

Clean air welding technologies from KEMPER

Harmful ultra-fine particulate matter generated during welding operations is a major health risk to welders. Extraction and filtration systems such as those available from KEMPER can provide effective protection from this hazard.

Modern innovations in welding technology are said to lower health risks by reducing levels of welding fume, but this can be misleading. At the nano level, impenetrable to the human eye, the concentration of particulate matter associated with some modern processes has actually increased, adding risk to employees in the metal processing industries.

Studies show that most welding fume particles are smaller than $0.1\text{ }\mu\text{m}$. Nearly all of these are respirable and can penetrate deep into the alveolar region of the lungs (alveoli) during inhalation.

Welders exposed to welding fumes on an ongoing basis run a significant risk of health-related problems. Common symptoms include fatigue; breathing difficulties; bronchial diseases; manganese, lead or cadmium oxides poisoning; metalworkers' fever from welding galvanised materials; and even damage to the central nervous system.

The harmful particulate matter generated when welding nickel, chromium or cadmium compounds can even be carcinogenic and significant health risks are associated with filler materials, with 95%

of harmful substances in fumes originating from consumable metal, while only 5.0% come from the parent plate.

Safety measures to protect against fumes

When selecting an adequate extraction and filtration system, of crucial importance is a risk assessment, which helps to identify the risks involved in the specific working conditions. At the heart of the assessment lies the question of what materials and welding procedures are being used. The most widely used gas-shielded welding procedures (MIG and MAG), as well as manual metal arc welding (MMAW) with coated electrodes, are associated with the highest risk potential, while the most hazardous particulates in fume are generated in welding processes involving chrome- and nickel-containing steels.

Technical ventilation measures must be used for processes in the medium hazard class, starting from TIG welding of toxic and irritant materials such as manganese or copper oxides. Although using a different filler material can help to mitigate risks, welders and other workers are advised always to use extraction and filtration systems to eliminate harmful particulate matter from the ambient air, especially since parent materials, consumables being used and welding procedures change from job to job.

Direct extraction of welding fumes

The most important principle for successfully implementing clean air technologies is to contain welding fumes directly at the point of origin. To achieve this in practice, KEMPER's low vacuum source extraction systems such as SmartFil, MaxiFil or MaxiFil Clean are frequently used. These extraction systems enable the capture of harmful sub-



Extraction hoods from KEMPER are designed with integrated lighting and a flange-shaped cover customised to the welding seam.

stances using extraction hoods and flexible extraction arms at distances of 30 cm from the point of origin.

Extraction arms connected via the extraction and filtration system or a pipe system on a centralised ventilation system are self-supporting devices. Extraction hoods from KEMPER are designed so they remove the harmful particles present in the air. This is made possible by a flange-shaped cover customised to the welding seam, which ensures a particulate reduction efficiency of 40% better than oval extraction hoods. Integrated lighting also improves workpiece visibility, which allows welders to adjust the hood more effectively.

Extraction systems can also be integrated into welding torches. These include the KEMPER VacuFil 125 or 500. Also available are the MiniFil systems that use funnel- or slit-shaped high-vacuum source extraction systems that are held in place by magnets, which offer an alternative to low vacuum source extraction systems.

When automated welding is used, extraction hoods with lateral plates for protection against crossflows are additional safety devices of choice, their size being customised to suit the operating area of the welding robot or automated system.

Source extraction systems typically reach their limits when welding large workpieces at multiple sites or due to a lack of extraction efficiency. The alternative to ensure industrial safety is to adopt a room ventilation system as an addition to source extraction systems. Room systems help to

protect non-welders in the production facility from exposure to harmful substances, while further improving the quality of the air in the working space.

With the launch of CleanAirTower, KEMPER is making this new layer of ventilation and protection readily available to those in need of mixed-mode fume-extraction. CleanAirTower is a stand-alone solution that can be installed anywhere in the working area, without the need to connect to an existing piping system. It is easy to position and extracts fumes from 360° around the area enclosed by an approximate 10 m radius. Welders directly exposed to welding fumes should still use personal protective equipment or welding helmets with auto-darkening filters and built-in ventilation units, which are also available.

Filtration and the disposal of pollutants

For effective industrial safety, filtration quality should be considered in addition to a high extraction coverage. This affects the dust reduction efficiency, which determines if the air supplied from the filtration system can be recirculated into the working area.

Welders need only use W3 filters, which

offer the highest efficiency, when welding chrome-nickel steel. These provide a particulate reduction efficiency greater than 99%. Such filters have already been integrated into KEMPER's entry-level fume extraction units. An important component of occupational safety for fabricators is the disposal of pollutants. During the replacement of dust containers in conventional systems, the separated and unfiltered particles can easily be re-released into the air.

KEMPER now offers a solution with a dust discharge system based on cartridges that ensures contamination-free dust disposal for surface-filter applications. The company has also developed a solution for devices with disposable filters that ensures the filters can be removed and replaced without contamination.

In order to monitor the effectiveness of occupational safety measures, highly sensitive sensor devices are able to measure particles being produced, down to the fine dust range. AirWatch, for example, is capable of detecting ultra-fine particles below $0.3\text{ }\mu\text{m}$. Such systems are also capable of automatically controlling extraction systems and room ventilation systems. On the basis of stored limit values, these air monitoring systems are also able to automatically start



KEMPER's AirWatch particle monitors are capable of detecting ultra-fine particles of below $0.3\text{ }\mu\text{m}$.

up extraction systems when necessary.

Industrial safety is not only a question of cost. Fabrication facilities need to understand the benefits of using air quality control measures. Effective protection against inhaling hazardous particles minimises the impact on human health, which in turn reduces work interruptions and health-related absences.

Better air quality also results in improved job satisfaction among employees, high work quality and increases in productivity. ■



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