CODE OF PRACTICE – 3

Live Steam Humidification Systems (Isothermal)

2021 EDITION

HEVAC
HEATING | VENTILATION | AIR CONDITIONING

HUMIDITY
CONTROL GROUP

HEVAC Humidity Group
Code of Best Practice

A Code of Best Practice for the design, installation and maintenance of steam humidification systems of the live steam type.

1. Introduction

This Code of Best Practice has been prepared by members of HEVAC (Heating Ventilating and Air Conditioning Manufacturers Association) Humidity Group, to give guidance to manufacturers, suppliers, installers and operators of isothermal humidification systems.

This Code of Best Practice should be read alongside the following guidance and regulations:

- Steam Fittings Regulations
- The Provision and Use of Work Equipment Regulations 1998
- The Control of Legionella Bacteria in Water Systems Approved Code of Practice & Guidance 2001 (L8) (HSC)
- TM13 2013 Minimising the risk of Legionnaires Disease (CIBSE) CIBSE Knowledge Series No KS19
- CIBSE Knowledge Series No KS20 Humidity Group COBP4 Planned maintenance.
- Manufacturers IOM

2. Code of Best Practice

a) Design

Members of HEVAC who are manufactures or suppliers of live steam humidifiers undertake to minimize the risk of harm from the proliferation of harmful microbes that exist in all water systems through good design, installation and maintenance guidelines. We also undertake to supply products which meet national electrical and gas safety regulations and guidelines, including safety labelling, Low Voltage Directive, Electro-Magnetic Compatibility and Gas Appliance Directive, as appropriate, in compliance with the requirements of CE marking.

Good product and application design means addressing the psychrometric process to ensure the isothermal principles are followed to allow the moisture to be absorbed within the design parameters. There are external influences that should be addressed which fall into two main categories, namely Product and Application, each of which is further addressed under the categories:

- Water status
- Wetted surfaces
- Non-Absorption

A well-designed system will address the product and application issues such as:

- Ensure steam supply follows manufacturer's recommendation for the type of humidification system being used (eg : pressurised, resistance heater, gas fired, etc)
- Avoid dead legs in supply steam pipe work. If unavoidable, fit drains with mechanical steam traps in pressure systems, or drains with 125 mm deep traps in low pressure systems. The latter must drain to atmosphere.
- Steam pipe work should take account of length of run, ambient temperature, capacity, material, insulation, trapping and condensate removal.
- The steam supply line should be sized correctly and insulated to prevent heat loss from the transmission piping and to make surfaces safe.
- Drain design should take account of condensate volume and temperature, back-siphoning, insulation and material.
- The power supply should comply with local and national regulations (GAS and/or Electric).
- Failsafe building systems, so that failure of a safety system does not expose the user or occupier of the space to risk, and/or provide alarms to warn of failure wherever feasible.
- Design to minimize potential risks caused by incorrect installation
- Design to minimize maintenance requirements in accordance with manufacturer's recommendations.
- Design Operating and Maintenance manuals to clearly reflect any potential risk to health, created by poor installation or maintenance. It should clearly describe the

construction, operation steam supply, condensate drainage, steam distribution, power and control mechanism along with maintenance and parts requirements.

- Control valves on pressure steam humidifiers should fail closed. Humidifier valves must fail closed in the event of system air failure
- The psychrometric process should be specifically considered for the design of each installation. In order to avoid wetting surfaces inside the airway, the designer must take into account the humidity ratio, (the ratio of humidity on and humidity off the humidifier) the airway temperature and any restriction in the airway space, as well as the straightness or otherwise of the airway.
- Multiple dispersion tubes can be used to alleviate absorption distance problems and specially designed units can be used when the problem is critical.
- The placement of control sensors is important. The control of output of the humidifier should be governed by a sensor in the space or in the extract system. The high limit control should be in the supply but in a position at least 5 x Absorption Distance (Bn) downstream from the humidifier.
- Allowance must be made for those systems that direct steam towards the airflow. Manufacturers recommendations MUST be followed to ensure safe non-wetting distances up-stream of the laces are observed.
- Care must be taken when using plug fans prior to the humidifier. A minimum space of at least 1000mm must be observed. Check Fan Manufacturers recommendations.

Steam supply:

The supply pipe should be connected to the top of a perfectly drained main steam pipe and run with a down gradient to the steam humidifier. A shut-off valve (normally provided by customer) is installed preceding the humidifier. A steam pressure gauge (manometer) local to the humidifier and downstream of the pressure reducing set, is strongly recommended. Longer steam supply pipes must be competently filtered and drained. All end of line applications must be specifically drained. Use mechanical steam traps.

b) Water treatment for steam production

Some boilers can be used with optional water treatment, to enhance their performance. However, consideration should be given to potential problems caused by water quality such as:

- Calcium carbonate (can cause scaling of equipment)
- Acidity/Alkalinity (pH) (can cause foaming or wear of metal parts)
- Chlorine (can attack stainless steel components)
- Silicon (can form an insulated barrier on hot metal surfaces)

The condition for perfect functioning over a long period is:

Application of dry steam, which does not contain any mineral salt, such as chloride, sulphate, sulphide and ammonia. (see note VdTÜV 1453, edition 4/83; Editor: Union of the associations of technical observation e. V., Essen).

Methods for improving water quality for humidification systems would include:

- Reverse OSMOSIS (Removes most dissolved solids and bacteria)
- Water Softener (Exchanges dissolved solids that cause scale such as calcium)

Advice should be taken from the original equipment manufacturer as to the quality of the supply water for optimum performance for both short & long term operation. Water treatment equipment should be subject to regular inspection and maintenance according to the manufacturer's instructions and risk assessment.

c) Installation

A risk assessment of the equipment to be supplied and use to which it is to be put should be undertaken before specifying the component parts of the system. Only competent individuals should carry out risk assessments.

Consideration should be given to the following installation issues:

- The equipment must be accessible for inspection and cleaning.
- Multiple power supplies to equipment must be failsafe.
- A failure warning alarm should alert the user of the equipment that there is a fault.
- Drains must be arranged to prevent reflux and be installed in accordance with manufacturer's recommendations.
- Installers of humidification systems should ensure adequate training is provided to the user on how to operate the system safely. This should be through clear instruction manuals and training.
- Upon completion of an installation, the user must be notified that they should conduct their own risk assessment of the system, which should be included in the site risk Assessment.

d) Service & Maintenance

Suppliers and installers of humidification systems should ensure, as far as possible, that users have suitable maintenance agreements in place. Users must be made fully aware of the requirements for service and maintenance and a suitably trained person are responsible for routine maintenance.

Only competent persons, as defined in the HSE's Code of Practice L8 and COBP4, should be used to clean and disinfect humidification systems.

The frequency and type of maintenance required will be specified by the equipment manufacturer or installer of the system and must take account the safe working duration of system components such as filters, membranes, electrical components etc.

Persons responsible for maintenance should record who the competent persons responsible for maintenance are, tests and results, routine maintenance, cleaning and disinfection dates, as per the HSE's Code of Practice L8.

e) Risk Assessment and Water Testing

Risk assessments must be carried out by suitable trained, competent individuals. Manufacturers and suppliers of humidification equipment should ensure that relevant staff is competent to carry out risk assessments and that staff should not undertake such services unless they are competent. Records should be kept of training and evaluation of such staff.

Samples should be taken in accordance with the recommendations of the manufacturer of the test, or laboratory carrying out the test. Analysis of legionella samples should be carried out by a UKAS accredited laboratory, which is part of the PHLS legionella QAS scheme. Where the presence of

Legionella is indicated, a review of the control measures and risk assessment should be carried out and remedial actions taken.

Dip slide sampling should be carried out in accordance with the manufacturer of the test's instruction and incubated for two days at 30°C. Where TVC exceeds 103CFU/ml, a review of the control measures and risk assessment should be carried out and remedial action taken.

Test samples should be taken from the water or steam in the system at the point where contamination is most likely to occur, or as close as possible If this is not practical, a sample might be taken just prior to the humidifier, but after any pre-treatment equipment of filters.

3. Further Information

Additional information on this topic can be obtained from the HEVAC Humidity Group. Contact details are:

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