

Factory Air Quality : Monitoring as the First and Last Step in Risk Management

Ambient air, that you breathe every day, contains life supporting oxygen, nitrogen, carbon dioxide, and chemicals like formaldehyde or carbon monoxide that can harm you.

Characteristics of that air, like temperature, humidity and barometric pressure, determine the comfort to humans at work in that space.

Now, start with that air and add the chemicals used in manufacturing, and then concentrate them in a confined space like a factory. The resulting air can become even more uncomfortable and toxic fairly quickly unless properly managed.

The health effects of ingesting chemicals include:

1. Irritation—mucous membranes (eyes, nose, throat)
2. Strained breathing—coughs, wheezing, chest tightness
3. Existing health problems become worse
4. Increasing risk of heart disease, cancer and kidney and liver diseases

Healthy adults in the workplace can tolerate lower levels of carbon monoxide and formaldehyde, for example. But, they can bring home these chemicals, attached to their clothing, to infants and children.

Toxicity levels are relative to the mass of the person ingesting the toxin. Even if the adult tolerates the mass breathed, their child may not tolerate that mass when the child is fifteen percent of their parent's mass. Further, formaldehyde is more dense than ambient air, it sinks to a child's breathing level. For example: formaldehyde off-gassing from flooring is a health and safety concern, especially for children.

RISK MANAGEMENT

Risk management surveys begin with defining the current situation. Factory air risk management begins by monitoring the air and defining the current situation. The air can be tested to satisfy OSHA, health studies for workers' compensation, HVAC temperature monitors as well as safety concerns for extreme conditions.

The first step is monitoring. The data is collected, analyzed, and interpreted. Issues discovered, and solutions implemented. The final step is to monitor on an ongoing basis to assure efficacy of the solution.

Proper monitoring should result in solutions that assure health and increase safety.

IMMEDIATELY DANGEROUS TO LIFE AND HEALTH (IDLH)

Baseline monitoring includes IDLH substances. Although you may think you do not have these issues, unfortunately, chemicals mix in the air. Do you have bleach and ammonia fumes? Several explosives and poisons can be formed.

Identify and quantify contaminants through a professionally designed and executed monitoring program. Airborne contaminants present a major pathway for disease. Proper monitoring will point to proper:

1. Selection of personal protection wear and filtering systems
2. Delineated mandatory protection areas
3. Risk to health from exposures
4. Medical monitoring
5. Decontamination requirements at the day's end

FORMALDEHYDE

Formaldehyde is a carcinogenic category 2, which means a non-lethal, but irreversible effect after a single exposure. The irreversible effects include:

1. Damage to the central nervous system
2. Kidney necrosis
3. Liver lesions
4. Anemia
5. Paralysis



AQM-101, Formaldehyde Monitor and Data Logger.

In 2015, The Formaldehyde Act under the Toxic Substances Control Act (TSCA), extended regulations to reduce emissions of formaldehyde from composite wood products, like flooring products used in the course of scientific research and other professions where tissue is preserved in some manner.

A Formaldehyde Monitor and Data Logger is an ideal instrument for indoor air quality (IAQ) diagnosis and HVAC system performance verification.

CARBON MONOXIDE

When workers breathe carbon monoxide, it moves to the bloodstream as oxygen does; however, carbon monoxide binds to hemoglobin to prevent oxygen from doing so. Less oxygen in the blood leads to less oxygen in the brain, heart and other vital organs.

Symptoms include fatigue and confusion in healthy employees. These symptoms render employees unsafe, unable to respond rapidly or make clear decisions. Vision, mental alertness and productivity suffer.

Carbon monoxide is particularly cruel to employees who already suffer heart disease, experiencing more chest pains or angina.

There are a variety of Carbon Monoxide Monitors and Data Loggers available to detect indoor air quality (IAQ) diagnosis and HVAC system performance verification.



HHAQ-105, Handheld Carbon Monoxide (CO) Monitor.



AQM-103, Carbon Monoxide Monitor and Data Logger.

PARTICULATE MATTER

Dust and particulate carry other pathogens and irritants too. Keeping solids out of the air supply requires sophisticated capture and containment. Proper monitoring to determine the filtering requirements is the first step.

In any manufacturing, but particularly high technology, particulate management is a quality assurance—quality control issue. Use a portable instrument to measure and report air contamination and download data to a personal computer using the USB interface cable.



HHPT-51, Handheld Particle Counter.

COMFORT CONTROL

Comfort creates productivity. Too hot or cold, low oxygen, high humidity environments are just distracting, or worse, sleep inducing.



FMA1000, General Purpose Industrial Air Velocity/Temperature Transmitter/Indicator.



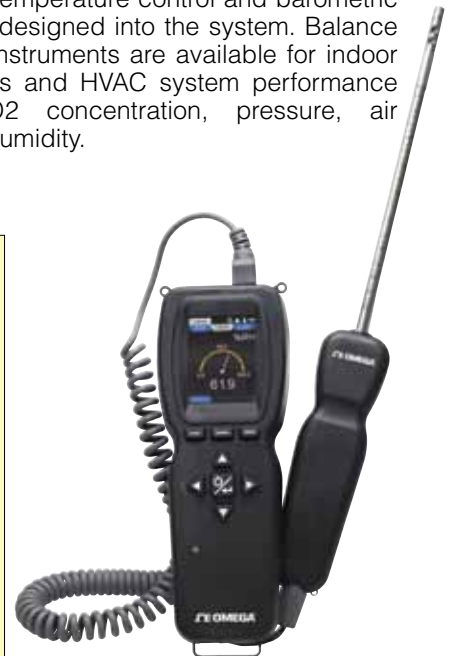
HX400, Humidity/Temperature Transmitter.

Modern buildings attempt to “positive pressure” the indoor environment to prevent mold spores from entering the building through leaks in the envelope.

Increased pressure actually raises the ambient temperature as well. A balance between temperature control and barometric pressure control must be designed into the system. Balance is key. A wide variety of instruments are available for indoor air quality (IAQ) diagnosis and HVAC system performance verification. Measure O₂ concentration, pressure, air temperature and relative humidity.



HHAQ-104, Portable Oxygen Monitor and Data Logger.



HH-USD, Handheld for Temperature, Humidity and Flow.

HVAC design requires sophisticated engineering since the components of air and the dynamics of air flow can be incompatible. Humidity removal affects temperature and pressure. Positive pressure on the building maintains control of outdoor pathogens from entering.

Cooler air holds less water, but that raises relative humidity if the air was not saturated before it cools. Oxygen levels should be high while carbon dioxide release should be low and carbon monoxide emission eliminated or directed outside.

HVAC design and balance is critical, and begins and ends with monitoring.

OCCUPATIONAL SAFETY and HEALTH ADMINISTRATION (OSHA)

The OSHA mission began with indoor working conditions. Embrace the mission and use their training tools that are available to the public through the OSHA website.

One of their most useful services is Spanish language materials, especially those concerning technical data like fitting personal protection gear, or the necessity to wear it. Be sure everyone understands the system from gearing up to decontamination.

RESOLUTION

Remember: Outsource your monitoring needs to the professionals at OMEGA Engineering.

Founded fifty years ago, OMEGA Engineering Inc. began manufacturing thermocouples and has grown to be your one-stop source for process measurement and control.

Now a global technology leader with more than 100,000 innovative products for measuring and controlling temperature, humidity, pressure, strain, force, flow, level, pH, and conductivity.

OMEGA offers a complete line of data acquisition, automation, electric heating, and custom engineered products for use in manufacturing, test and research environments.

Trust OMEGA as hundreds of major manufacturing companies do.

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<http://www.mass.gov/eea/docs/dep/air/qa/health-and-env-effects-air-pollutions.pdf>

<http://www.kendon.com.au/Catalogue/MSDS/Industrial/Formaldehyde.htm>

<http://www.gpo.gov/fdsys/pkg/BILLS-111s1660enr/pdf/BILLS-111s1660enr.pdf>

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