

Oxygen Deficiency Monitoring

Oxygen deficiency:

The nature of the hazard

Oxygen is essential for sustaining human life. The normal atmospheric concentration of oxygen is 20.9% by volume. Levels below 19.5% are widely considered to be immediately dangerous to life or health. Oxygen levels of 6% or less result in rapid death due to asphyxiation.

A typical scenario that causes an oxygen deficiency hazard (ODH) is a spill or leak of cryogenic liquid, such as liquid nitrogen. A small amount of liquid nitrogen evaporates quickly into a very large amount of gaseous nitrogen (the expansion ratio of liquid nitrogen to gaseous nitrogen is approximately 1 to 694). Nitrogen can dilute or displace air in an enclosed space, creating an ODH. In this case, the ODH is invisible and not detectable by the senses.

Oxygen deficiency hazards are not limited to cryogenic liquid spills or leaks. They can result from the leakage of compressed gas from cylinders or piping systems, the normal venting of liquified gas containers, abnormal venting of process gas, or from biological processes that consume oxygen and/or generate other gases that could displace normal air.

Oxygen monitoring

Monitoring of ambient oxygen levels is desirable when there is a possibility that oxygen levels might decrease for any reason. Oxygen measurement instruments should be installed in any location where there is a possibility of an ODH. Laws and regulations mandating oxygen measurement vary from country to country. In practice, many organizations develop internal guidelines regarding the necessity and placement of oxygen monitoring equipment. The definition of ODH and the placement of instruments is based on “engineering sense.” Factors that may be considered include:

- Nature of the likely ODH (e.g., compressed gas leakage, cryogen spill, biological byproduct)
- Density of the gases involved (lighter than air, about same density, or heavier than air)
- Size and shape of the enclosed area (low points and high points where leaking gas may accumulate)
- Number and location of entrances to the area

Generally, oxygen instruments are placed at “head height” (4 to 6 feet above the floor) and near entrances. Instruments might also be placed near any expected source of gas, e.g., in a corner of a room where containers of liquid nitrogen are stored.

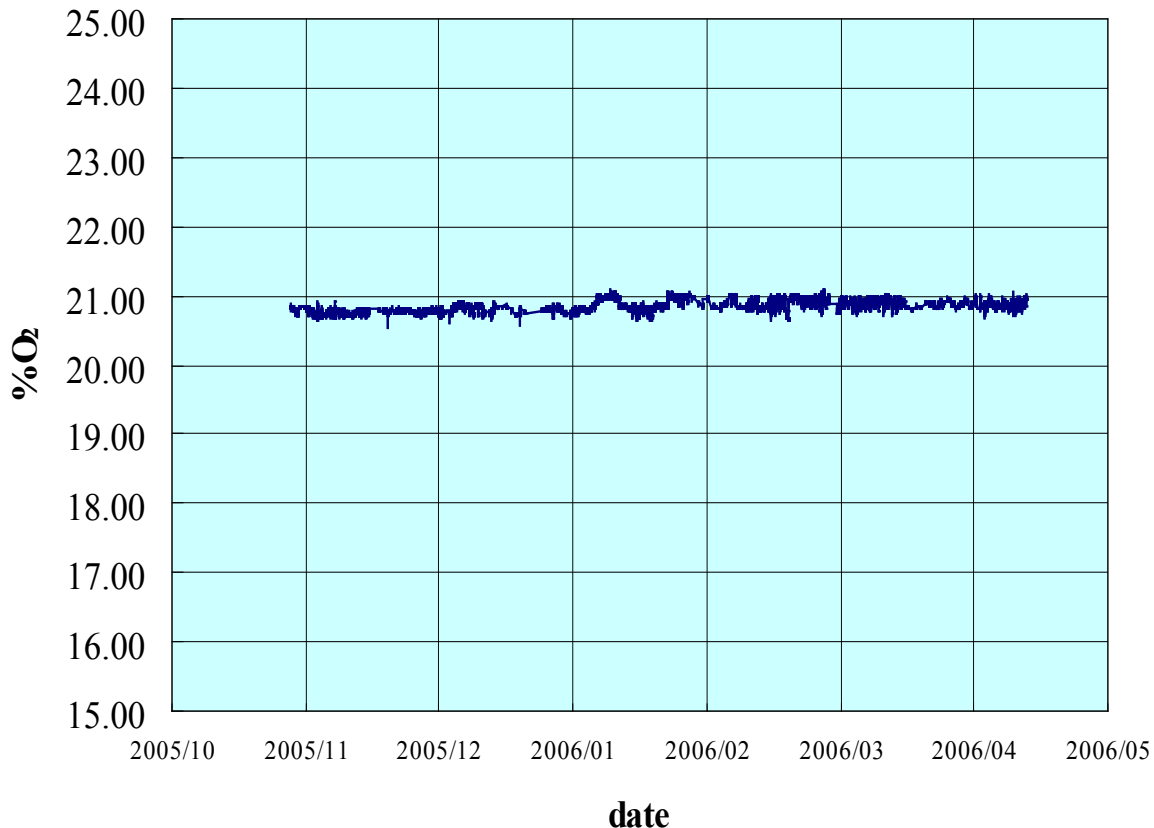
How can Vaisala help?

The Vaisala SPECTRACAP® Oxygen Transmitter OMT355 is well suited for ambient oxygen monitoring. The instrument is easy to use and easy to install. It includes a local display, a relay for connecting to alarm apparatus (lights, horn) and an analog output for connecting to a monitor or control system. The laser based optical absorption measurement has no depleting components or moving parts. Long term stability is excellent, with a suggested calibration interval of one year.

*Vaisala SPECTRACAP® Oxygen Transmitter OMT355
for Industrial Process Measurements*



Long Term Stability



Four month outdoor test data for the OMT355. An ideal gas correction has been applied to the data.