



Oil & Gas Safety

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By: Tim Turney, Contributor



Selecting a Personal Sampling Pump for the Offshore Oil & Gas Industry

Workers in the offshore oil and gas industry are exposed to a range of hazardous substances, leaving them vulnerable to asthmatic and allergic reactions, as well as longer term illnesses—such as cancer and cardiovascular, respiratory and nervous system disorders. While the cost to human health can be devastating, the financial costs to businesses through reduced productivity, employee absences, recruitment and compensation claims can be substantial.

OSHA issues citations and penalties if businesses violate permissible exposure limits (PEL). PELs are legal limits designed to control employee exposure to hazardous substances in an eight-hour period to prevent health risks. However, employers are also advised to monitor recommendations from industrial hygiene experts and manufacturers,

because it is estimated that 90% of OSHA’s PELs have not been updated since the 1960s.¹ Consequently, OSHA may issue citations under the general duty clause of the Occupational Safety and Health Act (OSH Act) if exposure limits exceed industry-wide standards and pose a threat to employee health.

Industrial hygiene methods are geared towards measuring personal exposure using personal air sampling pumps, because the tried-and-tested method can quantify personal exposure and ensure compliance with regulatory limits. A sampling pump’s size, weight, connectivity and ability to access data are key; however, flow rate stability, pulsation and back-pressure capability must also be considered. So, when purchasing a sampling pump, what features should you look for?

Safety Ratings

Many pumps are Intrinsically Safe (IS) rated as standard, but it is worth checking that your pump’s IS rating is still appropriate for your facility to avoid any safety issues. An IS-rated pump will not cause an explosion in a flammable atmosphere, which is critical for workplaces with significant levels of combustible substances. In addition, consider whether the pumps will be used in a harsh environment. For example, many pumps now have Ingress Protection ratings, which means they are protected from ingress by water and dust.

¹ <https://cen.acs.org/safety/industrial-safety/Former-OSHA-head-David-Michaels/99/i24>

Design

Size, weight and accessibility are critical design elements. Pumps should allow freedom of movement as well as be unobtrusive, robust and not prone to leakage. Selecting a smaller, lightweight, low-flow pump (0.05-1L) for sampling vapors and gases, over a medium flow pump (1-5L) equipped with a low flow adaptor is more user-friendly for workers.

Battery Life

When selecting a personal sampling pump, the battery life must be considered to maintain operation throughout the monitoring period. Lithium-ion batteries are now starting to be used in the latest personal sampling pumps with significant advantages over traditional nickel-metal hydride and nickel-cadmium batteries. For example, li-ion batteries have the highest energy density, which means that you need fewer cells and can ultimately achieve a smaller, lighter pump. Li-ion batteries also do not suffer from the “memory effect,” meaning only part of the battery charge is usable. This will avoid having to change the batteries regularly or implement a battery management procedure.

Compliance

It is vital to check that your pump meets the latest international standard for air sampling pumps. Compliance with ISO 13137 ensures accurate flow performance amongst other performance criteria, ensuring accurate sampling—and meaning you will not have to repeat measurements.



Back-Pressure Capability

The most significant factor to consider in the operational capabilities of your personal sampling pump is the choice of media. For vapors or gases, the more back pressure the tube produces, or if multi tube sampling is required, ensure this back pressure can be handled by the pump. Will they cope?

Pulsation and Air Flow

If monitoring for dusts with a medium flow pump, the ISO 13137:2013 standard requires that the pulsation of a personal sampling pump shall not exceed 10% of the flow rate. A pulsation measurement shows the difference in air flow between cycles; through every cycle, as the pump draws air in and expels it simultaneously, this exchange process causes an uneven flow. A large pulsation value means that if you are using a cyclone head for collecting respirable samples, flow does not remain steady, and the size cut of the respirable fraction is affected. To combat this effect, manufacturers include pulsation dampeners, which are rubber diaphragms that act as extra reservoirs of air to smooth the flow. Ensure that the pulsation values are within specification for your chosen pump.

Most pumps control the flow of air through the pump using a “constant flow” mechanism. As back pressure increases, the pump detects the change and alters the flow accordingly. At the end of the sample, flow should still be within plus or minus 5% of the calibrated flow set at the start of the measurement. A constant flow ensures that you can be confident in the volume of air sampled for your exposure calculations.

Constant Pressure Control

“Constant pressure control” is primarily used for low-flow applications and allows the possibility of taking samples with sorbent tubes for gases and vapors. This method controls the flow rate by holding a constant pressure level in the tubing between the samplers and the pump. For many pumps, in order to do a low-flow measurement, you would purchase a separate constant-pressure controller. If you frequently undertake low-flow measurements, it is worth investing in a pump that has this built-in.

Connectivity and Bluetooth

The latest generation of Bluetooth®-enabled pumps and flow calibrators can automate the calibration process and save valuable time, increasing confidence in the calibration results, which can be saved and/or emailed for reporting. Pulsation, once tested in a laboratory, can now be checked in the field at the same time as a normal flow-rate calibration through an airflow calibrator equipped with Bluetooth. As advances in technology continue to develop, remote methods can avoid disturbing workers and improve the validity and reliability of sample data.

It is vital that these factors, alongside the broader environmental conditions in the specific working environment, are at front of mind when purchasing new equipment.

Monitoring will help keep employees protected throughout the working day by ensuring air-sampling pumps identify hazardous amounts of fumes, dust and gases that increase the risk of long-term damage to worker health. ■

About the Author

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Workers in the offshore oil and gas industry are exposed to a range of hazardous substances, leaving them vulnerable to asthmatic and allergic reactions, as well as longer term illnesses. (photo courtesy Adobe Stock Images)

By: Eric Van Wely and Reiyao Zhu, Contributors

Six Steps for Selecting PPE for the Oil & Gas Industry

Workers in the oil & gas and petrochemical industries perform many high-risk tasks that involve exposure to multiple hazards. In some cases, these high-risk tasks are also performed under extreme weather conditions and in remote locations.

A broad range of personal protective equipment (PPE) solutions are needed to address the multiple hazards workers face, including garments for flash-fire hazards; protection against fine particle hazards and low-level liquid splashes; protection against concentrated chemicals under pressure; and gloves for cut and multi-hazard protection.

With so many different manufacturers offering PPE solutions, identifying and sourcing the most appropriate PPE can be very time-consuming for busy health, safety and environment (HSE) managers.

The following steps should help to simplify the process of selecting PPE for oil & gas applications.

1. Hazard Identification

Selection of PPE is the responsibility of employers under OSHA 1910.132¹.

Employer assessment of workplace hazards drives the selection of appropriate PPE, and a key first step is to conduct a Site Hazard Identification and Risk Assessment. This

¹ OSHA: Directive [1910.132](https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.132) of November 18, 2016 on the minimum health and safety requirements for the use by workers of PPE at the workplace; 81 FR 82999 <https://www.osha.gov/laws-regs/regulations/standardnumber/1910/1910.132>



photo courtesy DuPont

may involve consultation with a number of colleagues to make sure that all potential hazards have been identified. Common sources of risk include potential flash fires, mechanical hazards—such as exposure to slick, oily surfaces, sharp edges, punctures and heat contact—and exposure to a wide range of hazardous chemicals, dusts and solvents.

In order to minimize risk, most safety professionals apply the “Hierarchy of Controls.” This essentially means that, if possible, you should eliminate the hazard completely; if this is not possible, you should substitute a safer option. Risks may be reduced by applying engineering and administrative controls to minimize potential contact. Once the risk-reduction process is completed, PPE options can be selected to protect against any residual risk.

2. Matching PPE to the Hazard

There are a number of essential properties to look for in PPE, depending on the hazard(s) you have identified. This section gives some top-level guidance, but you should always consult with the PPE manufacturer to check that you have chosen the appropriate level of protection for your needs. Also remember that all the different PPE elements—gowns, coveralls, gloves and masks—must afford the appropriate level of protection.

Flame Resistance

Make sure you understand the basic differences between “inherent” and “treated” flame-resistant (FR) technologies.

- “Inherent” means FR properties are a natural part of the fibers used in the fabric. The flame resistance is intrinsic, permanent and cannot be washed away or worn out.
- “Treated” fabrics use chemical additives to make them flame resistant. The FR properties of chemically treated FR (FRT) fabrics, which are usually cotton or cotton/nylon blends, may be diminished or removed altogether, depending on how they are laundered and/or which chemicals they are exposed to in the work environment.

Chemical Exposure

Look for garments that exhibit the following properties:

- A strong permeation barrier built into the material to protect against a wide range of chemicals
- The ability to repel low concentrations of inorganic liquids and aerosols
- The ability to prevent solid particles from penetrating

To deliver optimum protection, ensure that the garment is tested against the specific chemical risks you have identified to deliver optimum protection. Ask your garment manufacturer to provide permeation data against your specific chemicals.

Cut Hazards

In the oil & gas industry, it is likely that cut hazards will be encountered in combination with exposure to chemicals and/or extreme temperatures. Thanks to recent advances in materials technology, PPE manufacturers are able to offer protective gloves engineered with Kevlar® to help provide the required combination of protection, without compromising the wearer’s ability to perform tasks, such as using tools and operating equipment.

Arc Hazard

Electric arc flash is one of the most serious and least understood electrical hazards encountered in the workplace. An electric arc is a continuous electric discharge of high current which flows through an air gap between conductors. This generates a very bright ultra-violet light, as well as intensive heat. An arc flash is typically caused by a short circuit,

which are often the result of a human error (e.g., caused by a worker touching a test probe to the wrong surface or from a slipped tool).

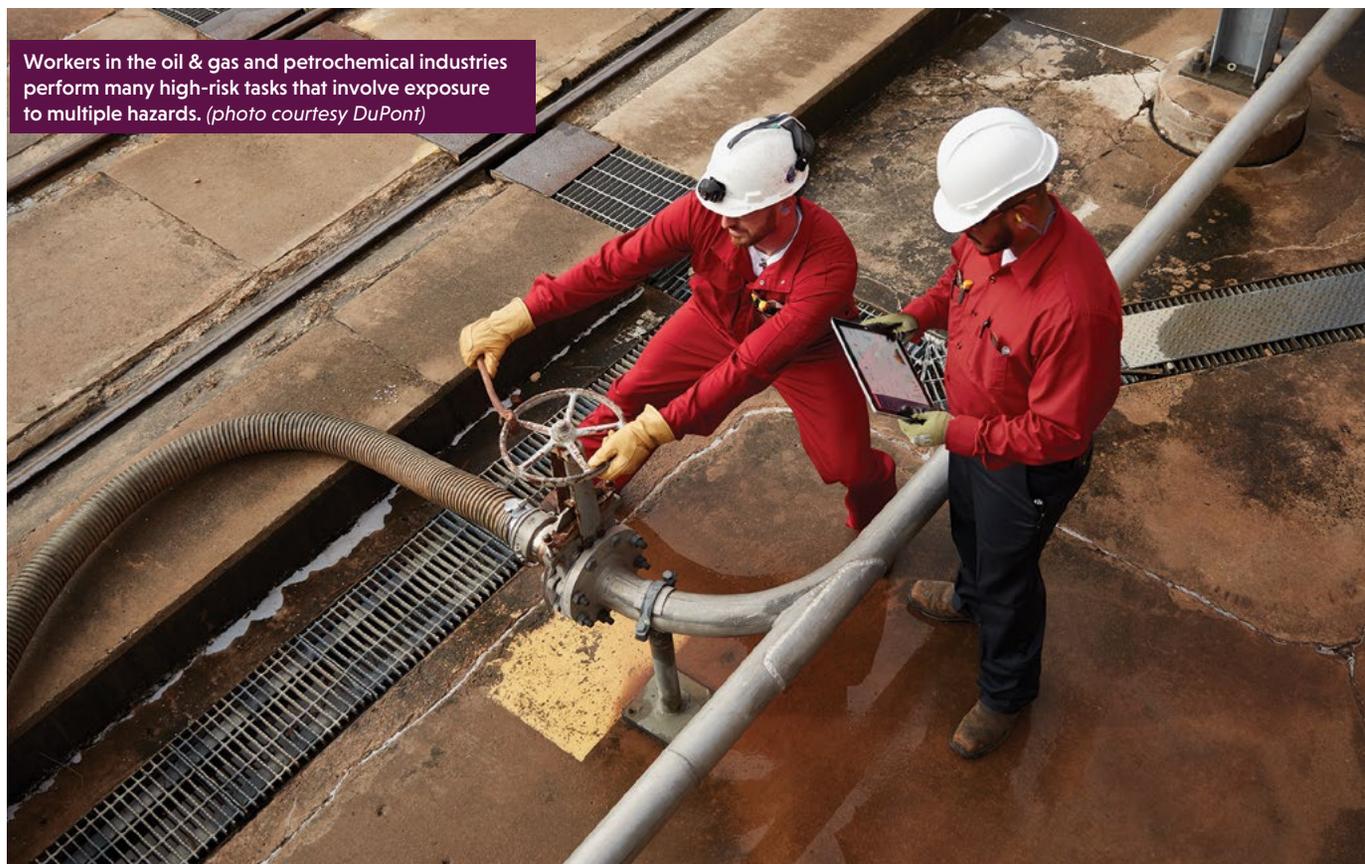
Recent advances in PPE protection include the DuPont™ Nomex® global portfolio². These offer reliable, inherently flame-resistant arc flash protection that meets NFPA 70E Category 2 requirements in a single layer, with enhanced garment durability for fewer replacements.

3. Regulatory Compliance

In addition to making sure PPE matches your particular protection requirements, it is necessary to evaluate it against regional and/or global standards. In the U.S., the provision

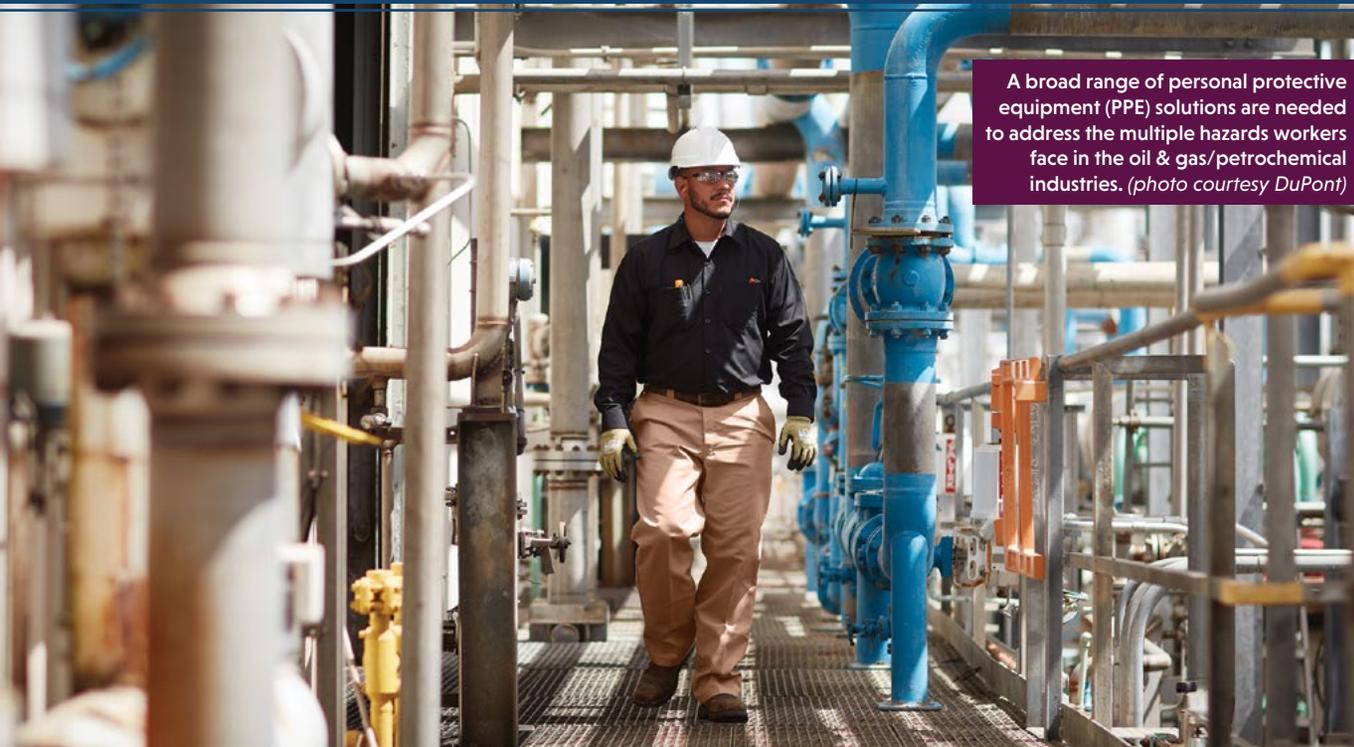
of protective clothing is covered by OSHA 1910.1321. The main points of the legislation are:

- Through a hazard assessment, the employer shall determine the appropriate PPE that will protect employees from the hazard(s) identified.
- Employees must be consulted over the PPE and provided with instructions/training on its use and compatibility with other PPE.
- PPE must be provided and maintained by the employer free of charge to employees and kept in good, reliable condition. The employer is also responsible for ensuring employee-owned PPE is adequate and maintained properly.



Workers in the oil & gas and petrochemical industries perform many high-risk tasks that involve exposure to multiple hazards. (photo courtesy DuPont)

² The Nomex® global portfolio of fabric solutions is an extension of the DuPont Personal Protection Portfolio



A broad range of personal protective equipment (PPE) solutions are needed to address the multiple hazards workers face in the oil & gas/petrochemical industries. (photo courtesy DuPont)

- All PPE must be appropriate for the work performed and risks involved, without itself posing any increased risk due to the work environment, conditions, or the design of the PPE.

If you are responsible for selecting PPE centrally for use in an oil & gas company with global operations, you need to check the relevant legislation.

4. Design and Comfort of PPE

PPE is only truly effective if it is used properly. Design and comfort both play a big role in employee acceptance. Consider the following:

- In terms of comfort, how soft and/or lightweight is the material?
- Are the garments sized well, so they will fit?
- How quickly does the material wick away or absorb moisture from breathing or sweating?
- How do workers properly don and doff garments to remain safe?

- Is the garment reusable? If so, how should the garment be properly cleaned and disinfected?

5. A Word About COVID-19

We cannot complete an article about PPE without mentioning COVID-19. The virus that causes COVID-19 has emerged as a global threat to the health of workers—placing additional responsibility on HSE professionals, particularly in essential industries like oil & gas.

As new guidance continues to evolve, it extremely important—and very challenging—to quickly adapt to the changing needs of workers during the COVID-19 pandemic. However, the same basic principles apply as for other forms of PPE.

- Evaluate the risk of exposure to the virus as well as hazards present in your work environment in order to protect workers effectively.

- Match the PPE solution to the hazard. For example, if there is a flash fire hazard, all PPE should be flame-resistant (including a face covering).
- Check PPE effectiveness in filtering out particulates, viruses or bacteria: ask the manufacturer for the data you need.
- Is the PPE solution reusable? If so, how can it be decontaminated appropriately and how often? How durable is it to multiple laundrings? Might a single-use disposable option be more appropriate and cost-effective?
- Is the solution comfortable to wear?

6. Save Time, Stay Safe

In conclusion, the PPE selection process can be long and complex, but there are ways that HSE managers can save time.

- Consult with an expert to help identify the specific combination of PPE that can address the multiple hazards a worker may face on the job.
- Look for PPE manufacturers that have in-depth knowledge, expertise and resources to help guide you in your research.
- Ask companies for resources and information that can help simplify the process of matching PPE to the hazards your workers face.
- Choose a PPE partner that can work side-by-side with you to help you match PPE to your hazards and provide additional support, such as training.
- Explore the *Oil & Gas PPE Guidebook from DuPont Personal Protection* to help you select PPE based on your tasks and hazards. ■

About the Authors

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BRADLEY'S COMBINED Halo™ Swing-Activated Faucet and Eyewash Saves Workspace

Is your worksite feeling tight, clustered or overrun with equipment?

Optimize valuable space in your work environment with Bradley's new combined [Halo™ Swing-Activated Faucet and Eyewash](#). This innovative space-saver provides the best

of both worlds – regular washing *and* emergency eyewash relief at a second's notice.

Specifically, Halo Swing-Activated Faucet and Eyewash features a durable gooseneck faucet for regular everyday use, such as handwashing, and a built-in emergency eyewash

featuring [Halo™ eyewash technology](#) that is proven to deliver the most effective eye washdown coverage available.

Designed by Bradley Corporation, manufacturer of industrial washing and safety solutions for more than 100 years, this model provides a highly efficient and convenient space-saving solution along with the greatest emergency washdown relief on the market.



How the fixture works

During regular faucet use, the eyewash is stored out of the way. In an emergency, the Halo eyewash is immediately activated when it is swung out 90 degrees over the sink. When the eyewash is activated, the swing-activated design ensures the faucet moves out of the way, deactivating the faucet in less than one second, and positions the eyewash directly over the sink for unobstructed access to the fixture. With the eyewash in the optimal position over the sink, water is contained in the sink without dripping or spraying on countertops and floors, which can create mess and risk of slipping and falling.

Reliable long-term performance

Designed with a durable ceramic valve that limits wear and tear on moving parts, this swing-activated model provides dependability and long-lasting performance. The faucet can be activated by three different options – two handle hot and cold ceramic control valves, single tempered water control valve or single lever manual mixing and control valve.

For added versatility, two swing-activated models are available, with eyewash access on either the left or right side of the fixture, providing a reliable, compact and convenient faucet and eyewash for a variety of worksites and environments.



In addition, the eyewash is fully functional even under low water pressure conditions (30psi). The Halo eyewash is mounted lower to the deck rather than on the top of the faucet, providing more convenient and comfortable use of the emergency fixture compared with competitive models on the market, and reinforcing stability and durability of the fixture during use.

Halo Eyewash models deliver the best protection

Bradley's [Halo™ eye and eye/face wash](https://www.bradleycorp.com/halo-faucet-eyewash) arms users with the most effective emergency relief available, providing 20 percent better protection than any other eye/face wash. With a more uniform and complete spray pattern distribution,

Using the latest technology in fluid dynamics, Halo eye and eye/face wash works in tandem with a pressure regulated flow control and the spinning motion of water, which creates an optimal spray pattern to rinse off contaminants quickly and thoroughly. A concentrated, yet gentle, deluge of water ensures the most effective flush available.

Halo eyewash models utilize a much more accurate method to maintain the flow of water over varied pressures with a gentle, non-injurious flow of water. Due to advances in fluid dynamics technology, Halo eyewash provides 20 percent better protection than other designs.

Halo designed for hygienic use

Halo eyewash models, including the Swing-Activated model, include an integral strainer to reduce debris in the water and prevent clogging, while the self-draining sprayhead ensures no stagnant water remains for any bacteria to grow, improving worker safety and hygiene. ■

<https://www.bradleycorp.com/halo-faucet-eyewash>
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With reliable, effective safety products that are available when and where you need them, Bradley is the name to trust.

Emergency Safety Solutions. Brought to Life.

bradleycorp.com/halo



Data Analytics and Gas Monitoring: Breaking Down Big Data to Identify & Mitigate Health & Safety Risks

By Igor Avlijas, P.Eng, Contributor

As most personnel return to the workplace full-time, industrial hygienists face the growing and continued challenge of mitigating gas and other hazardous exposures that result in both acute and long-term health effects.

Whether it's in oil & gas, construction, manufacturing or other industries, the threat of harmful substances, such as carbon monoxide and hydrogen sulfide, are constantly present across worksites. While it's widely known that these gases and chemicals pose a clear threat to workers' physical health, they can also have a negative effect on mental health.

Unfortunately, gas exposures are a common occurrence across industrial worksites, and these numbers are on the rise. Exposure to harmful substances led to the deaths of 642 workers in 2019, according to the [Bureau of Labor Statistics](#). This number represents the highest figure since the series began in 2011—and a 51% increase from 2015.

This trend heightens the need to eliminate the potential of severe exposure as all employees return to the workplace. Additionally, the threat of exposure to lower level gases is just as critical, but often overlooked, due to lack of data and the high cost of traditional gas-monitoring systems. Without proper mitigation, workers face a larger risk of compound exposures over their careers that lead to the possibility of health complications years or decades later.

Industrial hygienists, whether based on-site or centralized at regional or HQ offices, are constantly fighting the battle of ensuring health and safety as companies

aim to become more efficient, productive and profitable. Those challenges only grow if a centralized safety or industrial hygiene team is tasked with managing the health and wellbeing of workers across state lines.

In this scenario, lack of visibility and fact-based insight into every worker's exposure levels and at-risk behavior is a real challenge. That's where technology, big data and worksite digitization can empower industrial hygiene teams with greater line of sight that ultimately helps them protect workers locally and remotely.

The leading safety monitoring devices and wearables produce thousands of data points every day, including when, where and how often exposures to a variety of gases occurred. If the oceans of raw data are properly broken down by experts, this insight can be captured and leveraged to implement immediate improvements and preventative measures that minimize exposure, protecting the short- and long-term health of workforces.

The following capabilities outline how incorporating big data can help amplify the meaningful work industrial hygienists are conducting to ensure health and safety.

Prioritizing Risk Through Greater Front-Line Visibility

Big data analytics identify thousands of risk factors logged by a digitized worksite and safety devices and deliver complete line-of-sight across many aspects of workforce behavior and activity. Through GPS-enabled gas monitoring, it also helps identify the dangers that are active or just starting to occur, such as a gas leak or the continued presence of low gas levels.

Equipped with a comprehensive view of worksite risks, industrial hygienists can efficiently prioritize health concerns and initiatives enterprise-wide, addressing each and monitoring the impact over time.

Shortening the Decision-Making Cycle Through Actionable Insights

Everybody knows the power of data. However, data collection alone is just the first step on the way to addressing the threats. Safety-centric data science, artificial intelligence and powerful cloud computing are opening big opportunities in driving the end result—actions and decisions based on the insights extracted from the collected data.

Through a digital worksite, the visibility delivered to industrial hygienists is available in real-time via the Cloud—allowing accessible, centralized and robust monitoring across all worksites at once. With actionable insights at their fingertips, industrial hygiene teams can quickly identify an emerging danger—such as a new underground leak where carcinogen exposure is a threat—and immediately take the appropriate action to address the situation, from initiating an investigation to clearing the area.

Monitoring Progress Against Health & Safety Key Performance Indicators

Worksite data captured via wearables and other technology remains available in perpetuity. This ensures that industrial hygienists can view insights, such as exposure levels, from a certain historical period against baselines and targets, tracking the effectiveness of initiatives to determine if additional enhancements should be considered.

Incorporating Predictive Safety & Preventative Measures

At times, industrial hygienists can spend their days putting out fires reactively. Big data analytics allows IH professionals to take a proactive and preventative approach to worker health through predictive safety. Through big data, teams are served timely triaged early risk indicators that support the team to anticipate probable future issues, allowing a shift from reactive to proactive work processes.

Big data derived from connected safety technology offers the opportunity to take the next step when it comes to ensuring health and safety of the industrial workforce.

It serves as a tool that provides greater visibility and a comprehensive picture of a worksite, delivering timely actionable insights that allow teams to gain a stronger sense of the risks and prioritize improvements to mitigate them.

The result is greater availability of relevant information to inform decision-making and provide peace of mind that the workers are safe in the present, as well as for years and decades to come. ■

About the Author:

Igor Avlijas, P.Eng., is Leader of the Digital Worksite Program at Blackline Safety.



OSHA's National Emphasis Program— Outdoor & Indoor Heat-Related Hazards

“Heat stress related injuries can occur under almost any scenario and can be dependent on many external factors along with the health/fitness of the individual. One important preventive measure often overlooked is proper hydration. Implementing this National Emphasis Program using a healthy hydration approach encourages workers to drink more water and ultimately saves lives.” *Janet Baker-Truex, CEO, Nextteq International LLC, info@nextteq.com, www.readygohydration.com*

History/Background

On a warm, summer day in July, a 42-year-old man was on his way to work for his new job as a roofer. When he arrived, there was plenty of water, ice and drinks available at the site for him to hydrate throughout the day. It was only his third day on the job, and he got straight to work. The high temperature was about 86°F and a relative humidity of 57%, for a heat index of 90°F. Later that afternoon, the man told his colleagues he wasn't feeling well. He climbed down from the roof and sat out of the sun. When his co-workers checked on him a few minutes later, he had developed symptoms of heat stroke. He was taken to nearby hospital where he died shortly after. (See OSHA's case studies link, below.)

Cases like the one above demonstrate why the new Outdoor and Indoor Heat-Related Hazards standard and the National Emphasis Program (NEP) are so important to keeping workers safe. The NEP protects employees from heat-related hazards and the resulting injuries and illnesses in outdoor and indoor workplaces. The standard expands on the agency's ongoing heat-related illness prevention initiative and campaign by setting forth targeted enforcement components and reiterating its compliance assistance and outreach efforts.

This tactic is intended to urge early interventions by employers to prevent illnesses and deaths among workers during high heat conditions, such as working outdoors in a local area experiencing a heat wave. Early prevention measures include implementing water, rest, shade, training and acclimatization procedures for new/returning employees.

Why the Standard Matters

Millions of American workers are subjected to heat in their work environment and, even though illness from heat exposure is preventable, every year thousands become sick from occupational heat exposure. And, as noted in the above case study, some exposures can be fatal. According to OSHA, “Most outdoor fatalities, 50-70%, occur in the first few days of working in warm or hot environments, because the body needs to build a tolerance to the heat gradually over time.” This process is called [heat acclimatization](#), and the lack of acclimatization represents a major risk factor for fatal outcomes.

Occupational risk factors for heat illness include heavy physical activity; warm or hot environmental conditions; lack of acclimatization; and wearing clothing that holds in body heat.

Hazardous heat exposure can occur indoors or outdoors—and during any season, if the conditions are right—not only during heat waves.

Some outdoor industries where workers have suffered heat-related illnesses include:

- Agriculture
- Construction—road, roofing and other outdoor work
- Landscaping
- Mail and package delivery
- Oil and gas well operation

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And, some indoor industries where workers have suffered heat-related illnesses include:

- Bakeries, kitchens and laundries (businesses with heat-generating appliances)
- Electrical utilities (boiler rooms)
- Fire service



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- Iron/steel mills and foundries
- Manufacturing with hot local heat sources, like furnaces (i.e., paper products and concrete)
- Warehousing

Key Compliance Requirements:

All industries that could potentially deal with heat-related illnesses and conditions should note the following:

- Compliance safety and health officers (CSHOs), who are investigating for other purposes, shall open or refer a heat-related inspection for any hazardous heat conditions observed, or where an employee brings a heat-related hazard(s) to the attention of the CSHO (such as, employees or temporary workers being exposed to high-temperature conditions without adequate training, acclimatization, or access to water, rest and shade).
- When the weather is hot or a heat alert is issued for an area where the WHD, (Wage and Hour Division) is investigating, the WHD is encouraged to coordinate with OSHA by providing information on heat-related hazards.
- CSHOs should inquire during inspections regarding the existence of any heat-related hazard prevention

programs on heat priority days. A heat priority day follows when the heat index for the day is anticipated to be 80°F or more.

- Programmed inspections could occur on any day that the NWS (National Weather Service) has announced a heat warning or advisory for the local area. **IHW**

Resources:

- For more information about how to properly access high temperatures in correlation with safe working practices, visit: <https://www.osha.gov/heat-exposure/hazards>
- For Employers Adminstrating Heat Illness Prevention Training, read: https://www.osha.gov/sites/default/files/osha_heattraining_guide_0411.pdf
- For Specifics on planning and supervision, visit: <https://www.osha.gov/heat-exposure/planning>
- To read up on more case studies, visit: <https://www.osha.gov/heat-exposure/case-studies>
- For general heat exposure guidelines, visit: <https://www.osha.gov/heat-exposure>



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