CRITICAL ENVIRONMENT TECHNOLOGIES

# SENSOR LIFE EXPECTANCY GUIDE

## ELECTROCHEMCIAL SENSORS

- Typically designed to operate between -10°C and +50°C, do not exposed to extreme temperatures for prolonged periods of time. Repeated or prolonged exposure to temperatures like 60-65°C / 140-149°F can lead to evaporation of the electrolyte and shifts in baseline readings. Operation in very low temperature environments can impede the sensitivity of the sensor and slow its the response to the target gas.
- Continuous operation in low relative humidity environments can dry out the electrolyte and extended periods of exposure to high moisture environments can cause the electrolyte to absorb the moisture, causing dilution and inaccurate measurements.
- Prolonged exposure to extremely high gas concentrations can compromise sensor performance.
- Paint fumes, cleaning products, dust, sand, water, insects can reduce lifespan and compromise performance.
- Avoid exposure to high concentrations of solvent vapors during storage, installation and operation. Organic solvents may block the sensing electrodes, create false baselines and in some cases damage the electrodes and physically damage the body of the sensor.
- Negative cross-sensitivities may cause the sensor to produce lower readings than the true concentration of gas in ambient air.
- Before initial use after production may be stored at room temperature ideally at 20°C / 68°F and 60%RH or preferably in the fridge for up to 6 months. Beyond this period, the sensor performance is likely to deteriorate, such as with longer response time and lower sensitivity regardless of whether sensor has been used or not.
- The more exotic gases (chlorine, ozone etc.) tend to have shorter life spans than the more common gases (CO, nitrogen dioxide).

## SPECIFIC ECHEM SENSORS

- AMMONIA ($NH_3$): Background concentrations of ammonia might shorten the lifetime of the sensor. Exposure to a high concentration all at once will poison the sensor and render it useless.
- CHLORINE DIOXIDE ($ClO_2$): Negative cross-sensitivities may cause this sensor to produce lower readings than the true concentration of gas in ambient air. $ClO_2$ sensors may underestimate the $ClO_2$ concentration if hydrogen sulphide is present.
- ETHYLENE OXIDE ($C_2H_4O$): Should be zeroed on site if the ambient temperature is above 22°C (71.6°F). This particular sensor has a drift factor that can be as much as 1 ppm if the temperature rises to 25°C (77°F).
- OZONE ($O_3$): Sensitive and reactive to temperature and humidity changes, causing them to drift.
- HYDROGEN CHLORIDE (HCl): High humidity causes HCl absorption. Sensor should be stored with filter side facing down. Storage time should not exceed 4 weeks.
- FORMALDEHYDE ($CH_2O$): Abrupt changes in RH causes a short term transient signal. $CH_2O$ has moderate to high cross-sensitivity to other gases like hydrogen sulphide, isobutylene, phosphine, sulphur dioxide and hydrogen cyanide.
- OXYGEN ($O_2$): Continuous exposure to high concentrations of sulphide compounds like hydrogen sulphide can poison the sensor.

CRITICAL ENVIRONMENT TECHNOLOGIES

# SENSOR LIFE EXPECTANCY GUIDE

## CATALYTIC BEAD SENSORS

- Typically designed to operate within specific temperature ranges. High temperatures can accelerate wear and reduce lifespan.
- Maintaining optimal humidity levels is crucial. Excessive humidity can affect sensor components, leading to corrosion or malfunction.
- Paint fumes, cleaning products, sand, water, insects can reduce lifespan and compromise performance.
- Dust and dirt can compromise sensor performance lifespan, both during storage and operation.
- Silicone, lotions, hair products, lubricants, gas additives, lead, sulfur compounds and chlorinated hydrocarbon vapours can poison catalytic sensors. Other compounds, especially hydrogen sulphide, halogenated hydrocarbons and anything containing astatine, bromine, fluorine, chlorine, and iodine can be absorbed or form compounds that are absorbed by sensor which can result in the temporary loss of sensitivity. The sensor might recover after a period of operation in clean air. Even when the sensor is not powered, exposure to compounds that poison or inhibit the sensor can impact its lifespan.
- Requires calibration gas with air balance.
- Excessive vibration or impact can damage the sensor.
- When storing, package securely in a sealed container.

## SOLID STATE SENSORS

- Typically designed to operate within a range of -20 to 50°C / -4 to 122°F.
- Sensitive to changes in temperature and humidity. Changes of 10°C / 18°F or 10% RH can impair sensor performance requiring a couple hours of re-stabilization. Calibration should be done after any significant changes in temperature and/or humidity. If the location of the sensor has seasonal changes in temperature or humidity a recalibration after each change will be required to meet published specification.
- Wet environments will shorten lifespan.
- Dirty and dusty environments will shorten lifespan and require more frequent calibration.
- Requires oxygen, minimum 18% vol, for proper functioning.
- Sensitive to many other gases, vapours and chemicals such as silicone, paint, alcohol-based cleaners, fumes from running engines, fuel storage containers, etc.
- Continuous exposure to gas will make the sensor reading unreliable (will read higher than calibrated value).
- Must be calibrated in the environment it will be operating in.
- Flowing dry gas over a solid state sensor can result in a negative a reaction and inaccurate readings. Using a humidification chamber adds humidity and assists in recreating a “real-world” environment for the sensor.
- Requires regular calibration to compensate for drift/aging.
- When storing, package securely in a sealed container.

CRITICAL ENVIRONMENT TECHNOLOGIES

# SENSOR LIFE EXPECTANCY GUIDE

## INFRARED SENSORS

- Continuous exposure to gas will not poison the sensor but it may require a long time to clear before accurate readings can be taken again.
- Do not use in locations where corrosive chemicals such as chlorine, ammonia and other oxidizers are present, especially if there is a higher humidity level.
- High humidity can affect response and promote corrosion.
- Water or vapour condensation can impair sensor performance.
- Dust and dirt can compromise sensor performance.
- Excessive vibration or impact can damage the sensor.

## PID SENSORS

- Dust and dirt can compromise sensor performance lifespan, both during storage and operation.
- Fluctuating or high humidity can cause condensation and affect sensor response, leading to false low or conversely high readings.
- Protect from extreme temperatures and being physically damaged.
- Paint fumes, cleaning products, dust, sand, water, insects can compromise performance.
- The presence of interfering compounds may affect sensor accuracy.
- When storing, package securely in a sealed container.

## PARTICULATE SENSORS

- Sensor lifespan will be affected by continuous vs intermittent use.
- The dirtier the environment, the shorter the lifespan.
- The fan inside the unit can get clogged by the particulates and dirt in the air being sampled.

Most sensors will suffer general wear and tear and it may not always be easy to detect the damage caused, making regular maintenance important to help keep the sensors in good working order. Regular maintenance includes inspecting, cleaning if necessary, bump testing and calibration. This document is intended to provide guidance only and may not cover all possible mishaps, misuse or damages that could occur to a sensor, potentially reducing its performance or lifespan. CET does not accept any liability for such mishaps, misuses or damages that could occur to a sensor, reducing its performance or lifespan.