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# Safety First

## Eliminating particulates, isocyanates, and VOCs from shop air is essential to worker health

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Particulates and toxins need to be removed from the air before recirculation can occur.

These enclosures are made from steel framing and fire-resistant PVC to contain all particulates and gases. *Photo courtesy of Duroair Technologies.*

Shops that finish parts with a painting or coating process have been aware of the airborne dangers for many years. And, although lead-based paints are a thing of the past, other dangers still exist.

Nearly every manufacturing business that requires a coating to be applied to it's products—whether its paint, powder coating, or any other application that involves spraying— has two major problems. First, the work area needs to be contained so that it does not get contaminated with dust or other particulates. Second, the spraying process contaminates the air, which needs to be filtered or exhausted, or both, from the building.

Typical solutions to these two problems involve fixed, single-purpose rooms requiring that high volumes of air be exhausted. These enclosures require floor space that permanently reduces the square footage available for other processes, and limits the size and shape of objects that can be moved into the booths.

Exhausting air also means that replacement air must be brought inside. If outside air is significantly above or below the indoor air temperature, it must also be pretreated through makeup air processes. These pretreatment units have high initial capital costs with significant ongoing operating costs.

## Cleaning the Air

Determining the type of airflow, filtration, and exhaust setup can be a daunting task, so shops should consult experts who understand both the technology and the jurisdictional compliance.

There is a difference between dust particles resulting from a grinding process and what is created during a spraying process.

“If a manufacturer is laying down a coating, for example, we need to trap the isocyanates,” explained Ryan Watt, general manager for Duroair Technologies, Burlington, Ont., a manufacturer of indoor filtration units. “These are chemical particulates that become airborne during the coating process and should not be breathed in by workers.”

According to the Centers for Disease Control (CDC), isocyanates are highly reactive, low-molecularweight chemicals that are widely used in the manufacture of coatings such as paints, varnishes, elastomers, and spray-on polyurethane products.

Workers exposed to these chemicals can experience persistent or recurring eye irritation, nasal congestion, sore throat and cough, shortness of breath, and chest tightness.

“The other major group that we need to capture are volatile organic compounds [VOCs]. These are gases that can be poisonous, but also can be flammable and explosive,” said Watt. “A system needs to capture VOCs, eradicate them, and ultimately keep the levels under what is acceptable to OSHA and the Ministry of Labour.”

A shop air analysis needs to be performed to determine what types of contaminants are present, the type of filter to use, and the best way to configure the system to meet the needs of the shop. Also, it must be determined how often the filters need to be changed. *Photo courtesy of Duroair Technologies.*

VOC exposure limits are important to keep track of in a shop environment. If there are 50 parts per million (PPM) in the air, workers have an 8-hour exposure limit. However, if there are 100 PPM, this time drops to 15 minutes of exposure.

Depending on the location of the shop, local authorities also are starting to limit the volume of VOCs that can be exhausted into the outside air.

“Manufacturers are now looking for low-toxicity coatings, which is forcing the coating developers to change their offerings, but we’re not quite there yet,” said Watt.

New water-based coatings have limitations in terms of how long they last. They simply are not designed to last 20 years, according to Watt.

“The bottom line for most shops is that if the VOC levels are low enough, they can likely recirculate their air,” he said. “Most air recirculation systems use some type of carbon filter that essentially grabs on to the VOC molecules and contains them in the filter.”

## Filtration and Exhaust

A shop air analysis needs to be performed to determine what types of contaminants are present, the type of filter to use, and the best way to configure the system to meet the needs of the shop. Also, it must be determined how often the filters need to be changed.

“We know that the filters will capture what they need to, so it simply becomes a question of how long it takes them to become loaded,” said Watt. “If the system recirculates the air, we need to ensure that the air is safe to breathe. Our systems, for example, have monitors to ensure that the filters are catching what they need to catch, that they are not becoming loaded, and that no bad air is getting through.”

Sometimes the air cannot be recirculated because the compounds are just too toxic, so it needs to be exhausted out of the building. However, if only low toxicity is present in the air, it can be filtered and recirculated.

“This saves a company money because an exhaust system doesn’t need to be installed to remove the dangerous air from the building,” said Watt.

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