A.9 Design information and Monitoring of ventilation systems

This addendum provides guidance for operators and facility managers.

DESIGN INFORMATION

Each facility should maintain a concise description of its ventilation system. The document explains the basic operating principles of the ventilation system, including:

- Reference to the latest system P&ID(s) and system flow diagram(s)
- The main containment structures and their depressions
- Velocities through engineered openings
- Safety and Environmental functions
- Filter monitoring and changing criteria
- How the building ventilation is balanced.

The description should concentrate on the primary containment barriers, safety, and environmental protection - also consider the effects of system variations, such as increasing filter resistance due to particulate loading, and changes in weather.

Selecting parameters to monitor

Monitoring should concentrate on the primary functions and operating status of active/process ventilation systems, for example:

- Glovebox depression
- Cells and caves depression
- Filter differential pressure (and Activity levels where required)
- Process/active system extract flow
- Stack flow and sampling flow

The depression and flows within general (occupied) building areas may be too low to monitor accurately [these are set up and verified during commissioning]. The correct system balance is inferred from the continued stable operation of the building ventilation systems. Typical parameters to monitor are:

- Supply flow
- Supply temperature / general building temperature
- Humidity
- Building/Space extract flow

The system parameters and characteristics directly related to safety and environmental functions must be prominent in the operating instructions.

Setting Values, Range, Action and Alarm levels

Values for parameters are defined in the system design information and verified during commissioning. The default arrangement should be:

- Normal [design] value
- Range [usually a set amount above and below the normal value].
- Action level [set equal to the appropriate range limit (upper or lower)]
- Alarm level [usually a set amount outside the relevant range]

The set 'Range' should aim to ensure the system remains in balance, regardless of where other parameters are within their own allowed range.

The Operating Instructions must prominently explain the required responses to Action levels and Alarms. The margin between the plant action level and the alarm level must be measurable (easily distinguishable on the instrument scale) and allow appropriate time for response actions to take place (based on the typical dynamic response rate of the system). Action and alarm levels may require adjustment based on the plant's operating history – changes should be agreed with a competent ventilation designer.

MONITORING OF VENTILATION SYSTEMS

The status of the ventilation system must be regularly reviewed to identify possible trends and potential failures. Values recorded out of 'range' must be promptly notified to and assessed by a person suitably qualified and experienced to manage the ventilation system. Trends over the long term should reviewed by the ventilation design authority.

Log sheets must show the normal value and acceptable range for each parameter, and have appropriate units and a sensible scale. An example data logging format is:

Item	Parameter	Value	Range	'date' 'time'	'date' 'time'	'date' 'time'
Filter	**Differential pressure**	**330 Pa (clean)**	**300 – 1250 Pa**	450	460	etc
Glovebox	**Depression (negative)**	**200 Pa**	**180 – 220 Pa**	200	190	etc
Extract	**Flow (volume)**	**5.2 m^3/s**	**5.0 – 5.4 m^3/s**	5.25	5.20	etc

Notes:

1) Values and ranges must be logged in the same units as the instrument reading and have a sensible precision [number of significant figures] based on the instrument scale and magnitude of the reading e.g. 5.3 not 5.2761.

2) Action levels and Alarm settings should be in the same units as the instrument reading and with sensible precision.

3) Design information in any plant description should include a conversion to the units actually used on the plant - adjustment to a nearest sensible value is allowed:

   e.g. "Glovebox depression to be -200Pa (-0.80 in w.g.) and range -180Pa to -220Pa (-0.72 to -0.88 in w.g.)." In this example, a range -0.7 to -0.9 in. w.g. is sensible.

4) Any out-of-range readings or anomalies should be circled in red and a comment added.

5) Value or Range given as "no significant change" or left blank is not allowed.

Periodic technical surveys

A technical survey of the ventilation system will re-affirm the design intent and identify any deviations from correct operation. It is good practice to survey all ventilation systems periodically. Surveys must be carried out by a person suitably qualified and experienced in nuclear ventilation.