Monitoring Emissions of Hydrogen Fluoride (HF)
1. INDUSTRIAL EMISSIONS OF HYDROGEN FLUORIDE

Hydrogen Fluoride (HF) is a colorless gas with a strong irritating odour. It is lighter than air and diffuses relatively quickly. Hydrogen fluoride can enter the body either by inhalation of air containing hydrogen fluoride or by dermal contact with hydrofluoric acid (dissolved form of hydrogen fluoride). Dermal contact with hydrofluoric acid occurs mainly in the occupational setting. Inhalation of air containing hydrogen fluoride can cause irritation of the eyes, nose and throat. Exposure to high levels may cause muscle spasms and can damage the lungs and heart and in extreme cases can result in death. Dermal contact with hydrofluoric acid can cause severe skin burns. The skin may initially be red and painful while severe burns and internal tissue damage can develop over time following exposure. Absorption of large quantities of hydrofluoric acid through the skin can affect the heart and lungs and in extreme cases may result in death. Hydrogen fluoride is extensively used in various industrial processes, among which the manufacturing of fluorocarbons and for producing aluminum fluorides in the aluminum industry. It is also used as a pickling agent for stainless steel, as a catalyst in gasoline alkylation, as reactant in the manufacturing of uranium hexafluoride and in various other industries. Most of the Hydrogen Fluoride present in the air depends on human activities. Important sources are, for instance, municipal waste and special waste incinerators, petroleum refining, aluminum smelting, steel and copper industries, as well as brick and clay production facilities.

All the above listed processes and industries are requested to monitor their HF emissions. An instrument that uses a tunable diode laser, such as LasIR® from Unisearch, represents a perfect HF analyzer (fluoride analyzer). When configured for fluoride monitoring, LasIR is able to provide continuous updates on the concentration of the gas in a given area.

Unisearch has pioneered the use of Optical Spectroscopy in monitoring toxic gases for more than 30 years, and provided world-wide industries with effective gas monitoring systems. The LasIR technology has proven to be universally applicable in relation to gases that have a signature in the near infrared region. With HF emission and process control monitoring at Aluminum Smelters, the application of LasIR to HF had just begun.

Unisearch offers a wide range of technologies to provide the right solution for all your gas measurement needs. The LasIR is the technology (TDL spectroscopy) of choice for HF and other gases such as \( \text{NH}_3 \), \( \text{H}_2\text{S} \), CO and \( \text{CO}_2 \). Unisearch also offers mid-infrared TDL systems for other gases such as perfluorocarbons, and a dedicated ultraviolet system (DOAS) as the best instrument for measuring \( \text{SO}_2 \).
2. THE EMISSIONS MONITORING SOLUTION

LasIR® Description:

The LasIR is a gas monitoring system based on the absorption of light emitted by Tunable Diode Lasers, which emit monochromatic laser light at very precise wavelengths. The Tunable Diode Lasers used for the LasIR are similar to those used in telecommunication. For HF measurements, the TDLs selected emit a very narrow beam of light that is specific to HF and the laser is tuned on the absorption band by applying a specific electrical current. The laser is fiber coupled to single mode optic fiber allowing for remote monitoring of gases in open path ambient monitoring and/or stacks and from up to 16 different locations with a single controller. Gas concentrations are determined by proprietary software that allows for a high accuracy and sensitivity: the employed techniques provide sensitivities from the part per billion-volume meter to high concentrations of the target gas. This provides a dynamic range for the measurements of more than 6 orders of magnitude. The hardware allows for non-intrusive measurements directly in the stack or ambient air. Extractive cells can also be used when required by the application.

LasIR® Performance:

The LasIR has proven to be a very useful tool for the measurement and control of industrial gas emissions. Unisearch LasIR® HF analyzer has been tested and found to be suitable for use at combustion plants according to EC directive 2001/80/EC, at waste incinerator plants according to EC directive 2000/76/EC and other plants requiring official approval. Unisearch LasIR® HF analyzer is factory calibrated and does not require field calibration. Auditing is performed in compliance with applicable norms by means of an external flow-through gas cell connected to the analyzer via fiber optic and coax cables.
3. OPERATIONAL FEATURES OF UNISEARCH SYSTEMS

Advantages of TDL LasIR®

- Freedom from Interferences of other gases and particles.
- Fast real-time measurements: in milliseconds
- Sensitive: as low as sub-ppm levels.
- Versatile. Up to 16 different measurement points simultaneously with a single analyzer.
- Simple, compact, rugged, reliable, virtually maintenance free.
- Factory Calibration
- Remote Operation. The controller can be kept in the control room while measurements are taken across stacks and/or open path.

For more information on the technology please consult the following articles:


Please contact us for more information on installed systems and their performance

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