Personnel Safety System

Operator Training

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Part 4 Oxygen Deficiency Hazard (ODH) System

The purpose of the ODH system is to sense the oxygen level in areas where there is a potential for oxygen displacement by gases used during operations.

Ceiling seeking gasses such as helium or floor seeking gasses such as cold nitrogen or argon may displace oxygen.

The ODH system will alarm when the oxygen level in an area drops below 19.5%.

Placement of ODH sensors has been verified by actual controlled spills of helium in the accelerator and nitrogen in the endstation B.

The ODH system is completely separate from the PLC based Safety Interlock System (i.e. an ODH alarm will not drop the PSS out of "Beam Permit.")

ODH System

The Linac and Endstation ODH systems are two separate systems. The linac system is an older, analog based system. The Endstation and FEL systems are newer, digital based systems that are designed to accommodate the changing requirements of the endstations and FEL user labs.
Both systems use an electrolytic cell as the oxygen-sensing device. The cell produces a DC current proportional to oxygen partial pressure.

ODH Classification

ODH Classifications are listed in the EH&S Manual Chapter 6500-R2

ODH Alarm Response

Always assume the alarm is real until it is proven to be a false alarm.
Check the EPICS ODH screens to determine which area is alarming

- Are any other monitors in the vicinity alarming or warning?
- If so it may be a real alarm.
- If not, it may be a false alarm.

If the alarm is in a tunnel area closed up for beam operations do the following:

- Check the CHL screens for unusual excursions in pressure or liquid level.
- Check the EPICS ODH screens for other monitors in the area with low readings.
- If there are no signs that it is a real alarm then the monitor may be placed in “CAL” mode.

If the alarm is in an occupied area it must be checked out under ODH 2 restrictions:

- Two personnel in continuous contact
- Each must have a personal portable ODH monitor
- Each must carry a 5-minute escape pack
- Each must be ODH 2 qualified (medical approval and this class)

Procedure

Before leaving the control room check out your equipment:

- Disconnect the personal monitor from the battery charger
- Turn on the personal ODH monitor by pressing the on/off switch
  Within 45 seconds it will display the air oxygen concentration in percent
- Take the 5-minute escape pack out of the black plastic case. Leave the oxygen canister and hood in the orange bag.
- Check the charge in the oxygen bottle - it should be full.
- Test the airflow briefly by turning the on/off valve clockwise - you should hear air hissing in the hood.
- Shut off the valve.

Make sure that when the 5-minute escape pack is carried, the open end of the orange bag is facing up. (The canister can fall out.)

Additional escape packs and personal ODH monitors are located in the CHL control room and FEL building.

When checking out an ODH alarm, approach the area alarming with caution. Leaking cryogens will cause a water vapor plume but trapped gasses will be invisible.

Approach the area in alarm with the personal monitor held in front of you.

If there are any obvious signs of a leakage (like a large plume) leave immediately.

If the oxygen reading on your personal monitor goes below 19.5%, leave immediately.

Use the escape pack as necessary to exit the area.
To use the escape pack: Turn the airflow valve fully ON. Place the bag over your head.

If the investigation shows that the ODH alarm is not real then the ODH sensor may be placed off line until the head can be recalibrated or replaced.

If there is any sign that the ODH condition is real then the area is automatically upgraded to ODH 4. The Cryogenics staff are the only on site personnel qualified to handle ODH 4 conditions, i.e. call the Cryogenics Coordinator.

ODH Rack Locations:

North & South Linac: MCC equipment room rack MC02B03.
Reset the alarm and place the sensor in “Offline” mode following the instructions located on the rack door or in the PSS user’s manual.

Endstation ODH alarms: second floor of the counting house - rack CH01C09.
Reset the alarm and place the sensor in “Offline” mode following the instructions located on the rack door or in the PSS user’s manual.

FEL ODH alarms: second floor of the FEL - rack FL15B04.
Reset the alarm and place the sensor in “Offline” mode following the instructions located on the rack door or in the PSS user’s manual.