RVT best practice guides:

Fume Control

Why is a fume control system on site necessary?

39% of Australian workers are exposed to airborne hazards in the workplace with 23% being offered no protection from toxic respirable hazards. Having an effective fume control system on site is essential for the safety of your workers. Most people use the term “fume” very broadly, but to properly understand and control this hazard, we need to know exactly what we are dealing with.

This best practice guide contains specific advice on how to get the best out of your fume control system.

What is fume?

There are a range of hazardous fume types, which require specific control measures.

Fume is made up of very fine solid particles. Usually, it is created by heating a material and causing chemical reactions such as oxidisation and thermal breakdown until it evaporates. As this cools, it becomes vapour and, then, very small spherical particles. These particles can then be filtered using a suitable HEPA filter.

People often talk about paint and adhesive fumes, but these are actually gases and will pass straight through a particulate filter. To control these, we may be able to use a catalyst or absorb them using activated carbon filtration.

The final common “fume” is diesel exhaust; a complex mix of gases and carbon (soot) which requires a combination of particulate and catalysts to control it.

How can you get the best from your fume control system?

Effective fume control does not just rely on solution equipment, but on your actions as well. To best ensure the solution equipment can perform to its full potential on site, you can take a proactive approach. Before your project begins, you can break your fume control process down into stages. This will allow you to assess your environment and identify any problems that may arise over the course of your project.

By doing this, you will also be able to identify solutions. In this guide, we have broken the process down into 5 stages:

1. Before you start
2. Setting Up
3. During Work
4. Maintenance
5. Dismantling

These stages have also been applied to different processes, so you can see how both fumes and gases can be controlled.

For control of particulate including welding, burning and cutting

Before you start:

Look at the work process you plan to carry out:

- Is it possible to do it another way which will reduce or eliminate the fume?
- Can you cut using cold methods like reciprocating saws?
- Can you bolt or rivet instead of welding?
- Can you have materials prefabricated off-site?
- Can you capture some, or all, of the fume at source by using on-tool extraction etc.?

Look at the area you are working in:

- Is there anything that you need to protect?
- What is happening around your work area, are there any sensitive neighbours to protect?
- How well sealed is the area? Look particularly for service penetrations, suspended ceilings which go over walls and raised floors.
- Can you reduce the size of your work area? For example, it is much easier and cheaper to control 10m3 than 100m3. If you are screening the welding arc, can you use these to enclose the work area? Think about using temporary screens or enclosures around the work area; these protect other workers, the environment and make it quicker to tidy up after the work.
- Where can you vent air to? The most effective way of preventing fumes spreading is to work under a negative pressure with regular air changes. RVT Group equipment can be supplied with filters to medical standards allowing you to discharge cleaned air within most environments.

If you have any concerns or questions, RVT's technical experts are here to assist and advise you with solutions.

Key Fume Facts:

- 39% of Australian workers are exposed to airborne hazards in the workplace. (NHEWS Survey)
- 23% of workers who reported they were exposed to airborne hazards were not provided with any airborne hazard controls. (NHEWS Survey)
- Research estimates that 1.2 million Australian workers were exposed to diesel exhaust in the workplace in 2011. (Safe Work Australia)
- Significant differences in workplace exposure standards for welding fume around the world puts Australia far behind countries like Germany and the Netherlands. For example, Australian welders operating within the approved WES are exposed to four times the level of a known carcinogen than welders in Germany. (Safety Solutions, 2019)

Setting Up:

- If your area is badly sealed or adjacent to very sensitive areas, you need to look at temporarily sheeting up any openings and sealing gaps etc. with tape prior to starting work
- The fume control system should be set up with the hood as close as possible to the work activity. When positioning the hood, think about how the fume will be travelling whilst you are working. For example, an angle grinder throws particulate out in the direction of the cut, and fume from welding or burning tends to rise due to the heat. Therefore, careful placement of the hood is vital to ensure that as much fume as possible is caught at source. Welding fume filters will have details of their effective capture distance in most situations, but you must confirm that you are getting complete fume capture in your application.
- For more general extraction systems used with burning or cutting, the 3m long grey ducts are designed for suction and should be used before the fan. The 6m long green ducts are outlet ducts and should be used after the fan. It is important to use only the ducts supplied with the system as making alterations may result in reduced protection for workers and others in the area.

Fume extraction at London Waterloo Station during the £800 million Waterloo and South West upgrade

- If your system has been supplied with our Dustex® Extended Wandafilta, the fan and filter unit should be positioned in the room with the outlet duct fed through a window, doorway or similar opening.
- If the system doesn't have a filter, then the fan should be located in the work area and the outlet ducting should run to a suitable discharge point, well away from any other work activities or air intakes.

- Keep ducts as short and as straight as possible to maximise the air flow.
- You need to allow a certain amount of make-up air back into the area to replace what the fan is removing, otherwise a point will be reached where the fan cannot pull any more air out and the fume will build up. This can be achieved by means of a smaller fan supplying fresh air, but care needs to be taken that the fresh air supply doesn't blow the fume away from the extraction system.

If you are concerned about how well fumes are being captured, RVT Group can supply smoke generators to carry out tests before you start work.

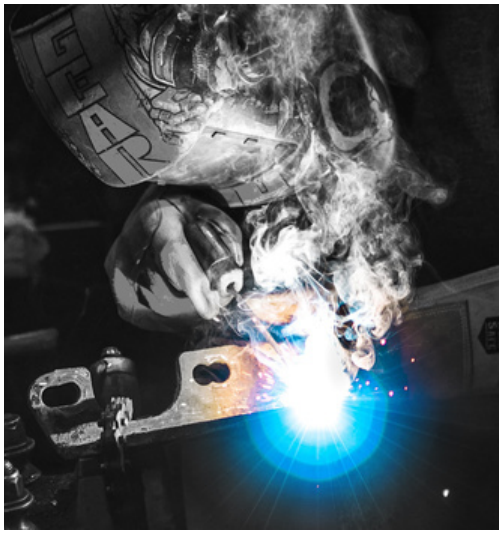
During Work:

- When you first start works in an area, ensure that the control measures are working by watching the fume from the activity. You should see it being captured by any on-tool system and the general extraction system.
- Keep the work area under observation.
- Have the minimum number of people in the area.
- Leave the system running for a suitable length of time after work is finished for the day.

Maintenance:

Before starting work for the day, you should check:

- The condition of any temporary screening/sheeting.
- That windows and doors are closed.
- That daily maintenance checks are carried out as per the machine instructions.
- That ducting is still connected and as straight and as short as possible.
- That the fan(s) are safe to use.



The 3C's Method

A proven methodology, devised by the RVT Group, to ensure effective control of all on-site health hazards.

Capture the hazard

Using appropriate extraction equipment, you need to capture the fumes as close to the source as possible.

Contain the hazard

Contain the area to ensure that harmful fumes, gases and vapours cannot affect those working nearby.

Control the hazard

In addition to extraction, you need to ensure that you have sufficient ventilation in place. This not only dilutes the contaminates in the air, but can also create negative pressure to ensure that the fumes do not migrate to other areas.

Dismantling:

Once your work activity is finished, switch off the fan and disconnect from the power supply. Remove the ducting, wrap and leave ready for collection. Also ensure that the work area is clean and safe for other users.

For control of processes producing gases

Before you start:

- Study the material safety data sheet (MSDS) and your RAMS. What are the specific hazards of this particular activity?
- Consider the work activity; is it possible to find an alternative material or method of working which will reduce or eliminate the hazard?
- Are there any areas around your work area which will be particularly sensitive to your works? Will it be possible to screen them off or provide them with a positive pressure of fresh air to prevent contamination?
- Many gases are harmless in low concentrations but have an unpleasant smell; is there anywhere that we can safely discharge filtered air? Away from windows, air intakes or other live areas?
- Is the gas flammable or explosive in the concentrations you are expecting?
- How well is the gas absorbed by activated carbon? Will you be creating dust at the same time?
- How much fresh air is available? Will you need supply air as well as extraction?
- Are the gases lighter or heavier than air? Are there any areas where concentrations of gas could become trapped?
- Can the gas levels be measured using a monitor?

If you have any concerns or questions particularly around the effectiveness of any filtration, RVT Group are here to assist and advise you with solutions.

Setting Up:

- An extraction system fitted with activated carbon filtration will usually consist of a Dustex® Wandafilta fitted with a carbon panel filter and a pre-filter to protect it from dust. During particularly dusty applications the unit may be supplied with several grades of filter to maximise the life of the carbon which can be “blinded” by dust.

- If you have been supplied with a capture hood, this should be positioned close to the source of the gas. For mixing activities, you may want to extend this to create an open fronted enclosure like a fume cupboard to work in. For painting and pouring work, move the hood as the work proceeds. The capture hood should be connected using grey flexible intake ducting to the fan. Then from the fan to the Wandafilta the green flexible ducting should be used. You should aim to vent outside your work area and as far from other work activities as you can. The ducting must be kept straight to maximise the airflows.

Our Ravex® Fume Extraction Kit on site

- If your system has been supplied with only the Dustex® Wandafilta, then this should be positioned close to the work, and connected by grey intake ducting to the fan. Green outlet ducting may be used to discharge the filtered air away from the work activity. Again, keep the ducting as short and as straight as you can.

- If you are using a fan to provide make-up air, this should be set up to feed the fresh air directly to the workers. Care must be taken to ensure that this fresh air blows the hazard towards the extraction system rather than away from it.

- If your work activity is likely to create an flammable or explosive atmosphere, the fans and other electrical equipment should be kept out of the work area unless they are suitably ATEX rated.

- Gas monitors (if appropriate) should be within the breathing zone of the workers and close to the outlet of the extraction system.

Short Term Effects of Fume Exposure

Thirst

Shortness of breath

Chills

Nausea

Vomiting

Irritated Eyes and Nose

Metallic Taste in Mouth

Coughing

Chest soreness

Muscle Aches

Cramps

Fatigue

Wheezing

Fever

Long Term Effects of Fume Exposure

Lung Cancer

Kidney Cancer

Lung infections/reduced lung function

Irritation of throat and lungs

Metal fume fever

Neurological effects

Asthma

Pulmonary siderosis

Damage to nervous system and anaemia

Decreased fertility

Depression

Impotence

Stomach Ulcers

During Work:

- Ensure that the capture hood or Wandafilta is kept close to the work activity.
- Monitor the work area.
- Have the minimum number of people exposed that you can.
- Leave the system running at the end of the shift, especially when materials are drying.

Maintenance:

- Carry out daily checks on the fans and filters following the details in their specific instructions.
- Ensure that the capture hood / Wandafilta is in the correct location.
- Ensure that ducting is still connected and laid out correctly, particularly supply air ducting.
- Activated carbon filters absorb gases into the chemical structure of the media. This means that it is impossible to predict how long a filter will last. If the gas you are working with has a distinctive aroma, you will notice when it starts to come through the filter. This is an indication that it is time to change the filter. If the gas you are working with is odourless or hazardous at very low concentrations, then you should use a suitable monitoring device in the filtered air stream.

Dismantling:

- With the extraction system running, seal up and dispose of any left-over material, applicators etc.
- Leave the extraction system running until all remaining gas has been dispersed or absorbed.
- Carry out any checks that may be laid out in your RAMS to ensure that the area is safe.

- Switch off, isolate and dismantle extraction equipment leaving it ready for collection.
- Any filters which contain hazardous materials should be removed, bagged and disposed of in accordance with local regulations.

Examples of our Ravex® Fume Control Solutions:

Our **Ravex® Portable Welding Filter** is a lightweight and portable solution, ideal for removing and filtering light to medium welding fumes. The filter nozzle on a magnetic stand makes this unit highly precise and the best solution for small, confined and difficult to access areas.

Our powerful **Ravex® Fume Extraction Kit** comprises of our Ventex® 300CF Centrifugal Fan and Dustex® Extended WandaFilta. this kit is perfect for creating negative pressure environments and filtering hazardous and flammable fumes and vapours. The filter unit is fitted with the primary EU4 washable filter, an EU7 or HEPA to remove any particulate in the pollutant, and with an activated Carbon Filter.

Our **Ravex® Portable Welding Filter MF** is a light-weight, high-volume and high-pressure fume extraction system, designed to capture and filter particulate from welding fumes. Intended for light duty welding applications, the quiet operation and portability of this unit makes it an ideal solution when working in confined and hard to reach spaces on site.

Our **Ravex® M60 Exhaust Filter** is designed for use on mid-size mobile plant with engine sizes up to 60KW, and will remove approximately 95% of the particulate emissions. Diesel filter kits should be used on all diesel plant machinery, especially when working in an enclosed space, such as a basement or warehouse.