DYNACOM
Designing Clean Air Solutions

Application Review: Welding Smoke

What is welding?

Welding (Per Wikipedia) is a fabrication process that joins materials, usually metals or thermoplastics, by using high heat to melt the parts together and allowing them to cool, causing fusion. Welding is distinct from lower temperature metal-joining techniques such as brazing and soldering, which do not melt the base metal.

In addition to melting the base metal, a filler material is typically added to the joint to form a pool of molten material (the weld pool) that cools to form a joint that, based on weld configuration (butt, full penetration, fillet, etc.), can be stronger than the base material (parent metal). Pressure may also be used in conjunction with heat or by itself to produce a weld. Welding also requires a form of shield to protect the filler metals or melted metals from being contaminated or oxidized.

Many different energy sources can be used for welding, including a gas flame (chemical), an electric arc (electrical), a laser, an electron beam, friction, and ultrasound. While often an industrial process, welding may be performed in many different environments, including in open air, under water, and in outer space. Welding is a hazardous undertaking and precautions are required to avoid burns, electric shock, vision damage, inhalation of poisonous gases and fumes, and exposure to intense ultraviolet radiation.

What contaminants does this process produce?

Welding produces metal oxides which are in the form of a dry smoke. Often times there is oil on the part that is being welded and as the part heats up due to the welding process an oil smoke will be generated as well.

Capture:

- Fume extraction arms (whether on portable units, wall mounted units or centralized collectors)
- Down draft or back draft tables
- Overhead hoods
- Ambient or un-ducted systems
- Per the Industrial Ventilation Manual for smokes released at low velocity into moderately still air a capture velocity of 100-200 fpm should be maintained.
- NOTE: Which of these methods is preferrable will be determined by the goal of the system. If the goal is to take the fumes away prior to passing through the welders

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breathing zone then ambient systems and overhead hoods will not achieve the goal. If the goal is for overall room air quality improvement, then all the systems would have a positive impact.

Convey:

- Per the Industrial Ventilation Manual "fumes" such as welding smoke should be conveyed at a minimum of 2000-2500 fpm. Higher duct velocities are acceptable. Velocities of 3000-3500 fpm are commonly used.

Collect:

- The best available control technology for weld smoke applications is the use of reverse pulse cartridge style dust collectors. These systems are highly efficient on weld smoke and require relatively low maintenance.
- Electrostatic precipitators (ESP's) are a viable alternative for ambient systems and some light load oily smoke source capture systems. They are typically not recommended for production welding operations.
- Disposable media systems utilizing a HEPA post filter are an excellent option for ambient filtration systems. They are efficient and relatively low cost compared to other technologies.

Clean:

- Filters for cartridge collectors need to be replaced, as a rule of thumb, every 2000 operating hours. Actual time frame will vary.
- ESP collection cells typically will need to be water washed weekly to monthly.
- Disposable filters including the HEPA filter in ambient media systems typically are replaced 1-3 times per year.

Combustibility:

- Weld smoke is not potentially explosive. Even when welding on aluminum it creates an aluminum oxide which is not explosive.
- Weld smoke applications can present a potential fire hazard since they often create sparks. The metal oxides can burn and become a source of fuel.
- If using a cartridge collector flame retardant filter media should be utilized and a sprinkler system or other fire suppression should be considered.