The Use of Photoionisation Detectors within In Vitro Fertilisation Laboratories.

Volatile Organic Compounds (VOCs) pose many risks to human health and the environment and should be monitored and controlled to reduce exposure. In specific environments, such as laboratories, air quality is monitored to ensure air supply is not contaminated. This reduces the risk to human health in the face of exposure and helps to maintain the integrity of laboratory processes.

In Vitro Fertilisation (IVF) is an Assisted Reproductive Technology (ART) used to help individuals or couples in conceiving, when natural conception is not possible. Despite technological advancements over the years, the success rate of IVF is typically below 40%, making it vital to optimise every aspect of the process to improve success rates. A crucial factor influencing IVF success is air quality, as VOCs can detrimentally impact successful outcomes. Therefore, a major step of risk prevention is to monitor and control VOCs.

Why VOC Monitoring is Essential in IVF Laboratories

1) **Embryotoxicity**
    a. Specific VOCs such as formaldehyde, benzene, and toluene can disrupt cellular metabolism and damage DNA or proteins in developing embryos, significantly reducing treatment success rates.

2) **Oxidative Stress**
    a. VOCs within the environment can increase Reactive Oxygen Species (ROS). High ROS levels can damage sperm, eggs, and embryos, leading to reduced quality and viability.

3) **Reduced Sperm Quality**
    a. VOC exposure has been shown to harm sperm motility, DNA integrity, and overall viability. This reduces the chances of successful fertilisation, especially in procedures such as Intracytoplasmic Sperm Injection (ICSI).

Many everyday products such as perfumes, cleaning agents, furniture, and building materials all contain VOCs and can contribute to indoor air quality pollution. Some VOCs are harmless at low levels, however, trace levels can be harmful in sensitive environments such as IVF laboratories.

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Understanding and managing VOC concentrations is essential to preserving the integrity of IVF processes, ensuring that air handling and ventilation systems are optimised to maintain a contaminant-free environment.

The Role of Photoionisation Detectors

In many global sectors, Photoionisation Detectors (PIDs) play a critical role in monitoring indoor air quality and detecting VOCs with speed and sensitivity.

PIDs offer a broad detection range of over 700 VOCs and allow fast and accurate detection of concentrations down to parts-per-billion (ppb) levels. This level of sensitivity is critical, as IVF laboratories typically follow ISO Cleanroom standards, often ISO Class 5 to 7, meaning the VOC concentration should be in the low parts-per-million (ppm) range.

Continuous monitoring provides IVF laboratory staff with real-time insights into air quality conditions, allowing them to maintain environmental consistency.

MiniPID 2 HS: Essential Sensor Technology for Sensitive Environments

The ION SENSE® MiniPID 2 HS showcases market-leading PID technology specifically designed for ultra-low level VOC detection in critical applications. Engineered to detect VOCs at sub-ppb concentrations, this sensor provides the exceptional sensitivity required for IVF laboratories, where even trace contaminants can impact success rates. The MiniPID 2 HS features a patent-pending filter that protects the ionisation chamber, ensuring reliable performance in demanding cleanroom environments.

Key Features and Benefits

1) **Ultra-High Sensitivity**
   With a minimum detection limit of 0.5 ppb, the MiniPID 2 HS provides the precision needed to monitor VOC concentrations at the critically low levels required in ISO Class 5-7 cleanrooms, enabling proactive environmental control to protect sensitive IVF processes.

2) **Anti-Contamination Design**
   The unique filter system and humidity-resistant construction protect the ionisation chamber from moisture, dust, and aerosols, ensuring consistent performance and reducing the risk of false readings in laboratory environments where environmental conditions must be carefully maintained.

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3) **Long-Term Reliability**
   Featuring exceptional lamp stability with > 10,000 hours of continuous operation paired with a >10,000 hour filter life, the MiniPID 2 HS ensures long-term reliability with minimal maintenance requirements and predictable operating costs, making it ideal for continuous monitoring applications.

4) **Versatile Integration Capabilities**
   As an OEM sensor, the MiniPID 2 HS can be seamlessly integrated into fixed monitoring systems, building management systems, and custom air quality solutions, providing flexibility for laboratories to build comprehensive VOC monitoring infrastructure tailored to their specific requirements.

A Commitment to Safer, Cleaner Environments

ION SENSE® stands by its mission to protect lives and preserve the environment by offering world-leading solutions for VOC monitoring across a number of industrial sectors.

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