

## APPLICATION NOTE

# Monitoring Toxic Gases in Healthcare facilities

**Using the New DX-4030 FTIR Gas Analyzer for :**

- 1). Simultaneous measurement of Waste Anesthetic Gases**
- 2). Toxic Sterilants in the Histology Lab. and Central Supply**
- 3). Contaminated patients arriving at Emergency Departments**

### Application 1: Simultaneous measurement of Waste Anesthetic Gases

Waste Anesthetic Gas (WAG) concentrations in Operating and Recovery Rooms continuously expose healthcare workers and increase their own health risks. A routine monitoring program can easily close this gap and provide complete assurance to the healthcare workers that their workplace environment and air quality carries no health risk to themselves and colleagues.

For years, many healthcare facilities have diligently undertaken routine monitoring using instruments primarily focused on detection of Nitrous Oxide (N<sub>2</sub>O) assuming that if the N<sub>2</sub>O gas concentrations were below NIOSH guidelines then, other WAG's such as Sevoflurane, Isoflurane, Enflurane, Halothane, and Desflurane would also be within acceptable levels.

Generally either the testing instrument was limited to monitoring just one gas (N<sub>2</sub>O) or it was excessively time consuming to monitor each gas separately. The measurement technique typically used and cited under NIOSH Method 6600 was an infrared spectrophotometer. However since that document was written in 1984 and updated in 1994, major advances in monitoring technologies have occurred.

**THE GASMET DX-4030**  
**THE SOLUTION**  
**FOR TODAY'S HOSPITAL GAS MONITORING**

Gasmeter Technologies new DX-4030 Gas Analyzer can measure 25 gases simultaneously using Fourier Transform Infrared technology (FTIR).

An internal sample pump actively samples room air and all 25 gas concentrations are displayed and logged on a PDA (Personal Digital Assistant) with updated readings each 5 seconds.



Figure 1 : Operating rooms are monitored for waste anesthetic



Figure 2 : The DX-4030 being used by an OR nurse



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The following table presents a typical library of gases suitable for healthcare workplace monitoring.

- Library of common Hospital Gases -	
Gas	Range (ppm)
Nitrous Oxide	0 - 100
Desflurane	0 - 50
Sevoflurane	0 - 50
Isoflurane	0 - 50
Halothane	0 - 50
Enflurane	0 - 50
Formaldehyde	0 - 50
Glutaraldehyde	0 - 50
Ethylene Oxide	0 - 50
Ortho-phthalaldehyde (OPA)	0 - 50
Methyl Methacrylate	0 - 50
Hydrogen Peroxide	0 - 50
Xylene	0 - 250
Toluene	0 - 200
Acetone	0 - 200
Isopropanol	0 - 100
Ethanol	0 - 200
Methanol	0 - 500
Carbon Dioxide	0 - 2,000
Carbon Monoxide	0 - 200
Methane	0 - 100
Ammonia	0 - 50
Water Vapour	0 - 3%

**YES, THE DX-4030 CAN MEASURE ALL THESE GASES SIMULTANEOUSLY!**



Fig.3 – Nitrous Oxide results displayed on PDA. Data sent from DX-4030 by Bluetooth wireless

Table 1. Typical library of Hospital gases

The Gasmeter DX-4030 FTIR Gas Analyzer is ideal for staff responsible for performing routine testing of WAG's in the operating rooms and recovery rooms as it provides a simultaneous direct reading of all the anesthetic agents. The user can immediately action any necessary maintenance when leaks are detected around the anesthetic machines, fittings or storage area, thereby saving valuable hospital resources as well as eliminating possible worker occupational health exposure issues.

**Application 2: Toxic Sterilants in the Histology Lab. and Central Supply**

Verifying that workers in the histology laboratory are breathing a safe air supply free from toxic preservative gases such as formaldehyde, glutaraldehyde, xylene or ortho-phthalaldehyde can be performed regularly and easily using the new generation DX-4030 multi-component gas analyzer.

Regular gas monitoring for these toxic gases ensures all engineering controls are functioning normally and that workers are not unknowingly being exposed to dangerous levels of these carcinogenic chemicals.



For healthcare facilities operating sterilizing equipment such as Ethylene Oxide (EtO or EO) or Plasma Sterilizers using hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) or peracetic acid, the DX-4030 multi-component gas analyzer provides an excellent supplement to existing permanent gas monitoring systems either as a back-up or by allowing measurements in locations away from existing fixed sensing points. Worker peace-of-mind can be quickly and accurately achieved in a walk-round survey using the DX-4030 gas analyzer.

### **Application 3: Contaminated patients arriving at Emergency Departments**

Capable of monitoring hundreds of chemicals, the DX-4030 offers a very cost-effective solution for screening suspected contaminated patients arriving at the emergency department. If allowed to go unscreened, personnel exposure and widespread contamination of the hospital air quality is put at significant risk.



The DX-4030 can quickly monitor the air quality in close proximity to the contaminated patient(s) identifying high risk chemicals from a library of common toxics including chemical warfare agents. The supervisor with this measurement can rapidly assess the risk and implement all necessary controls.

Gasmeter DX-4030 gas analyzer is designed to run from rechargeable battery to provide complete portability or it can be powered from AC power for long term (TWA) monitoring applications or personnel air quality surveys.

The instrument is fully ready to use after a three minute zeroing procedure usually performed daily. The communication between the DX-4030 analyzer and the PDA uses Bluetooth wireless technology or an optional RS-232 cable link. The PDA provides full instrument control including diagnostics, instrument settings, result display and saving measurements.

Validation occurs for each reading, warning the operator immediately of an unknown gas that has been detected. A quality assurance indicator labeled "residual" is tagged to each toxic gas measurement. The DX-4030 provides the user with an easy-to-use instrument without the fear of false alarm readings.

**Maintenance:** Providing all of the traditional benefits of infrared gas analyzers such as ease-of-use and low cost-of-ownership, the DX-4030 gives a significant advantage for instrument calibration as it never has to be sent back to the factory for recalibration. The DX-4030 performs an internal calibration with each gas measurement using a high precision Neon-Helium laser.

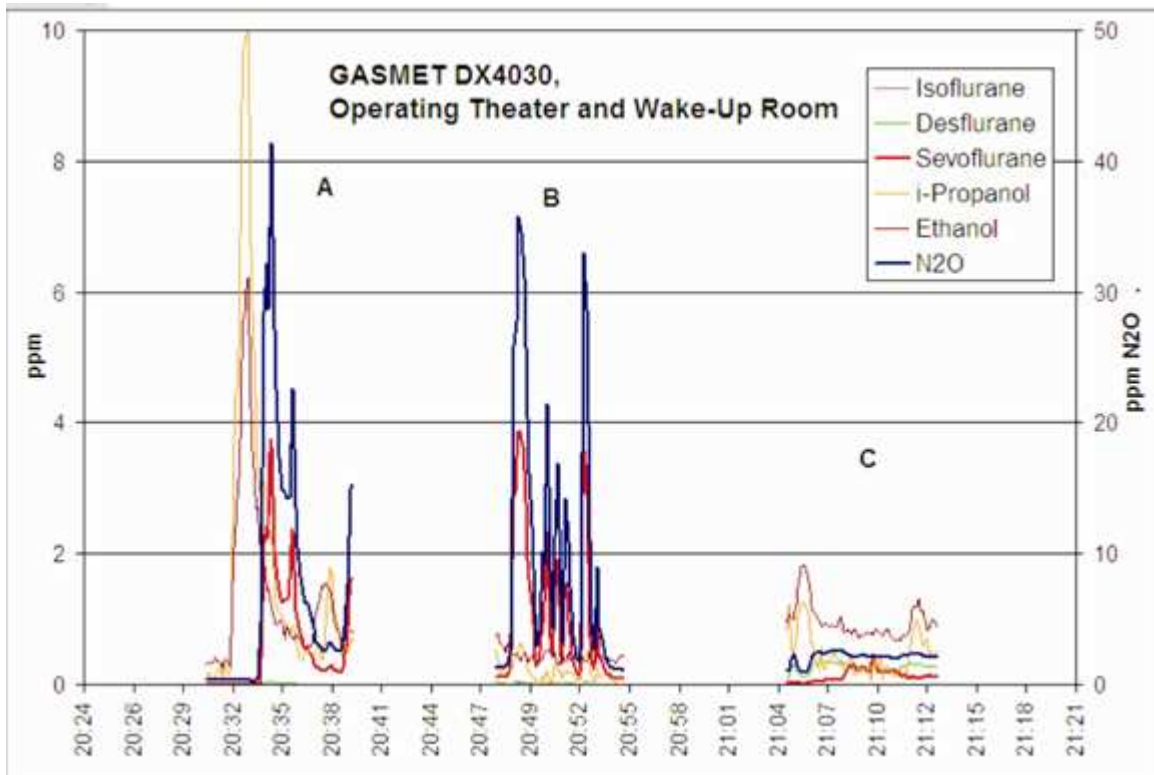
The new generation Gasmeter DX-4030 FTIR Gas Analyzer offers a very cost effective monitoring solution, by providing employee protection against excessive exposure to the many toxic gases used in the various healthcare departments.



**Application example:**

Measurement data from a hospital (three measurements ):

- A) In operating theater close to patient’s mask. In addition to high concentration of anesthetic gases, there’s also IPA and Ethanol present from disinfecting.
- B) Recovery room: patient exhales waste anesthetic gases after surgery.
- C) Same place later in the evening: concentrations of gases are starting to decrease.



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