Gas Alarms

Low Oxygen Alarms and Response Procedures

Hot Topic
6 July 2017

Overview

• What do we do?

• No standardised response procedures

• Confusion over P&F, Securities and local area responsibilities

Why do we need them?

The primary purpose of gas alarms at UQ is to provide an early warning of a problem and help to ensure people’s safety.

Low oxygen alarms are set at a point that provides advanced warning of dropping oxygen levels within a space:

• Depending on the nature/cause of the oxygen displacement you may have seconds or minutes to react.

• The resultant hazardous atmosphere may exist momentarily or remain for an extended period – again depends on the nature/cause of the oxygen displacement.

Low oxygen alarms are only one control measure and should form part of a larger risk management strategy.
Incidents have occurred in Australia

- In 2001 a CSIRO lab team member died after entering an oxygen depleted area
- He died in an airlock chamber which led to a liquid nitrogen storage area
- Problems with the air handling system were identified days before the incident and a post-it-note and two signs were placed on the entry doors
- His body was not found until the following day after his wife told staff members he had not come home the night before

What do we currently do?

- Security will respond to all low oxygen alarms
- If emergency services are required Security will coordinate their response
  - If Security cannot determine there is no casualty they will call QFES
- Security will notify the listed emergency contact person
- Warning signs are placed on the entry doors
- If no further immediate action is required Security will then leave site
- In most cases it’s now up to the emergency contact person to determine what happens next

What happens next?

- Varies depending on location
  - Both across St Lucia and at external facilities
- Varies depending on local resources
  - Do you have a portable gas monitor?
What do we want to do?

- Standardised response
  - Applicable to all campuses/locations
  - Minimum impact on existing resources
    - No increase to existing staff levels
    - Equipment may need to be purchased
  - Needs to consider both normal business hours and after hours situations
  - Ability to quickly verify if an actual emergency or a false alarm
  - Considered prior to starting works (same as chemical spill)
    - A risk assessment/SOP should be in place detailing response plan

What do we want to do?

- Clearly defined responsibilities
  - Everyone knows their role
    - Actual emergency response
    - Verification of false alarm

- Physical lock out following alarm activation
  - One of the recommendations following the CSIRO incident
  - Sign fatigue
  - Multiple entry points

Challenges we face

- Location
  - UQ security presence?
  - UQ controlled?
  - Access restrictions
    - Can we verify is someone is unconscious in the room (visibility issues)?
    - Are there other hazards that would hamper emergency response (e.g. lasers)?

- Time of day
  - Day, night, weekend?

- Local resource availability
  - OH&S staff, Lab Manager, Infrastructure Manager
    - Based in the same building/campus?
    - Local emergency response capabilities?
    - BA, trained personnel
What is achievable?

- **Standardised response**
  - To many variables
  - OHS Division to develop guidance material
  - Local procedures need to be developed

- **Clearly defined responsibilities**
  - This is crucial to prevent or reduce the severity of an incident
  - Nominated emergency contact for gas alarms?

- **Physical lock out following alarm activation**
  - Swipe card or key?
  - Multiple access points, may require removing access to larger areas

Local management required

- **Local response procedures need to be considered**
  taking into account your specific situation

- **Needs to be developed in conjunction with Security**

- **Needs to be clearly documented and communicated to**
  all affected parties

- **Needs to take into account 24 hour access**

- **Are extra resources and/or equipment required?**

Fixed Gas Detection Equipment

- **All low oxygen alarms should be connected to the BMS**

- **May also be linked to other building or equipment**
  safety systems triggering shut downs, gas isolation etc

- **Require regular maintenance**

- **Do not have a set service life with local environmental**
  conditions and previous shelf time influencing the
  sensors life
Fixed Gas Detection Equipment

Position is crucial

- Often done during design phase
- Needs to take into account
  - expected hazard (heavier or lighter than air)
  - worker/task location
  - exit location

Preventative maintenance

- Low oxygen sensors are designed to fail “safe”
- Vast majority of low oxygen alarms at UQ are due to sensors failing
- Scheduled replacement of low oxygen sensors can reduce the quantity of false alarms

Alarm inoperative

- No work should take place in a room/space that could give create an oxygen deficient atmosphere if it has an inoperable low oxygen alarm.
New installations

- All new low oxygen alarms need to be connected to BMS
- This cost should be included with installation
- Need to consider other issues like external room visibility as well

Portable Gas Detection Instruments

- Designed to provide earlier warning of changes in workers breathing zone
- Do not prevent leaks occurring
- Need to be periodically calibrated against National Institute of Standards and Technology (NIST) certified reference test gases
  – Every 6 to 3 months depending on use

Portable Gas Detection Instruments

- Should be turned on in fresh air away from potential interferences
- Should be “bump” tested prior to use
- Majority of portable gas detectors use electrochemical sensor technology to monitor for oxygen deficiency
- Prone to interference from other workplace contaminants
Portable Gas Detection Instruments

- Response time (usually 30 seconds)
  - There will always be a delayed response
    - 12% - Unconsciousness without warning, poor judgment, blue lips
    - 6-10% - Nausea, vomiting and unconsciousness, 6 minutes 50% fatal
    - <6% - Coma in 40 seconds, spasmodic breathing, convulsions, and death.
  - May have multiple alarms (high and low)

Example Scenarios

Low Oxygen Alarm – Chemistry
- Low oxygen alarm is activated in an unoccupied room.
- Security arrive on site and verify no one is trapped in the room.
- Security place warning signs on the entry doors and notify the emergency contact listed against the room in Archibus.
- Laboratory Supervisor who is the listed emergency contact does not have the required instrumentation to verify if the alarm is false or if the room does currently have an oxygen deficient atmosphere and contacts their local WHSC/OHS Manager.
- WHSC/OHS Manager attends site with portable gas detection equipment and determines the alarm has been caused by a faulty sensor.
- Laboratory Supervisor logs a job in Archibus to have the sensor replaced.

Low Oxygen Alarm – AIBN
- Low oxygen alarm is activated in the LN2 storage area.
- UQ security arrive on site however cannot determine if anyone is trapped without entering themselves.
- QFES are called and the area isolated to prevent further entry.
- AIBN have trained staff on hand and BA equipment.
- AIBN staff don BA and enter the room finding one casualty unmovable and unresponsive on the floor.
- The casualty is removed from the affected area and Security staff begin CPR.
- Emergency services arrive on site and transport the casualty to hospital.
- AIBN staff wearing BA inspect the room and identify a suspected dewar failure.
- The dewar’s manual pressure release is opened and the area vacated allowing any remaining liquid to safely exhaust and the dewar to return to room temperature.
- Atmospheric monitoring the next day confirms oxygen levels have returned to normal and the dewar is removed from site by the supplier and area returned to normal use.
Example Scenarios

Low Oxygen Alarm - HMRC

- Low oxygen alarm is activated in a laboratory.
- UQ Security do not maintain a presence at HMRC and staff on site cannot determine if someone is unconscious within the room without having to enter themselves.
- There is no BA equipment onsite and staff are not trained in its use.
- QFES is called and the room isolated to prevent any further personnel from entering.
- QFES arrive on site and determine the room is empty and oxygen levels within the room are normal.
- Local staff log a job in Archibus to have the sensors replaced.

Breath easy

Questions?