting process

During roasting, coffee beans release strong aromas and fumes. In the Nestlé coffee processing and packaging plant in Toronto, these aromas and fumes are vented to the outdoors by an array of powerful exhaust fans. However, the exhaust fans themselves seemed to present an on-going problem that manifested as various symptoms depending on the time of year.

Summer heat

During the warmer months the heat from the roasting ovens was making working conditions uncomfortable for the employees working in the packaging area located adjacent to the ovens. Several windows were kept open to allow cool, fresh air into the plant. However this fenestral remedy did not work very well because most of the incoming air was sucked up by the powerful, hungry exhaust fans before it could reach the packaging area.

Winter woes

During the winter months, when windows are kept closed, the situation became more complicated. The most noticeable problem was a consistent build-up of fumes inside the plant. The obvious culprits were the exhaust fans which seemed to be operating without trouble but for some reason were not performing as they should.

Another winter-time problem had to do with the ovens. Burner operation was affected by an apparent drop in oxygen supply. The first attempts to remedy this situation involved adjusting the burners for the reduced oxygen levels. However this also necessitated adjusting the speed at which the coffee beans could be roasted, which in turn affected production levels.

The plant's heating systems were also affected. With insufficient supply air, the plant's heaters were overworked and under-performing. To complicate this problem, cold winter air was infiltrating the building, creating "cold spots" around the plant's interior perimeter.

Negative situation

All of the aforementioned problems were the result of one thing: insufficient air supply for the exhaust fans. 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 to make up for the expelled air, otherwise the exterior air pressure becomes higher than the interior air pressure; a negative pressure condition results and the building becomes a vacuum. Under a negative pressure condition, exhaust fans and any other air-dependent equipment,

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.

A coffee tree produces approximately 2,000 hand-picked cherries a year to result in one pound of roasted coffee.

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

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.

such as oven burners and heating systems, cannot function properly. Furthermore, outdoor air is sucked in through any openings it can find, including cracks in walls, and gaps around windows and doors.

After some consultation, Nestlé asked Four Seasons Controlled Climates to develop a solution. The first step was to find exactly how much supply air was needed to establish equilibrium between indoor and outdoor air pressure. An engineer was sent to survey the plant and perform the necessary calculations. Those calculations were then used in the design of a rooftop-mounted make-up air system and air distribution system. A make-up air system is specifically designed to take in outdoor air and then heat it or cool it as necessary before introducing the air into a building.

The makeup air unit that FSCC installed at Nestlé supplies fresh air to a specially-designed overhead air distribution system which directs the air into the plant. During the summer months, the unit provides a "shower" of 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.

Positive results

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 is maintained at target levels. 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 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.

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

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.

Replace your old standing pilot with a safer, more efficient electronic ignition system.

In any fuel-burning heating equipment the heating process cannot take place without ignition of the fuel released by the burners. This may sound painfully obvious and somewhat simplistic, but over the years many different types of ignition systems using various technologies have been developed. Manufacturers have continually improved ignition systems to meet the following needs:

- Higher efficiencies mandated by government
- Conservation of fossil fuels
- Greater pilot-relighting convenience in remote locations
- Fewer annoying shutdowns caused by standing pilots blowing out
- Greater use of electronics to improve both efficiency and safety.

Ignition Systems

There are two basic types of ignition systems:

- Standing Pilot Ignition
- Electronic Ignition

Standing Pilot Ignition (SPI)

The most widely used ignition system in the past was the SPI system. Many older units still in operation employ SPI. In SPI a pilot flame must always be available for burner ignition.

An important component of a typical SPI system is the thermocouple. A thermocouple is a device composed of two dissimilar metals that generates electricity when heated. The end of one piece of metal is placed in the pilot flame and the other end is kept cooler by combustion airflow. The temperature difference between the two ends causes a small DC voltage to be generated. This voltage is enough to allow the thermocouple to act as a safety device. As long as the hot junction is kept hot, sufficient current is generated to keep an electromagnetic relay open in the gas valve, allowing gas flow. If the thermocouple's hot junction cools due to flame loss, the thermocouple's electrical output drops. This, in turn, causes the electromagnet in the gas valve to be overcome by spring pressure, cutting off the gas supply. A manual reset button is used to start a thermocouple system. The main disadvantage of an SPI system is that it burns gas continuously at a rate of about 400 Btu/h, and only part of this heat is converted to useful energy.

Electronic Ignition

Control module for the White-Rodgers 50a55 Integrated Electronic Ignition System.

Standing Pilot Ignition systems using thermocouples must be manually reset each time the pilot goes out. This isn't always possible, so manufactures developed electronic systems to overcome this problem.

There are three types of electronic ignition systems: *intermittent-pilot ignition*, *direct-spark ignition*, and *hot-surface ignition*. Direct spark ignition and hot surface ignition are called *direct-ignition* systems because they do not need a pilot to ignite the main burner.

Intermittent-Pilot Ignition

In a typical intermittent-pilot ignition system a call for heat causes an electronic module to generate a spark that lights a pilot. The pilot, in turn, lights the burner. An ignitor sensor is used to create ignition and "prove" that flame has occurred. When the heating need is satisfied, the pilot goes out with the burner. There is no constantly burning pilot, as with an SPI system.

Direct-Ignition

Direct-ignition systems are standard features on many of today's heating systems. The primary difference between a direct-ignition system and intermittentignition systems is the absence of a pilot flame in any form.

There are two types of direct-ignition systems: *direct-spark ignition* (DSI) and *hot-surface ignition* (HSI). In direct-spark ignition, a spark lights the main burner directly. In hot-surface ignition, a hot element made of silicon carbide or silicon nitride is used to light the main burner.

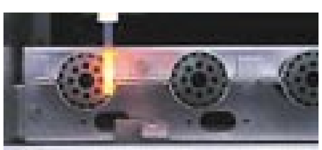
A typical direct-ignition system is composed of the following components:

- Electronic control module
- Ignitor
- Flame sensor
- Gas valve

Hot surface ignitor with silicon carbide element

Electronic ignition systems function as complete integrated systems, with adaptive control to adjust to ever-changing conditions.

Inputs to the control module are received from the thermostat, flame sensor and possibly an optional pressure switch. When the thermostat calls for heat the control module initiates the precise microprocessor-controlled timing of the ignitor and gas valve. The flame sensor provides proof of ignition. If no flame is detected, ignition is retried. The control module will stop the ignitor and initiate a safety lockout if no flame is detected within a preset amount of time. Control modules have automatic reset, internal and external system diagnostics, and an optional pre-purge period before ignition. In addition, they usually provide control of the circulation blower.



Correct positioning of the ignitor over the burner is essential for proper ignition.

Inexpensive upgrades

An electronic ignition system offers many benefits over older ignition systems using pilots:

- Eliminates the potential danger associated with open flame standing pilots
- Saves fuel; there is no pilot to consume fuel
- The control modules provide precise control, better system monitoring and greater safety capabilities.

With such benefits available at low cost, upgrading a heating system equipped with a standing pilot to electronic ignition makes good sense, especially in the face of sharply rising natural gas prices.

Hard Stuff

Silicon carbide (SiC) is an exceedingly hard, synthetically produced crystalline compound of silicon and carbon. It was discovered by American inventor Edward G. Acheson in 1891, while attempting to produce artificial diamonds. His early product initially was offered for the polishing of gems. The new compound soon became an important industrial abrasive.

Properties and applications

Until the invention of boron carbide in 1929, silicon carbide was the hardest synthetic material known. With a hardness approaching that of diamond, few materials are harder. In addition to hardness, silicon carbide crystals have fracture characteristics that make them extremely useful in grinding wheels and in abrasive paper and cloth products. Its high thermal conductivity, together with its high-temperature strength, low thermal expansion, and resistance to chemical reaction, makes silicon carbide valuable in the manufacture of high-temperature bricks and other refractories. It is also classed as a semiconductor, making SiC a promising substitute for traditional semiconductors such as silicon in high-temperature applications.

Methods of manufacture

To make silicon carbide a mixture of pure silica sand and carbon in the form of finely ground coke is built up around a carbon conductor within a brick electrical resistance-type furnace. Electric current is passed through the conductor, producing a chemical reaction in which the carbon in the coke and silicon in the sand combine to form SiC and carbon monoxide gas. The lump aggregate is crushed, ground, and screened into various sizes appropriate to the end use.

For special applications, silicon carbide is produced by a number of advanced processes. Reaction-bonded silicon carbide is produced by mixing SiC powder with powdered carbon and a plasticizer, forming the mixture into the desired shape, burning off the plasticizer, and then infusing the fired object with gaseous or molten silicon, which reacts with the carbon to form additional SiC. Wear-resistant layers of SiC can be formed by chemical vapour deposition, a process in which volatile compounds containing carbon and silicon are reacted at high temperatures in the presence of hydrogen. For advanced electronic applications, large single crystals of SiC can be grown from vapour and sliced into wafers much like silicon for fabrication into solid-state devices. For reinforcing metals or other ceramics, SiC fibers can be formed in a number of ways, including chemical vapour deposition and the firing of silicon-containing polymer fibers.

FEATURE

The Threat of Airborne Contaminants in Manufacturing Facilities

What you can do to protect your employees, your equipment… and your profits.

Of all the factors that can effect the operations of a manufacturing facility, most managers, other than those involved in certain applications, would seldom consider the air in the plant to be of much consequence, especially if the air quality seems to be acceptable. However, the air quality in your facility may be much worse than you think and the consequences can impact the health of employees, productivity and the profitability of your operation. In this article we outline how common airborne contaminants can severely affect a manufacturing plant. We also look at methods of air filtration and where they should be used.

The Effects of Airborne Contaminants on Employees and Equipment

Air Quality and Employees

Poor indoor air quality can degrade working conditions, and poor working conditions lead to lower worker productivity. Poor air quality also causes respiratory problems and increased absenteeism. Evidence from studies suggest that up to half of the cases of upper respiratory disease in the workplace may be associated with the work environment itself. One report published by the U.S. National Center for Health Statistics reports that over 50% of absenteeism is caused by upper respiratory infections.

Airborne Contaminants and Equipment

The air inside most manufacturing and fabrication facilities is contaminated with weld-fumes, smoke, dust, dirt and oil mists. These contaminants coat work surfaces and equipment, damaging electronic controls, servo motors, optics, the DC and CNC drives of grinding machines, lasers, robotics and other equipment. Part quality can be affected by airborne contaminants if the dirty air interferes with laser optics and spray-booth operations. The result can be high part rejection, frequent re-working and lower part yield.

The Costs of Airborne Contaminants

HVAC Equipment

In a typical manufacturing plant the single biggest energy expense is often the heating and cooling of the facility. The dust and oil in the air may be too much for the equipment's built-in filters to deal with. As a result, coils can become coated with dirt, dust and oils, reducing their heat transfer efficiency. Keeping air filters clean can reduce energy use by up to 20%.

Make-Up Air

One of the primary advantages of using air filtration systems in manufacturing is the collection, filtration and recirculation of air, rather than ducting air to the outside. This reduces the cost of heating or cooling make-up air.

Furthermore, exhaust air from a manufacturing facility often contains oil mists. These oils settle on roofs and can contaminate aquifers. Contamination such is this is coming under increased government scrutiny and legislation.

Facility Maintenance

Facility maintenance is another area where savings can be substantial. For example, without proper filtration, dirt and dust can build up and be introduced into the air in high concentrations by employee activity. Oil mists coat walls and lighting fixtures, reducing light levels and increasing lighting costs because more lights are needed, and bulbs coated with dust and oil will fail prematurely.

Fire Hazards
Machining operations occasionally result in flash fires or even explosions caused by sparks in the presence of oil mists. A filtration system that removes combustible materials will reduce the risk. Reducing combustibles can reduce insurance premiums for fire and general liability. It is common for metalworking organizations to be rewarded with savings of 5% to 7% annually.

Insurance Costs
Healthcare costs is a growing issue. In addition to annual costs for health care insurance premiums, consideration should also be given to long-term liability costs associated with contaminated air.

Worker compensation costs are also affected by the hazards of slippery surfaces due to oil mists. If oil covers a factory floor, it represents a high potential for falls that can impact healthcare and liability insurance premiums, and even lead to litigation. If airborne contaminants are reduced to achieve sufficient improvement in air quality, a manufacturer can expect to save 10% to 15% on general liability and health insurance premiums.

Clean Air and Filter Efficiency

What is "clean air"?
The term "clean air" is relative. Whether air can be said to be clean or not depends on the needs of the specific environment. For example, air that is adequately clean for an office environment would be much too dirty for an industrial clean room area.

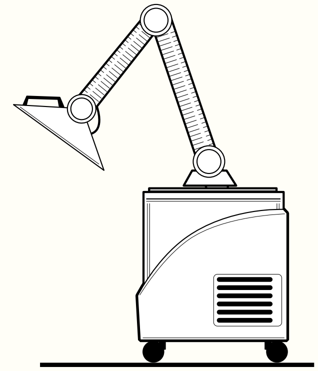
The cleanliness of air also depends on how you measure the level of contaminants. Contamination by particulates can be measured in three ways: *particle count*, *particle area*, and *particle weight*. It is important to know what size of particles are of greatest concern. In a given volume of air, for example, the percentage of total weight from particles smaller than 1 micron may only be 30%, but that may make up over 99% of the total number of particles.

Filter Efficiency
The removal efficiency of an air filter can be measured in two different ways: *dust holding capacity* and *arrestance*.

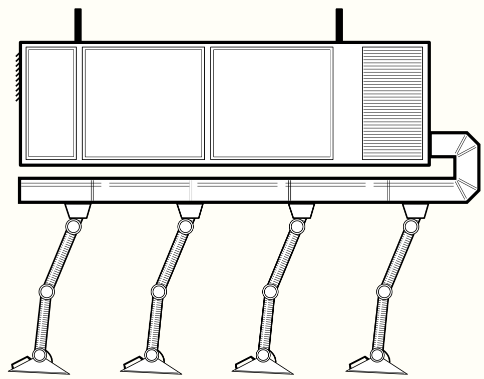
Dust holding capacity measures how much dirt by weight a filter can hold before it reaches a predetermined final resistance.

Arrestance measures the percentage of particulates that are captured as the particulates pass through the filter. For example, if 100 grams of particulate reach a

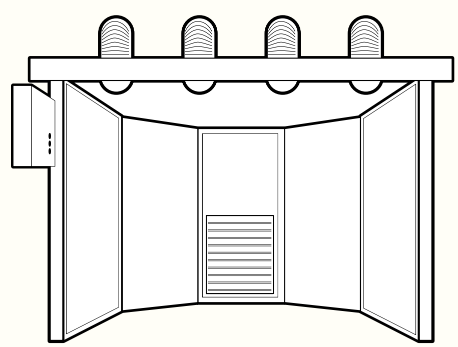
Today, a wide variety of air filtration options are available. Below are three of the most commonly used types of filtration systems.



Portable Filtration Systems with extractor arms are used for source capture of fumes, dust and gases at workers individual work stations. Another option is downdraft work tables, which have the capture vent built into the table.



Central Systems: In cases where many workers need filtration of the same substances, central filtration systems with ducted extractor arms are often used. Central systems are also used for ambient filtration of dust and other contaminants when source capture is not necessary.



Other more specialized applications include spray booths, and mist collectors.

filter and it captures 80 grams, the filter has an arrestance efficiency of 80%.

Arrestance efficiency also depends on the size of particulates being captured. A filter with a rated efficiency of 99% for capturing particles larger than 10 microns, may have a much lower efficiency at capturing particles smaller than 2.5 microns. Capturing particles that are 2.5 microns or smaller can be an important consideration because these size particles are “respirable particles”, which means they are small enough to penetrate deep into the lungs.

Filters with seemingly comparable efficiencies may not be so comparable. For example, a HEPA (High Efficiency Particulate Arrestor) filter, which is 99.97% efficient at capturing particulates 0.3 microns in size, is more than 30 times more effective than a filter that is 99% efficient at 0.3 microns.

Filtration Methods and Maintenance Costs

Selecting the right air filtration system requires balancing many factors. No single type of air filtration system is best for all applications. Selection must be based on the type and quantity of contaminants in the air. The cost differences between types of air filtration comes down to maintenance costs – pay for labour to clean filters or pay for disposable filters.

Cartridge Filters

Cartridge filters provide an economical and easy-to-use solution for filtering dirt and weld fumes. Well-designed cartridge filters can provide efficiencies higher than 99%. Most cartridge filter systems use a blow-down process to clean the filters, where a pulse of compressed air is triggered by timer or by a worker.

Bag Filtration

Dust collectors using bag filters are economical to operate and easy to maintain, with up to 99% efficiency. Collected particles are removed by a shaking mechanism that dislodges particles from the media.

Electrostatic Precipitators

Electrostatic precipitators are effective at removing sticky or wet submicron contaminants such as oil smoke and welding fumes. Particles are ionized as they pass by charged wires and are attracted to charged metal plates. They are not very effective with large particulates. Although they are extremely efficient, they require more maintenance than other types of filters because the collector plates can load up relatively quickly, and once they are covered, they are rendered ineffective. Cleaning involves either wet-washing or by impacting, rapping or vibrating the filter.

Centrifugal Mist Collection

Centrifugal mist collectors remove coolant mist from machining operations, right at source. As air passes through the filter media, submicronic mist particles are retained until they grow to droplet size, then thrown free of the perforated rotating drum to the inner wall of the casing. High velocity drives the liquefied oil into a collection chamber. The clean, recycled oil is drained from the unit for re-use or recycling. Centrifugal mist collectors are equally effective for petroleum-based, synthetic, semi-synthetic or water-based coolants.

Gas Filters

Gas vapour filters contain either activated carbon, potassium permanganate, activated alumina, zeolites or combinations of these, depending on the types of gas being captured. The list of chemicals that may be in the air is indeed long. The different media are suited to capture different types of gases, and are able to adsorb different gases to varying degrees. Carbon filters can be refurbished with fresh carbon.

Modular Media Filtration

Modular media systems use a number of selected filter modules in one unit to provide solutions to many air contaminant problems. The units are customized with different types of filters to provide the optimum balance of filtration effectiveness and maintenance cycles in a specific environment. A typical system can incorporate pre-filters, some type of disposable or cleanable filter media, a HEPA filter, and a gas vapour filter.

Today we know much more about the health effects of airborne contaminants. Reflecting this growing knowledge are ever more stringent air quality regulations and greater awareness among employees. We also know more about the associated costs of poor air quality and how poor air quality can damage machinery and equipment, and increase facility maintenance costs. Given these factors, it is now more important than ever to consider the air quality at your facility.

Sources: Nederman, Inc., (www.nederman.com), Donaldson Company, Inc.(www.donaldson.com)

HOW IT WORKS

Direct Injection Steam Humidifiers

Humidity and Heating Costs

Relative humidity (RH) is a vital ingredient in total environmental control. Generally speaking, relative humidity maintained between 35% and 55% seems most conducive to human comfort. Drier air feels cooler than more humid air at the same temperature. This fact makes it possible to achieve a comfortable condition during the heating season at lower temperatures in a humidified building than in a building where RH is not controlled. The savings in heating costs can be significant over the course of just a single heating season. Besides heating costs, there are many other reasons to control RH:

• Prevent static electricity discharges that can ignite explosive gases in manufacturing and storage facilities, or damage computers and other electronic equipment

• Avoid material processing problems caused by static attraction and material distortion.

• Protect stored materials such as paper products, wood products, textiles, food stuffs and pharmaceuticals from degradation.

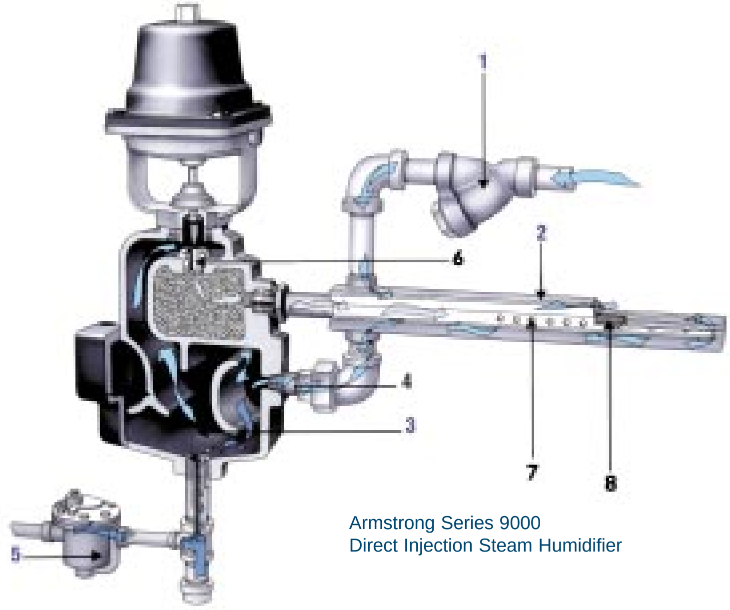
How to humidify

Steam humidification is recommended for virtually all commercial, institutional and industrial applications. One of the most popular types of steam humidifier is the direct injection steam humidifier, which adds moisture to the supply air of an HVAC system by the injection of steam directly into a duct.

Why Steam?

1. Steam is pure, sterile and odour free.
2. Steam contains no mineral dust to irritate personnel or foul a process.
3. Steam is easily controlled and able to meet variations in load without waste.
4. Maintenance is simple since there are few moving parts and they are all easily accessible outside of the duct.
5. There are no water pads to replace or pans, wheels etc. to clean and keep free of algae.
6. Steam eliminates the need for water in the heating ducts or the area being humidified. This removes the risk of stagnant water which can provide a fertile breeding ground for algae and bacteria.
7. The use of steam for humidification generally obviates any need for after-heaters in the air handing system.

Sources: Hygromatik, Armstrong



Armstrong Series 9000
Direct Injection Steam Humidifier

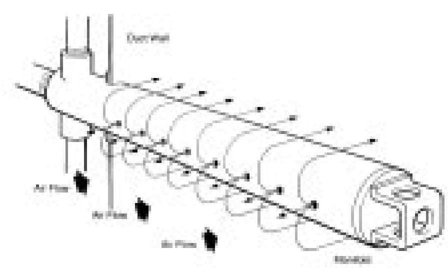
The main objective for a steam humidifier is to inject dry steam in a controlled manner into an air stream and distribute the steam, thus insuring it is all absorbed by the air.

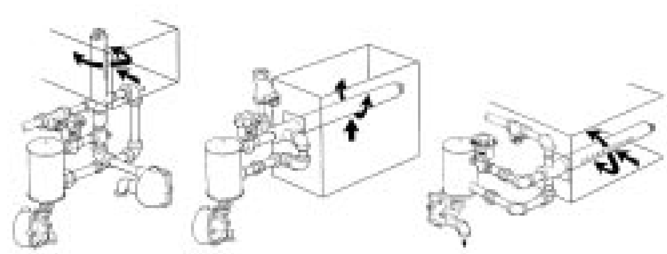
How it Operates

Supply steam enters the inlet pipe strainer (1) flows along the top of the steam jacket distribution manifold (2) around the end and along the bottom of the manifold. This is to pre-heat the dispersion tube (8) and prevent condensation. From the manifold jacket, steam flows into the separation chamber (3) via the directing nozzle (4) . The condensate separates out and flows to the bottom of the separator chamber where it is discharged through a float trap (5). Dry steam flows from the separator chamber and is regulated through a control valve (6). The dry steam is then discharged through the mesh covered orifices (7) of the steam jacket dispersion tube.

Right: How steam flows out from the steam jacket distribution manifold.

Below: Humidifiers can be custom configured for various vertical and horizontal installations





The machine-human productivity connection

By Robert M. Williamson

In nearly all of the 250 or so equipment-intensive plants and facilities I have visited, taught at, and worked in over the past 30 years, I have observed the relationships between the skills of employees and the reliability of the equipment. These observations may provide helpful insights for plant and facility managers who are troubled with unreliable equipment and high maintenance costs. Here are a few:

Observation Number 1: There is a direct correlation between the way the plant floor people are treated and the reliability of the equipment for which they are responsible. Clean and reliable equipment usually means employees needs are regularly addressed. The people are listened to. And the same applies to the equipment if its needs are also regularly addressed. The equipment needs are "listened to." Responding in a proactive manner to people typically results in proactive maintenance of the equipment. A work culture of "equipment ownership" develops.

Observation Number 2: The highest levels of equipment reliability exist where skilled maintenance people operate the equipment. Likewise, the lowest levels of equipment reliability exist where unskilled or semi-skilled people operate the equipment. There is a direct correlation between equipment reliability and the equipment-specific skills and knowledge of equipment operators.

"Put all machinery in the best possible condition, keep it that way, and insist on absolute cleanliness everywhere in order that a man may learn to respect his tools, his surroundings, and himself"

What can we conclude from these two observations? Equipment-specific skills and knowledge improve equipment reliability. The positive attitudes of employees lead to more reliable equipment. Not exactly rocket science, is it? So why don’t all managers and supervisors, all levels of decision-makers and leaders, in a business emphasize the well-being of their people and equipment alike? This is a real mystery to me.

Observation Number 3: We are firmly in an era where there is a shortage of skilled employees in manufacturing and maintenance. Fewer young people are being encouraged to undertake that kind of work. There is a trend of having operators perform routine maintenance on their equipment. This trend makes sense only if handled properly and the right tasks, the right training, the right people, for the right reasons. However, overall productivity can suffer if "downsizing" maintenance results in more operator-performed maintenance that takes time away from their "operating" job roles and responsibilities. There must be a careful balance.

Observation Number 4: We are in another cyclical era of improving performance by "cutting costs." Often, cost-cutting programs have a negative impact on employees’ workloads and/or attitudes, which can be directly linked to more equipment reliability problems. This increases costs and reduces operating efficiency or throughput. A vicious cycle, no doubt. It appears easier to look at overall cost reductions rather than finding ways to reduce the cost per unit produced by improving equipment reliability and work processes.

A vision of the future

Reliable equipment reduces the overall operating costs by producing more first-pass quality production during the scheduled time available. People waiting for "maintenance" to fix their equipment, people waiting for the product at the next stages in the process, in-process inventory buffers, and customers waiting for their orders all add up to significant losses. These losses are exponentially higher than the actual cost of the emergency, reactive repair. Unreliable equipment is not necessarily a positive motivator of people either. If left unchanged, unreliable equipment leads to more unreliable equipment and then the "escalating costs must be cut!" Remember that there is a direct correlation between the reliability of the equipment and the way the plant floor people are treated.

Henry Ford said it best when describing the Ford principles of management in his 1926 book, Today and Tomorrow: *“Put all machinery in the best possible condition, keep it that way, and insist on absolute cleanliness everywhere in order that a man may learn to respect his tools, his surroundings, and himself. The future of equipment-intensive businesses will always depend on the people who operate and maintain the equipment and their ongoing dialogue with those who design, build, and manufacture the equipment. People, the work processes they use, and the equipment they work on are the roots of productivity in the workplace of the 1920s and the workplace of the future.*”

Robert M. Williamson is the president of Strategic Work Systems, a TPM and maintenance consulting firm based in South Carolina.

WEB

Announcing the FSCC Book Centre!

The next time you're looking for a good book on say, managing employee conflict or outsourcing or material handling or some other management issue, check out the Book Centre at the Four Seasons Controlled Climates web site – www.fscc-online.com.

Four Seasons Controlled Climates has teamed up with Chapters.ca to offer a collection of informative, helpful books for managers.

Most of the posted books have detailed descriptions, so you know what you are getting before you buy. No need for you to wade through thousands of books on other web sites using clumsy keyword searches. No need to drive to a bookstore that may or may not have what you are looking for.

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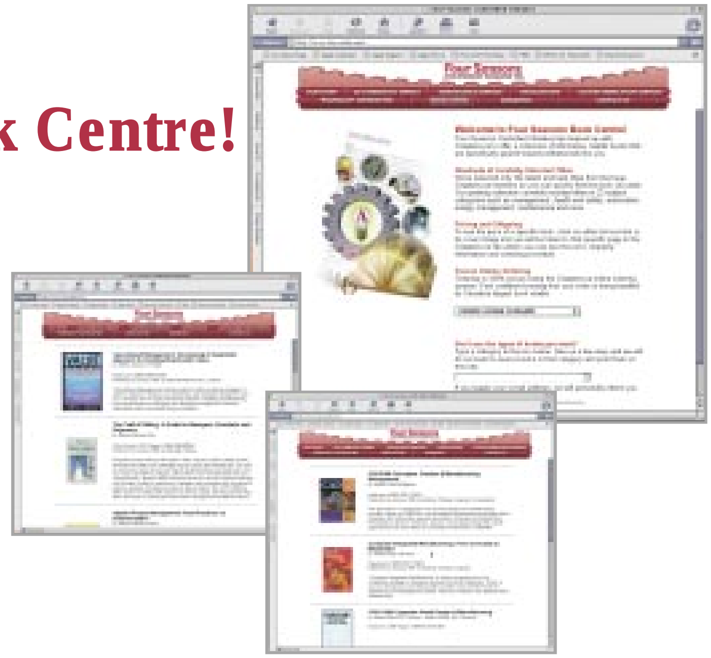
Check out the Four Seasons Book Centre at fscc-online.com. It's just one more way we bring you the information you need to make informed decisions for your mechanical services - and management - needs



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- **CAD/CAM**
- **Energy Management**
- **Facilities Management**
- **Change Management**
- **Metal Processes**

Web Site Make-Over

The Four Seasons Controlled Climates web site (www.fscc-online.com) is receiving a complete make-over that's designed to make the site more dynamic and informative. The changes so far include:

New Design: The site has been redesigned to work better with different browsers, different platforms and screen sizes. The main menu has been redesigned so that it is easier to use and fully accessible no matter what page you're on or where you are on the page.

FSCC Book Centre: The new FSCC Book Centre is the online book store for managers where you'll find the latest books in a wide range of categories. (see article above).

Links Page: Access some of the best resources on the web for facility managers, production managers, maintenance managers and engineers. Over 50 links and growing.

New Home Page: A newly-designed home page has better explanations of the sites features and a "main event" window is your link to the current hot topic.

Download Issues of PilotLight: Want to find an old article you read in a previous issue of PilotLight but you threw out the issue? Are you a new Four Seasons Controlled Climates Customer who has just started receiving PilotLight? Now you can download the latest and past issues of PilotLight directly from our web site. Each issue is in PDF format, which retains the full-colour look and layout of the printed version and is specially prepared for printing from any colour or black and white desktop printer. The files are small enough to easily store on your own hard drive so you can print as many copies as you want and distribute them to employees or colleagues. As well as complete issues, you will also find individual articles that are optimized for viewing directly on the web site.

Check out www.fscc-online.com today to take advantage of the latest features and watch for more great new features to come!

Old Willy's Words of Wisdom

One of the most influential people Willy has ever known was Eleanor Roosevelt. Although she was famous as the First Lady and wife of President Franklin D. Roosevelt, there was a great deal more to this remarkable woman.

From a young age, Eleanor became involved in various civil and human rights causes. In 1920 she joined the League of Women Voters, for which she made her first public speeches. In 1922, she joined the Women's Trade Union League and the Women's Division of the Democratic State Committee. Her published writings at this time solidified her stance as a leader of female independence. The same year, she became director of the Bureau of Women's Activities of the Democratic National Committee.

Eleanor became the first wife of a president to hold a press conference. At the first of many, only women were allowed to attend, which, as intended, put pressure on newspapers to hire female reporters. In 1935 she began to publish her opinions in a daily syndicated column entitled "My Day".

Eleanor helped initiate the National Youth Administration, securing employment rights for the young. She denounced anti-segregation policy in the South, and helped to create anti-lynching legislation.

Following President Roosevelt's death in 1945, Eleanor became a U.S. delegate for the United Nations. She remained devoted to civil and human rights issues right up until her death in 1962.

What Willy remembers most about his friend Eleanor were her many words of wisdom, which she liked to share through her writings and public speeches. Here are just a few of the things she said:

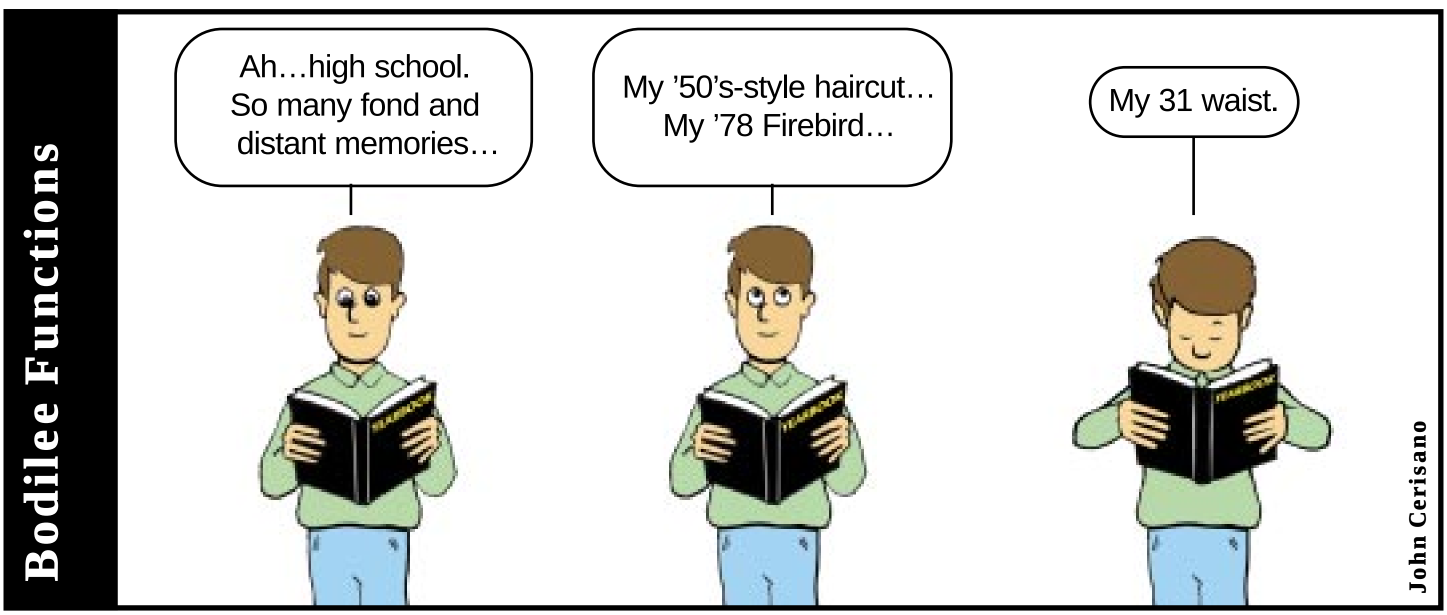
"You gain strength, courage and confidence by every experience in which you stop to look fear in the face."

"Courage is more exhilarating than fear, and in the long run it is easier."

"Teach the young to use their own minds. For one thing is sure: If they don't make up their own minds, someone will do it for them."

"The important thing is neither your nationality, nor the religion you professed, but how your faith translated itself in your life."

"You have not only the right to be an individual; you have the obligation to be one. You cannot make any useful contribution in life unless you do this."



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