IS YOUR SAFETY PROGRAM EBBING OR FLOWING?

Best practices in gas detection for the wastewater industry

Honeywell

PROTECTING PEOPLE AND ASSETS

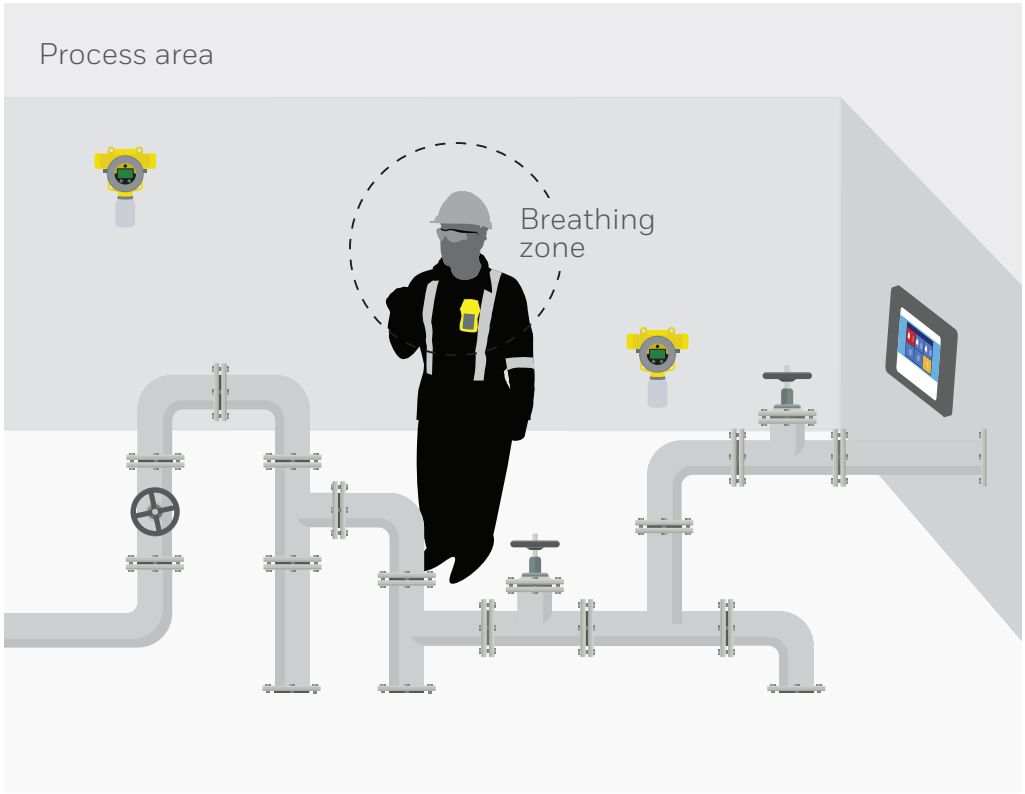
The wastewater industry contains a variety of toxic and combustible gas hazards, such as ammonia, methane, chlorine, hydrogen sulfide and volatile organic chemicals. It's nearly impossible to eliminate these hazards, so one must be able to detect them to protect equipment and personnel.

Honeywell recommends a combination of fixed gas detectors, life safety controllers and portable gas detectors to drive safety and compliance throughout a facility:

Fixed gas detectors. These permanently mounted detectors, which may be a combination of transmitters and sensors, add a layer protection for assets while providing early warnings to workers prior to their entry of the area.

Life safety controllers. These user-friendly controllers can activate outputs such as alarms, strobes and ventilation. Life safety controllers, unlike programmable logic controllers (PLCs), have a built-in display and allow for simplified setup and operation.

Portable gas detectors. As a type of personal protective equipment (PPE), these wearable devices monitor gas levels in a worker's breathing zone. Portables protect workers when they go beyond the detection perimeter of a fixed detector or when a fixed detector is not present, and they can also allow for sampling of the atmosphere of confined spaces prior to a worker's entry.



ADDITIONAL CONSIDERATION

If you have an area that needs gas detection only some of the time, consider a transportable area monitor as a proactive solution for planned maintenance. You can also use a transportable monitor for evaluating an area for the best overall gas detection system.

CRITICAL CONSIDERATIONS FOR FIXED DETECTORS

How many fixed gas detectors do you need for a certain process area? Where should you put them? Should they be high or low? How much space should be between them?

The answers to these kinds of questions can vary greatly depending on your operations. To determine the quantity and placement of your gas detectors, consider these critical factors:

- **What is the threat?** Identify the gases in the area.
- **Where is the source?** Mount detectors where gases are most likely to be present.
- **Is the gas lighter, heavier or equal to the weight of air?** *See next page for more information.*
- **How large is the area?** Consider the detection perimeter of each sensor.
- **What are the environmental conditions?** Assess temperature, humidity and pressure levels in the area.
- **What kind of ventilation is in the area?** Consider how gases may behave due to natural or forced air currents.
- **Is there a risk that the area could fill with water?** Position detectors where they will not become submerged.

WHEN SHOULD YOU USE PORTABLE DETECTORS?

The short answer: whenever you suspect a hazardous atmosphere is present. In addition, a best practice in gas detection is that **wherever you have fixed detectors, you should also have your workers wearing portable gas detectors** — either single-gas or multi-gas — to monitor their breathing zone. Portable detectors can provide earlier warning to workers before a gas reaches the sensor on a fixed detector.

The most commonly used multi-gas detector measures hydrogen sulfide, carbon monoxide, oxygen levels (enrichment or deficiency) and combustible gases at the lower explosive limit (LEL). However, workers may need a portable detector for additional atmospheric hazards such as chlorine, sulfur dioxide or volatile organic compounds (VOCs).

Portable detectors should be lightweight, comfortable and simple to operate, with a rugged enclosure that stands up to challenging environments. Portable gas detectors are also critical for confined space entries. *See page 5 for more information.*

TOUGH ENOUGH

All gas detectors — fixed and portable — should have a high ingress protection (IP) rating. For example, a rating of IP66 ensures the detector can withstand strong jets of water and dust.

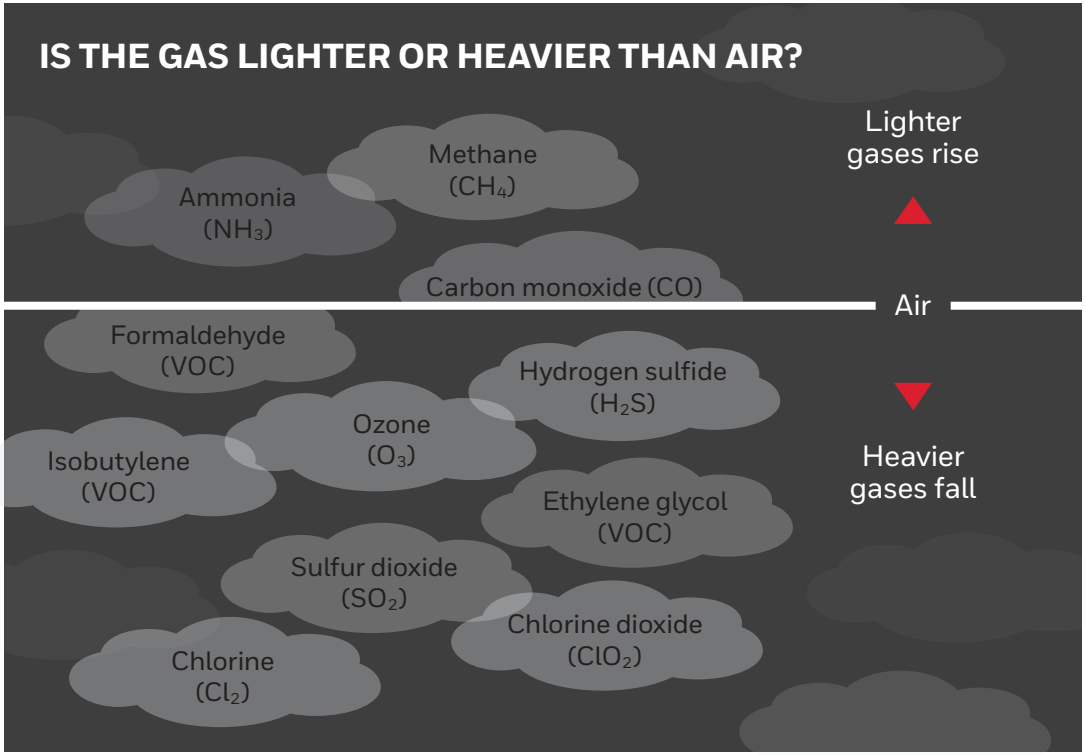
A WEIGHTY DECISION

When it comes to the placement of gas detectors, a key consideration is the density of the target gas relative to air.

Gases that are heavier than air will fall, so fixed detectors for these gases should be mounted at a low level. Conversely, gases that are lighter than air will rise, so detectors should be mounted at a higher level.

Therefore, depending on the gases present, some areas in a wastewater treatment plant will benefit from multiple single-gas transmitters at varying heights. This placement helps ensure fast notification of danger, since the sensors will meet the gas as it rises or falls.

Another option is a single transmitter with multiple sensors; however, this approach may cause a delay in notification, as all gases would need to reach the location of the one transmitter before triggering an alarm.



3 main types of gas hazards:

- **Flammable:** Risk of fire and/or explosion (example: methane)
- **Toxic:** Risk of poisoning (examples: chlorine, ammonia, hydrogen sulfide)
- **Asphyxiant:** Risk of suffocation (example: oxygen deficiency when oxygen is displaced by another gas)

SAMPLE APPLICATIONS

Hazardous gases can exist in numerous areas of a wastewater treatment plant. See the next pages for three of them — along with key tips for gas detection.

AREA #1

Pumping stations, which temporarily store influent water and lift it to the head of the plant, are often considered confined spaces for gas detection. They are subject to releases of hydrogen sulfide and methane from decomposing waste, which can cause explosions or toxic poisoning, as well as other gas hazards that can create risks related to oxygen levels.

FIXED GAS DETECTORS

Honeywell recommends at least four transmitters for this space — one for each gas to be monitored. Given the varying densities of the gases, place the methane and carbon monoxide sensors higher in the space, while positioning the hydrogen sulfide sensor lower.

For the detection of methane, consider a sealed, optical-design infrared sensor, which delivers fast response and stable performance with less maintenance than catalytic or unsealed, optical-design infrared sensors.

PORTABLE GAS DETECTORS

For permit-required confined spaces such as a wet well, an attendant should use a pumped four-gas or five-gas portable detector to sample the gas levels in the space and ensure it is safe prior to entry.

Moreover, it is critical for this confined space attendant — who performs the "hole watch" — to continue using the pumped detector to monitor gas levels while workers are inside the space. With this best practice, the attendant has real-time gas data in the palm of their hand, so he or she can watch for changes in the environment, communicate with workers and coordinate emergency rescue if needed.

Workers in the space, meanwhile, are advised to use four-gas or five-gas portable detectors to monitor the safety of their breathing zone.

TIP: VOC VIGILANCE

In some cases, influent water may include volatile organic chemicals (VOCs) such as solvents or acetones. When you have VOCs in an area, choose a portable five-gas detector or transportable detector that has a broad-range PID sensor (photoionization detector).

Area: Wet well in pumping stations

Gas hazards:

- CH_4 ▲
- H_2S ▼
- CO —
- O_2 levels
- VOCs (densities vary)

Key:
▲ Lighter than air
— Similar to air
▼ Heavier than air

Photo: Jason Turgeon

AREA #2

As the first level of filtration, the bar screen room can be exposed to several hazardous gases in the influent water. Honeywell therefore recommends an array of fixed gas detectors at different heights.

Like the wet well, the bar screen room in some plants may be classified as a confined space. In this instance, an attendant should use a pumped portable gas detector to check the space prior to entry and continue to monitor the workers inside, and those workers should wear a portable detector that monitors a minimum of four gases.

MONITORING GASOLINE VAPORS: AN LEL SENSOR IS NOT ENOUGH.

As in the wet well, influent water in the bar screen room can contain volatile organic chemicals — particularly gasoline vapors, which are both combustible and toxic.

For this known hazard, Honeywell recommends portable or transportable detectors with a PID sensor in addition to an LEL sensor that can detect liquid chemical compounds as they begin to vaporize at low ppm (parts per million).

TIP: VOC VIGILANCE

For VOCs such as gasoline vapors that are combustible and toxic, gas detectors should have both an LEL sensor and a PID sensor.

Area: Bar screen room

Gas hazards:

- CH_4 ▲
- H_2S ▼
- CO —
- O_2 levels
- Gasoline vapors ▼

Key:
▲ Lighter than air
— Similar to air
▼ Heavier than air

Photo: HUBER Technology, Inc

AREA #3

The storage room for wastewater disinfectants carries a risk of accidental gas release, and even small leaks can pose big safety hazards. Disinfectants may include ammonia, ozone, chlorine and chlorine dioxide.

FIXED GAS DETECTORS

Honeywell recommends identifying the potential sources of gas leaks and placing fixed transmitters nearby, while keeping in mind that sensors should be positioned at varying heights if there are multiple gas threats in the room. For example, since chlorine is a heavy gas, it will tend to fall while ammonia will tend to rise.

How do you know whether it's safe for workers to enter the storage room? Consider installing one or more transmitters at the entrance to the storage room, which can be cabled to sensors on the inside of the room. In this way, the transmitter's display will indicate the gas status inside the room, so workers can assess the safety. Moreover, placement of the transmitter outside the room can protect the device from chlorine corrosion.

PORTABLE GAS DETECTORS

Meanwhile, for the workers who enter the room, Honeywell recommends portable gas detectors — either single-gas or multi-gas, depending on the disinfectants present — to protect their breathing zone.

Area: Disinfectant storage room

Gas hazards:

- Cl_2 ▼
- NH_3 ▲
- O_3 ▼
- ClO_2 ▼

Key:

- ▲ Lighter than air
- ▬ Similar to air
- ▼ Heavier than air

A TOTAL GAS DETECTION SOLUTION

Honeywell helps protect workers and assets wherever they're at risk. We offer a comprehensive portfolio of fixed and portable gas detectors, along with sensors, controllers, instrument management systems and other connected technologies. Consider these Honeywell products for gas detection in wastewater applications:

Fixed gas detectors

Sensepoint XCD transmitter

XNX™ universal transmitter with Optima Plus sensor

Series 3000 transmitters

Portable gas detectors

Honeywell BW™ Icon

Honeywell BW™ Solo

Honeywell BW™ Ultra

Honeywell BW™ Max XT II

Transportable gas detector

Honeywell BW™ RigRat

Life safety controllers

Touchpoint™ Plus

Touchpoint™ Plus Wireless

MORE INFORMATION

To learn more about gas detection solutions for your wastewater plant, please visit safety.honeywell.com.

About Honeywell Industrial Safety

Honeywell Industrial Safety helps build a long-lasting culture of safety through comprehensive education, innovative technologies, and comfortable, high-performance products that inspire workers to make safer choices on their own. Our company is the ideal partner for organizations committed to a cultural transformation that minimizes injuries and maintains a safer, more productive workplace.

For More Information
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