GLOSSARY

Posted on June 1, 2015 by Christian Wopen

A B C D E F G H I J K L M N O P Q R S T U V W X Y Z

Automatic start-stop mechanism

The automatic start-stop mechanism automatically open or closes the extraction and filtration unit as needed during welding operations. The sensor determines the required filtration capacity according to the welding fume concentration. After welding operations are finished, the extraction and filtration unit remains active for a few seconds or minutes (depending on its settings) until is automatically shut down.

Class of separation of welding fumes

The class of separation of welding fumes defines the filtration capacity of the extraction and filtration unit. The filtration efficiency determines the classification to one of the three classes of separation of welding fumes. High-alloy steels may be safely welded only with the use of an appropriate filtering device. There are three classes of separation of welding fumes: W1, W2 and W3. The class of the extraction and filtration unit depends on the materials to be welded, welding methods and hazardous substances that can be generated during such operations.

Displacement ventilation

Displacement ventilation, also called layered ventilation, is one of the two options - besides mixed ventilation - which can be used in room ventilation systems. Welding fumes are extracted at a height of four to six meters. Mixed ventilation supports the thermal flow of welding fumes by supplying air from below. Decontaminated air is supplied to the production area near welding workstations via air diffuser outlets at the floor level. The rising air supports the natural buoyancy of welding fumes and their movement upwards. This system is recommended by the Association of Timber and Metal Workers.

Extraction arm

An extraction arm is an essential component of the low vacuum extraction system. It is necessary for ensuring welders' safety. Ideally, it automatically retains its pre-determined position so that the extraction system does not interfere with the welding operations. Extraction arms can be up to 10 m long.

Extraction hood

In the strict sense of the term (see also extractor), an extraction hood is a safety device for robotic welding stations and other automatic welding operations. Although welders are not directly exposed to welding fumes during automatic welding processes, unfiltered hazardous substances may be carried in the air to the production area and pose a health risk to people present nearby. The extraction hood covers the area swept out by the movements of the robotic welding arm which determines its size. Additional lamellae on the side

panels help to prevent any uncontrolled air turbulence. The air flow rate is calculated so as to include the total thermal flow rate at the point of welding processes. Because the extraction hood provides no respiratory protection against welding fumes, it is not suitable for use during manual welding operations.

Extraction table

Extraction tables are considered safety devices for the thermal cutting of metals in accordance with the applicable regulations and therefore they should be included in all cutting systems. To protect people present nearby, extraction tables carry away fumes generated during the cutting process. They also help to ensure that the cutting tool performance is not affected by dust, sparking or fumes.

Extractor

The extractor attached to the extraction arm, also referred to as extraction hood (see also extraction hood), is an essential component of the low vacuum extraction system. It is designed so as to make the welder's operations easier. Ideally, it can be easily rotated by 360°. It has a flange-shaped design to cover completely the weld, thus reducing the need for adjustment. An integrated lighting device can improve the visibility of the workpiece.

Flow rate control

The flow rate is controlled automatically by the central extraction and filtration unit that carries away air from multiple welding sites at the same time. The suction capacity is adjusted as needed by means of a frequency converter and pneumatic shut-off valves that provide separation between workstations. The negative pressure in the pipes remains constant, so that there are no limitations for number of welders at individual workstations. An additional advantage of the automatic flow rate control: cost savings as a result of reduced energy costs.

High vacuum extraction

High vacuum extraction (unlike low vacuum extraction) is provided at the point of origin of welding fumes by funnel- or slit-shaped suction nozzles. The range of extraction of hazardous substances is up to 150 mm. In general, the suction nozzles are kept in place by magnets. They are connected via hoses to the extraction and filtration unit. It is necessary to provide a flow rate (see also flow rate control) of 100 to 150 m^3/h at a relative negative pressure of at least 6,000 Pa. Due to the limited extraction range the nozzle position must be regularly adjusted.

IFA

The Institute for Occupational Health and Safety of the German Social Accident Insurance (IFA) is a research and testing institute of accident insurance providers in Germany. IFA performs inspections and certification

of extraction and filtration units in terms of their filtration capacity. The institute classifies the extraction and filtration units according to three classes of separation of welding fumes and approves them for use. IFA is based in Sankt Augustin near Bonn.

Layered ventilation

Layered ventilation, also called displacement ventilation, is one of the two options - besides mixed ventilation - which can be used in room ventilation systems. Welding fumes are extracted at a height of four to six meters. Mixed ventilation supports the thermal flow of welding fumes by supplying air from below. Decontaminated air is supplied to the production area near welding workstations via air diffuser outlets at the floor level. The rising air supports the natural buoyancy of welding fumes and their movement upwards. This system is recommended by the Association of Timber and Metal Workers.

Low vacuum extraction

With low vacuum extraction systems (unlike with high vacuum extraction systems) welding fumes are captured at the point of origin by means of extraction hoods which ideally are connected to a self-supported, flexible and 360°-degree rotary extraction arm. Hazardous substances are captured at a flow rate of 700 to 1000 m^3/h and negative pressure of 800 to 1200 Pa according to the extraction hood design. The extraction range for welding fumes is 300 to 400 mm. Low vacuum extraction systems are used most frequently.

Mixed ventilation

Another type of room ventilation, apart from displacement ventilation, is mixed ventilation. Mixed ventilation systems provide air extraction at a height of four to six meters. Decontaminated air is supplied at a height of four meters through nozzles or ventilation grilles and then extracted on the opposite side. This process runs continuously so that a horizontal air stream is created which carries the rising particles of welding fumes and all the air is mixed.

Occupational Health and Safety Act

As prescribed in the German Occupational Health and Safety Act, operators are required to determine all work-related risk factors before starting work. As far as welding operations are concerned, this requirement also covers risk factors and hazardous substances such as welding fumes. According to the German Occupational Health and Safety Act, where particles hazardous to human health are generated during welding processes, appropriate protection devices should be in place before any operations are commenced. All such safety devices should be regularly inspected in accordance with the German Occupational Health and Safety Act.

Production hall ventilation

Production hall ventilation systems are designed to support source extraction. Where source extraction systems cannot be used e.g. due to the length of workpieces or frequent changes between workstations, production hall ventilation or room ventilation systems can be implemented. Contaminated air is extracted at a height of four to six meters. This helps to protect other workers present in the production area, not participating in the welding operations, from exposure to hazardous welding fume particles. Production hall ventilation systems are based on either layered ventilation or mixed ventilation.

Regulation on hazardous substances

The German Regulation on hazardous substances specifies the requirements for the capture and safe removal of “hazardous particulates” at the point of origin. The extracted air flow should be such that as little dust as possible reaches the air inhaled by welders. According to the German Regulation on hazardous substances the re-circulation of the extracted air is acceptable, provided that sufficient decontamination is achieved. The functional capacity of air quality control units should be checked at least once a year.

Room ventilation

Room ventilation systems are designed to support source extraction. Where source extraction systems cannot be used e.g. due to the length of workpieces or frequent changes between workstations, room ventilation or production hall ventilation systems can be implemented. Contaminated air is extracted at a height of four to six meters. This helps to protect other workers present in the production area, not participating in the welding operations, from exposure to hazardous welding fume particles. Room ventilation options: layered ventilation and mixed ventilation.

Source extraction

Source extraction systems capture hazardous substances directly at the point of origin. These systems are mandatory in accordance with the applicable regulations. Source extraction options: welding torch with integrated extraction, low vacuum source extraction and high vacuum source extraction.

The technical principles for hazardous substances – Welding operations

The technical principles for hazardous substances – Welding operations (TRGS 528) provide detailed specifications for the requirements of the German Regulation on hazardous substances which need to be implemented during welding operations. They specify the hierarchy of protection measures required during welding processes. Ventilation engineering controls are secondary to the selection of low-hazardous procedures and consumables.

Welding fumes

Welding fumes contain health-hazardous particles generated during welding processes. Although today any substances generated during welding operations and released into the air are considered welding fumes, in the strict sense this term refers specifically to particles smaller than 1 µm. Welding fumes are therefore classified as a specific alveolar fraction with particle size below 10 µm. Welding fumes consist of particles smaller than 1 µm and generated mostly during welding operations. Particles smaller than 0.1 µm are called ultra fine particles.

W1

W1 is the first and lowest level of separation of welding fumes. The class of separation of welding fumes provides information about the filtration capacity of the extraction and filtration system. The degree of separation must be at least 95% or more. Class W1 filters suitable for non-alloy and low-alloy steels.

W2

W2 is the second and medium level of separation of welding fumes. The class of separation of welding fumes provides information about the filtration capacity of the extraction and filtration system. With class W2 filters, the degree of separation must be greater than 99.5%. Class W2 filters are suitable for alloy steels containing nickel and chromium (5-30%).

W3

W3 is the third and highest level of separation of welding fumes. The class of separation of welding fumes provides information about the filtration capacity of the extraction and filtration system. Class W3 filters provide separation greater than 99.9%. These filters must be used for high-alloy steels that contain more than 30% of nickel and chromium.