

Guideline: Safe use of wet scrubbers

Purpose

To set out the guidelines for the safe use of wet scrubbers at the University.

Definitions

Scrubber is a wet air cleaning technique or piece of equipment for the removal of water soluble contaminants (e.g. acid gases, biological agents) and some dusts from the exhausted air. In general, they involve spraying an aqueous solution onto a coarse filter material (increasing the water to gas contact area) within the airflow. The contaminant adheres to or dissolves into the aqueous solution where it is physically or chemically removed from the air stream.

Guideline

1. A local exhaust system, like a fume cupboard, is made of numerous components, ranging from the air capture hood, duct work, fan and exhaust outlet, and occasionally an air-cleaning device, like a scrubber/filter is included before the fan. This filtration step or process is to ensure that the air exiting the system is clean enough to allow it into the environment, protect the asset and reduce contaminant levels below those required by the relevant authorities (EPA). In general, emissions from University exhaust systems should not exceed the Australian work health and safety exposure level peak, ceiling, or time weighted average (TWA) level. It would generally require a catastrophic failure of a process to exceed [ACT environmental protection standards](#).
2. Where an operational process is likely to generate more contaminant and exceed these occupational exposure limits, it is recommended that the experiment/process is controlled to reduce emissions from the process/equipment. For example the use of chemical neutralising bubblers and condensers etc. In addition changes to work practices, techniques and equipment may assist in reducing emissions.
3. When experiment or process control is not feasible, then additional filtration/scrubbing may be necessary. A wet scrubber may be one option. Activated charcoal may be used for certain organic vapours and gases.
4. A wet scrubber is a wet air cleaning technique or piece equipment for the removal of water-soluble contaminants (eg. acid gases, biological agents and

some dusts) from the exhausted air. In general, they involve spraying an aqueous solution onto a coarse filter material (increasing the water to gas contact area) within the airflow. The contaminant adheres to or dissolves into the aqueous solution where it is physically or chemically removed from the air stream.

5. A perchloric acid scrubbing fume cupboard is a special example of a wet scrubber. These are required for specific applications (eg use of perchloric acid, perchlorates and even hydrofluoric acid) where corrosive and oxidative chemicals can react with organic material.
6. An in-laboratory scrubber is the preferred location, as it can be easily maintained and cleaned by the user and prevents contamination of the duct work.
7. The efficiency of wet scrubbers will depend on the:
 - property of the materials to be removed from the air stream;
 - physical state of the aerosol/material – dust, mist, gas, vapour, and
 - solubility or reaction with scrubbing solution.
8. The correct operation of a wet scrubber requires that it be appropriately maintained, either by the user or maintenance contractor, and the scrubbing solution regularly checked for best collection efficiency. Poorly maintained scrubbers accumulate dust, contaminants and algal growth.
9. Due to these potential problems and difficulties in maintaining performance, the decision to have a scrubber is to be made only after careful consideration of the following:
 - type of chemical to be emitted and the efficiency of removal through a wet scrubber;
 - quantity of chemical to be released and its emission rate;
 - emission relative to Occupational Exposure Standards (including odour) and EPA guidelines; and
 - adverse reactions within the scrubber.
10. Where a wet scrubber is no longer required, a case may be made to have the scrubber decommissioned, as per the [Managing fume exhaust system procedure](#) requirements. Current and future uses will be assessed against the points above.

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