MEC Systems Inc.

Leader in Misting & Temperature Control Systems

www.mecsystems.com mister@mecsystems.com

*Unit Size and Structure may vary depending on application requirements

Since the early 1980's **"MISTER"™** innovative systems were among the first used to cool and humidify environments, from outdoor residential and commercial cooling, to indoor greenhouse complexes. Over the last 25 years, research and development has kept **"MISTER"™** fogging systems as a front runner in every industry that requires cooling, humidifying and fogging.

MEC Systems (Mechanical Environmental Controls) designs and manufactures environmental control systems that cool, humidify, reduce dust and odours.
The systems can also be used to reduce the risk of explosions and fire. MEC's **"MISTER"™** trademarked products are used worldwide In many industries and applications, including dust suppression in sawmills, humidification for wine barrel storage rooms, and greenhouses, cooling for outdoor patios, poultry farms, zoos, theme parks and special effects. MEC currently has misting systems operating in North and South America, the Caribbean, South Pacific, Europe, the Middle East and the Far East.

Industrial Sawmills Wineries Agriculture Commercial & Residential Sports Facilities

TECHNOLOGY

MEC is one of the original manufacturers of effective high pressure misting/fogging systems that can cool, humidify, and reduce dust and odors.

A) TECHNOLOGY

The "MISTER" system consists of an arrangement of atomizing nozzles, whose function is controlled by a central control module. The control module maintains the required system operating pressure, filters the water supply, and activates the operation of the nozzles based on signals received from a sensor, which is specified according to the application.
The "MISTER" system uses ordinary water that has been treated, filtered, and pumped up to between 600 and 1000 psi. It is then delivered down a ½" stainless steel tube or flex hose. Unique "MISTER" nozzles are

placed at various distances along the tubing. These nozzles atomize the water into billions of micron sized particles which cool the surrounding air, as well as increasing its relative humidity.

B) CONTROL MODULE

The two major components of the control module are a positive displacement pump and motor. Both of these are thermally protected by a dump valve that releases if the temperature exceeds 140 F. A pressure gauge and solenoid valves regulate both the inlet and outlet water flow. The inlet water must reach a pressure of 10 psi before the solenoid valve is opened. Likewise, the outlet water flow to the nozzles must reach a pressure of 100 psi before the solenoid opens. The pressure gauge has a six second delay feature.

C) NOZZLES

"MISTER" unique atomizing nozzles offer low flow rates as well as a high rate of forward discharge velocity. This results in high turbulence and therefore, extremely uniform particle distribution. Each nozzle includes a non-corrosive stainless steel orifice and internal components. A special O-ring seal design requires only finger tightening for a completely watertight seal.

Nozzle orifice diameters range from 0.006" to 0.40", which corresponds to maximum flow rates ranging from 0.0121 to 0.1486 USGPM. These maximum flow rates are based on a 1000 psi operating pressure. Lowering the operating pressure of the system results in lower nozzle flow rates.

Droplet sizes that were produced by different MEC nozzles were measured using Laser Doppler Anemometry by Aeromatics (Sunnyvale, California). Laser Doppler Anemometry (LDA) measures the scatter of laser-light from individual droplets to yield the size of the droplet as well as its velocity. The results showed that MEC's nozzles produced a broad spectrum of droplet sizes ranging from 1 to 50 microns. A majority the droplets, on a Sauter mean basis, were in the range of 2 to 10 microns in diameter. Also, it was known that nozzle size and operating pressure have only a minor effect upon droplet size distribution.

D) NOZZLE LINE

1) Stainless Steel
Stainless steel performs well under oxidizing conditions (e.g. acidic or alkaline solutions), since resistance depends on an oxide film on the surface of the alloy. It is easily fabricated into complex shapes and can withstand temperatures up to 1500 F.

2) Flexhose
MEC Systems Inc. uses a ¼" diameter flex hose for specific applications where stainless steel would be impractical.

E) WATER SUPPLY

In all atomization systems, one must pay close attention to supply water quality. MEC's nozzle designs include very small diameter orifices and very narrow passages. Water with Total Dissolved Solids (TDS) counts exceeding 300 PPM or with high calcium of pH levels should be treated in order to prevent excessive nozzle blockages and/or excessive filter cartridge maintenance. If the water quality is in question, a water analysis report should be obtained.

The "MISTER" system is provided with four stages of water filtration: 25 microns, 10 microns, 5 microns, and 1 micron. This will aid in the prevention of nozzle plugging.

BASIC FUNDAMENTALS

A) VAPORIZATION

The conversion of a liquid to its vapor is called vaporization. Heat must be absorbed by the liquid for this process to occur. For instance, in order for 1 mol (18 g) of liquid water to be completely vaporized at 20 C, 44.10 KJ (41.80 BTU) of heat energy must be absorbed. The amount of heat required to convert one mole of liquid into one mole of vapor at a given temperature and constant pressure is called the latent heat of vaporization.

H2O (1) +44.1 KJ H20(g)

It always requires heat to vaporize a liquid because of the greater magnitude of the force of attraction between the molecules in the liquid state as compared to the gaseous state. Energy must be supplied to overcome the force of attraction between molecules in the liquid, to pull them apart and increase the distance between the molecules. The energy supplied increases the potential energy of the molecules.

B) FLASH EVAPORATION

The cooling effect created by the "MISTER" system is due to the flash evaporation of liquid H20. This is the change that occurs when a liquid under pressure passes through a nozzle to a pressure low enough that some of the liquid vaporizes or "flashes", producing a two phase stream of vapor and liquid in equilibrium.
Water is first filtered, and then pumped to as much as 1000 psi. The water is then sent to "MISTER" unique atomizing nozzles. When the water passes through these nozzles, flash evaporation occurs. The energy required for this vaporization to occur is provided from the surrounding air in the form of heat, thus cooling the surrounding air.

C) IMPACT

The impact of MEC's high pressure spray is given by the following formula: Impact = Mass per Unit Time x Spray Velocity. The variables affecting the impact of a spray are flow rate, spray angle, concentration of the

spray, operating pressure, and air friction. These variables will either affect the mass per unit time or the velocity and this affects impact. The flow rate is, of course, essentially the mass per unit time. The drop sizes affect the velocity in that smaller drops lose velocity due to air friction more
rapidly than the larger ones.

Total impact of the nozzles should be distinguished from the impact per unit area. The total impact of two nozzles may be the same, but the impact per unit area can be entirely different. The spray angle and the concentration of the spray does not directly affect the total impact but does affect the impact per unit area. The smaller the spray angle and the more concentrated the spray pattern, the higher the impact per unit area is.

POLLUTION CONTROL

A) PARTICULATE EMISSIONS

Particulates may be defined as solid or liquid matter whose effective diameter is larger than a molecule but smaller than approximately 100 m. Particulates dispersed in a gaseous medium are collectively termed an aerosol. Particular types of aerosols include: dust, smoke, fog, and haze.

The adverse health effects of particulates depend not only on their amounts but also on their chemical and physical properties. Particle size limits access to the lungs. Those reaching the lungs by mouth are usually less than 15 m and by nose, less than 10 m. Fine aerosol particles, 2 m or smaller, ultimately reach the lung's fine structures, the individual alveoli. The effects produced depend on chemical properties such as toxicity, acidity, and solubility.

The "MISTER" system removes particles from gas by capturing the particles in water droplets and separating the droplets from the gas stream. The droplets act as conveyors of the particulate out of the gas stream. The three main mechanisms utilized in capturing particulates include:

I) Inertial Interception
On approaching a collecting body, a particle carried along by a gas stream tends to follow the stream but may strike the obstruction because of its inertia.

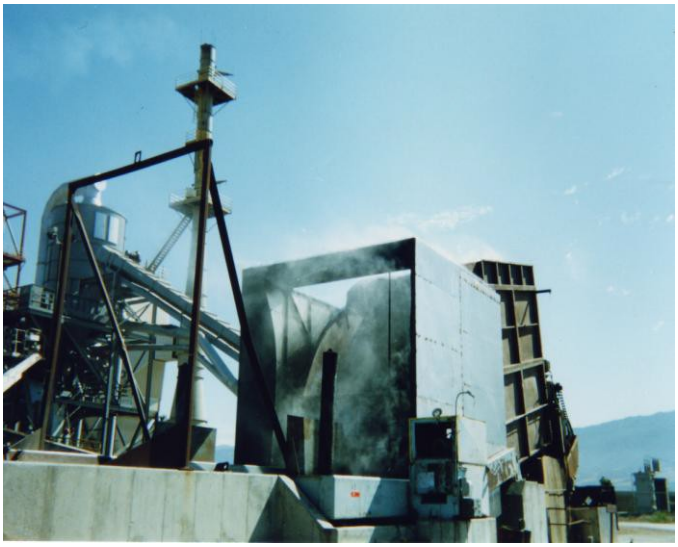
ii) Brownian Diffusion
Smaller particles, particularly those below about 0.3 m in diameter, exhibit considerable Brownian movement and do not move uniformly along the gas streamline. These particles diffuse from the gas to the surface of the collecting body and are collected.

iii) Flow-line Interception
If a fluid streamline passes within one particle radius of the collecting body, a particle travelling along the streamline will tough the body and may be collected without the influence of inertia or Brownian diffusion.

These mechanisms cause the tiny pollutant particles to be lodged inside the collecting droplet. The larger droplet is then separated from the gas stream by gravity. Because of the minute size of fog droplets produced, the “MISTER” system is best suited for the elimination of very fine particulates.

B) FUGITIVE DUST

Dust is typically formed by pulverization or the mechanical disintegration of solid matter into particles of smaller size by processes such as grinding, crushing, and drilling. Particle sizes of dust range from a lower limit of about 1 micron up to 100 microns and larger. Dust particles are usually irregular in shape and will not flocculate or settle under the influence of gravity. Common examples include fly-ash, rock dust, and ordinary flour. Dust collection is concerned with the removal of these particles for the purpose of:



1) Air-pollution reduction
2) Equipment-maintenance reduction
3) Safety or health hazard elimination
4) Product-quality improvement
5) Recovery of a valuable product

It is well known that increasing the relative humidity of air will significantly reduce the amount of dust in the air. The “MISTER” system controls low humidity levels in the air, thereby reducing this problem.

C) SMOKE

Smoke implies a certain degree of optical density and is typically derived from the burning of organic materials such as wood, coal, and tobacco. Smoke particles are very fine, ranging in size from less than 0.01 m to 1 m. They are usually spherical in shape if of liquid or tarry composition and irregular in shape if of solid composition. Owing to their very small particle size, smokes can remain in suspension for long periods of time and exhibit lively Brownian motion.
Convection flow causes reburn.

FORESTRY INDUSTRY

A) Hygroscopic Materials

Hygroscopic materials are defined as those which are able to take on or give up moisture, thereby changing their regain. They are particularly sensitive to humidity changes in their environment. When these materials finally reach a balance, where they are stable and no longer take on or give off moisture, they are said to have reached their equilibrium moisture content (EMC).

When a hygroscopic material is stabilized at its EMC for a particular temperature and relative humidity, there is little effect on the material. The problems begin when the relative humidity begins to drop and the air pulls moisture from the material, upsetting its EMC. When the material loses moisture it will shrink, warp, crack,

and become thirsty for solvents. This causes problems not only with the material, but also with the machinery, finishing processes, coatings, etc. Weight and texture are also significantly affected.

When the EMC is upset to the point of damaging a product and rendering it unsalable, economic loss results. This includes the loss of any and all energy required to manufacture that product, and the additional energy input and labour expense if the product is reworked.

B) Wood

Wood is a hygroscopic material, able to take on or give up moisture to the surrounding air. As wood takes on moisture it swells, as it gives up moisture it shrinks. The amount of moisture in the wood, expressed as a percentage of its dry weight, is referred to as its regain. Regain will vary with temperature, relative humidity, and type of material.

As wood loses moisture it shrinks, however, the tangential shrinkage is much greater than radial shrinkage. This causes dimensional changes and instability in the wood and it will pull apart along the grain, causing cracks. If the wood is strong enough not to crack, it will warp as the uneven shrinkage occurs. This is why it is important to condition wood to the proper regain for best workability and then stabilizes it at the corresponding EMC by maintaining proper humidity control.

Optimum conditions for wood constitute a regain between 5% - 9%, depending on the wood and its use. This corresponds to the EMC with 35% - 45% relative humidity air at 75 F.

C) Dry Kilns

The “MISTER” system is ideal for use in lumber dry kilns. It can be used with lumber of any species and thickness and can be installed in both conventional and dehumidification dry kilns.

The “MISTER” system provides solutions to many problems experienced during conditioning and equalization. First, it eliminates the tendency of the dry bulb temperature to rise uncontrollably. This rise in temperature decreases the relative humidity in the kiln, reduces the effectiveness of the conditioning process, and lengthens the time required for equalization/conditioning. This temperature rise is due largely to an enthalpy decrease when high-temperature, high-pressure steam is released into the kiln interior. A smaller heating effect results from the temperature change undergone by the steam as it leaves the spray line. It is estimated that the combined effect of these two factors result in a release of 1,270 BTU each for pound of water vapor absorbed into the lumber. If a cool water spray were to be used in place of live steam, approximately 1,112 BTU/lb. of spray would be used in raising the temperature of the water droplets to the kiln interior temperature. This would largely offset the 1,270 BTU/lb released when the vapor entered the wood surfaces, thereby significantly reducing the heat problem.

Another advantage of using the “MISTER” high pressure system with conventional kilns is the steam savings. Take the case of a mill with several kilns which are heated by a waste wood boiler.

When the mill was constructed, the boiler was oversized to allow for future kilns. As these were added, the excess heat capacity of the boiler decreased to the point that the output of the boiler would not support additional kilns.
By replacing the steam spray systems in all kiln attached to the boiler with the “MISTER” system, enough energy can be saved to permit the construction of additional kilns without an expensive boiler upgrade.

APPLICATIONS

EFFICIENT COOLING SYSTEMS:

The systems use multiple thermostats and zone controls to ensure an even distribution of temperature levels in any setting or circumstance. Whether for a farm, factory, winery, greenhouse or storage facility, MEC technologies are an efficient and cost effective solution. The flash evaporation in the system can be used in any environment or climate - low or high humidity - without creating excess moisture that can interrupt operations and make for an uncomfortable workplace.
Applications are excellent for any of the following: Poultry/Hog/Dairy farms; Multiple Industries; Wineries; Commercial operations such as Greenhouses; Fruit/Vegetable stores; Outdoor Recreational facilities; Residential patios.

HUMIDIFYING SYSTEMS:

A high-pressure fog system is a fraction of the cost to operate compared to compressed air or steam systems. Humidification is the way to combat dry air and the problems that come with it in certain industries such as greenhouses to prevent moisture loss and stress on plants resulting in smaller returns on your investment; dry kilns to increase loads and hasten cycle times; wine barrel storage facilities to retain volume that can be lost with changing environmental factors; wood manufacturing & storage to maintain quality of wood that won't warp or swell.
Applications are excellent for any of the following: Dry Kilns; Print Shops (stop paper from curling, cracking, static build up); any size Greenhouse; Wood Storage and Manufacturing; Concrete Curing; Textiles (avoid static/shrinkage).

INDUSTRY DUST CONTROL:

When atomized water is introduced into dusty environments, the dry fugitive dust particles absorb the water droplets, causing them to increase in weight and settle to the ground. Dust suppression systems are invaluable to operators of facilities that are prone to producing inevitable dust, which pose health problems to workers and make machinery cleaning a difficult and costly pose health problem to workers and make machinery cleaning a difficult and costly process.
Applications are excellent for any of the following: Sawmills (all transition points including cutting areas, storage, screens, debarking, generator rooms); Material Processors; Poultry Ranches; Rock Quarries.

COMMERCIAL ODOUR CONTROL:

MEC systems break down and scrub gas and air molecules with sub-micron sized water particulates to ensure odours are eliminated. Our systems comply with all Government Regulations. Odour control and multiple forms of waste water treatment are heavily regulated by the government. In order to avoid fines and penalties, it's important for you to know and comply with the changing regulations. Odour neutralizing agents can also be injected through the system to control odorous gases.
Applications are excellent in controlling: Hydrogen; Sulphur Dioxide; Methyl Mercaptan; Ethyl Mercaptan; Skatoles; Indoles; Amines; Carbon Dioxide.

LEGAL CANNABIS ODOUR CONTROL:

With our proven Odour Control System – MEC Systems Inc is emerging as a leader in the field of "legal" cannabis odour control. Using a Plant Oil based Odour Control Agent – which is injected into the Misting Pumping Unit –and dispersed through MEC's patented Nozzles - our Odour Control for Legal Cannabis neutralizes the heavy cannabis odour without any damage to plants and is safe for staff exposure.

LANDFILL ODOUR CONTROL:

Without the necessary component of odour control, landfill and transfer stations run the risk of creating an unsafe working environment as well as causing damage to the environment. All areas of solid waste handling are, by nature, odourous affairs. Composting and co-composting facilities, as well as landfills all generate odours which can be offensive to the workers and to the surrounding community. Different types of solid wastes generate different odours including ammonia, methane and other odourous mercaptans. MEC **Misting or Fogging systems** are ideal for all these locations. As with most odours, emissions are intensified by agitation. When compost rows are turned or solid waste is off-loaded, there is a dramatic increase in the amount of odour in the atmosphere. It is important for odour and waste to be managed at transfer stations.

Applications in Review

INDUSTRIAL : factories, warehouses, cement factories, truck and train loading areas, hangars, oil refineries, sewage and compost treatment plants, pre cooling of rooftop condensers.

SAWMILL INDUSTRY: All transition points, dry kilns, processing areas, cutting areas, debarking areas, screens, generator rooms, wood storage facilities.

COMMERCIAL & RESIDENTIAL: Hotel and residential swimming pool areas, restaurant patios, golf course driving ranges, private homes, tennis courts, theme parks, special effects, tourist attractions, rest areas, customer line ups, marinas.

SPORTS FACILITIES: Baseball and football stadiums, auto race tracks, horse racing tracks, tennis courts.

AGRICULTURE: Poultry barns, greenhouses, hog barns, horse stables, dairy barns, medical cannabis grow operations, plant and bulb storage areas, wineries and barrel storage areas.

All of MEC's misting systems come with a 1 year warranty on the pumping unit and 5 years on the stainless steel nozzle line, however, proper maintenance of your misting system is necessary to ensure optimum performance and longevity based on the MEC SYSTEMS INC. Installation and Maintenance manual provided with each system.

Warranty & Maintenance for a "MIST$_{ER}$"™ Misting System

All of MEC's misting systems come with a 1 year warranty on the pumping unit and 5 years on the stainless steel nozzle line. Warranty terms based on Installation & Maintenance manual provided with each system. Proper maintenance and installation of your misting system is necessary to ensure optimum performance and longevity.

Oil should be changed on a regular basis. The manufacturer of the pump used in the misting system usually recommends changing the oil every 500 hours. Some owners prefer to change the oil more frequently - at 250 – 300 hours. The types of oil to be used vary, depending on the pump used for your system. MEC recommends that your first oil change is performed after 20 hours of operation, then all subsequent oil changes can be at 500 hour intervals or earlier if you choose.

Regularly check the condition of the filters and the incoming pressure gauge at start up to ensure adequate supply and water pressure to your pumping unit.

To protect your warranty only use recommended brand filters in system maintenance manual. MEC's misting systems are designed and manufactured with a 4 filtration system, consisting of a 25 micron filter, then through a 10 micron filter, followed by a 5 micron filter, and finishing with a 1 micron filter to ensure as much foreign matter is removed prior to the water entering the pumping system. The order of the filters from 25 down to 1 micron should not be altered since some water sources may contain only large particulates and the need to change only the 25 micron filter can reduce your maintenance costs. If your water pressure or flow is restricted due to clogged filters cavitation of the pump may occur, causing you needless expense to replace the pump. The incoming water pressure should never exceed 100 psi and never be lower than 40 psi.

MEC SYSTEMS INC.
49482 Castleman Road
Chilliwack, British Columbia
Canada v2p 6h4
Ph: (604) 794-7779
Fax: (604) 792-7072
Em: mister@mecsystems.com
www.mecsystems.com

MISTER™

EXPERIENCE THE DIFFERENCE