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2 Industrial Hygiene in the Workplace



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COVER STORY: ERGONOMICS + SAFETY

10 Reduce Repetitive Stress Injuries

> Basic ergonomic education, like proper lifting and stretching, is a commonly used tool for reducing RSIs, but there are other tools employers can use to increase the efficacy of their risk-reduction efforts.

12 Preventing Devastating RSIs in the Workplace

Identifying, understanding and reducing work or worksite risks is the best approach to prevent RSIs. This article takes a close look at programs that can help prevent catastrophic RSI injuries from happening.

RESPIRATORY PROTECTION

14 Upgrade Respiratory Protection—Now! With the rapid spread of the Omicron variant, public spaces and businesses should move to elastomeric masks.

NOISE CONTROL/HEARING CONSERVATION

- **18** Noise Control in the Workplace With continued vigilance and sound programs, it's possible to identify noise sources that contribute to employees' overall noise exposure of employees. Small measures taken daily can help eliminate noise-induced hearing loss.
- 26 Listen Up! From the NHCA Experts: Impulsive Noise

To accurately capture impulsive noise, a measurement system must meet demanding technical specifications.

AIR SAMPLING

28 Connectivity: Transforming the Industrial Hygiene Sampling Pump How Bluetooth technology and mobile applications provide smarter, more streamlined sampling.

LONE WORKER SAFETY

30 Keeping Lone Workers Safe The goal of any lone worker program is to prevent workers from going undetected if they become incapacitated or trapped in the field. Meeting this goal requires that businesses develop a systematic approach.

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GAS DETECTION

34 Fixed Gas Detection: Issues & Answers By comparing portable gas detection to fixed systems, deciding which is best for your company is easier.

ENVIRONMENTAL COMPLIANCE

38 How has COVID-19 Affected Environmental Compliance?

A look at how the pandemic has affected key challenges, including waste, management systems and the environmental profession as a whole.

FACILITY MAINTENANCE + CLEANING

42 The Importance of Hygiene in the Future of the Workplace This exclusive "Thought Leadership" piece

highlights a partnership between YellowBird and the AIHA–with the goal of keeping highrisk industries and their employees safe with the help of qualified health & safety professionals.

BEFORE YOU GO ...

- 8 Note from the Editor A note from Barbara Nessinger, Editor-in-Chief
- 44 Products that Protect
- 46 Ad Index





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Note from the Editor



"Good health is not something we can buy. However, it can be an extremely valuable savings account."

-Anne Wilson Schaef

Every EHS professional knows that ensuring productivity and keeping a business alive and well depends on the health of its employees. There is no better "savings account" than a workforce that stays fit and healthy. To

that end, the companies that make PPE, safety gear and provide safety solutions know how important it is to help employers ensure the safety of their workers.

During the global pandemic, this has never seemed more important, as the focus has been on keeping workers safe from COVID-19 for the *past two years*. However, there is another aspect to worker safety that we'd be remiss if we didn't address: repetitive stress injuries (RSIs) and how to combat them.

With the continued focus on our resistance to an external enemy—i.e., the COVID virus—it's easy to forget that employers and employees still need to maintain the right ergonomic practices and procedures to keep employees' bodies in top condition. Losing a worker to an RSI can be costly in more than just a monetary way. Often, RSIs mean lifelong, debilitating pain for the sufferer—and can mean having to replace a valued employee due to an avoidable injury.

Our cover focus is on ergonomics and repetitive stress injuries. Two articles delve deeply into the causes of RSIs and workplace injuries to the body—and how implementing small, inexpensive programs and procedures can help—providing almost immediate results and helping with workplace morale, to boot. Such things as job-specific guidelines and training; risk/injury assessments; early intervention; and managing injuries are just some of the concepts discussed in these two pieces.

Another topic of importance in this issue is noise control/hearing protection. We offer two areas of focus—one offers practical, economic solutions to help augment an effective hearing conservation program. The other, from the experts at the National Hearing Conservation Association, explores the challenges of measuring "impulsive noise" in the workplace.

Moving back to COVID-19 (after all, how can we not), there is an article on environmental compliance in the COVID era, including the environmental impacts of the pandemic. And, to finish off this packed round-up of content, we also take a look at some of the latest technology in air sampling; comparing fixed gas detection with portable detection; and how to keep lone workers safe.

As always, we strive to provide state-of-the-industry information to your doorstep. I hope it assists you in your respective positions within the industry and that you continue to keep your workers safe, healthy and injury-free.

Regards, Barbara Nessinger, Editor-in-Chief

P.S. If you are interested in contributing an article, Thought Leadership or Perspectives piece, feel free to contact me at <u>bnessinger@workplacemhs.com</u>.

Industrial Hygiene Inthe Work place

A RDG Media, Inc. Publication P.O. Box 80915 Rochester, MI 48308 586-227-9344 www.IndustrialHygienePub.com

PRESIDENT/GROUP PUBLISHER Randy Green

EDITOR-IN-CHIEF Barbara Nessinger

SENIOR ACCOUNT EXECUTIVE Jacob Swindell

ACCOUNT EXECUTIVE Lydia Stewart

ACCOUNTING MANAGER Kristin Green

SYSTEMS ADMINISTRATOR Angi Hiesterman

OPERATIONS/CUSTOMER SERVICE Jody Kirchoff

PUBLICATION COORDINATOR Lacey Scanlan

WEB DESIGN Josh Scanlan

LIST RENTAL Angi Hiesterman

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Reduce Repetitive Stress Injuries

Basic ergonomic education, like proper lifting and stretching, is a commonly used tool for reducing repetitive stress injuries (RSIs). But there are other tools employers could be utilizing to increase the efficacy of their risk-reduction efforts. In this article, we will talk about these other tools that belong in your program.

Injury-prevention programs generally include identification of risk, implementing safety measures and training employees. Incidents and accidents are reported and investigated to determine if further interventions could be helpful. This works very well for acute injuries, like sprains, fractures and lacerations. A specific injury occurs, and often a specific cause can be identified, investigated and remedied. This is not the case with RSIs; that makes injury-prevention efforts more complex.

Tools to ID Repetitive Stress Injuries

Repetitive stress injuries are cumulative. They build up over time from repeated microtrauma to soft tissues. Work tasks can contribute to the trauma; so can hobbies, sports and habits.

Symptoms can develop suddenly; come and go; or move from one place to another, making it confusing for employees. They often relate symptoms to aging, arthritis or an old sports injury, and they do not report them until significant damage has occurred. No two people have the same tolerance for microtrauma, so you might have someone with a significant injury, and someone else doing the same job has no complaints at all.

Risk comes from both work and personal factors, so using a combination of tools gives us the best opportunity to prevent or minimize injuries. Risk factors can be broken into job-related risk and personal risk.

Job-related risk comes from the physical demands of performing the job. Some common examples include sustained, awkward postures when working at an assembly line; frequent lifting in a warehouse; or exposure to vibration while using a jackhammer.

Person-related risk come from the way a person performs the job, i.e., how they lift; and/or whether or not they rush, take stretch breaks or even use PPE correctly.

Assessing the Risks

Below are some tools to address each risk in each category.

Job-focused controls include:

- Job task analysis
- Job modifications
- Job-specific training

In a job task analysis, the physical demands of the job are identified and measured by their relative ergonomic risk. Ergonomic risks include awkward postures, repetitive tasks, force, temperature, speed, etc. Job tasks with higher risk scores are prioritized.

Job modification includes any activity taken to reduce the inherent risk of the job. Tool improvement, equipment adjustments, adding mechanical assists, task redistribution and job rotation are some examples.

Job-specific training includes body mechanics specifically for a particular task (as opposed to generalized recommendations); job specific recovery exercises; and proper tool use.

Generalized ergonomic principles are great, but limited. How many times have you heard "Lift with your legs and keep your back straight?" That is not always possible. To create meaningful training, look at the higher risk tasks of a job and determine the best possible way to realistically perform the job task and teach that.

Not all risk can be eliminated, but developing job-specific guidelines and recovery exercises can help employees' bodies better tolerate the work. For example, a job that requires a lot of overhead work is a high risk to the neck and shoulders. Job-specific training can teach them to break these tasks up; alternate arms; get in a recovery position after sustained work; or perform particular stretches and exercises for the neck and shoulders.

Person-focused controls include:

- General training
- Job coaching
- Early intervention
- Injury management

General training includes common safety and ergonomic recommendations. Examples include proper lifting, generalized stretching routines and encouraging use of breaks.

Job coaching is done while observing the person as they perform the regular functions of their job. The "coach" then makes suggestions to reduce risk factors. This can include a better way to perform a lift; a better work position; avoiding rushing; and proper performance of stretches. Job coaching is usually done when an individual has reported discomfort or even an injury.

Early intervention is really an entire safety initiative, but we will focus on just a few components for the scope of this article. As counter-intuitive as it might sound, encouraging employees to report discomfort as soon as possible will reduce risk. Early reporting allows an opportunity to keep an injury from developing or to minimize injuries that do occur.

Once we are aware of someone needing help, we might provide a job coaching session or schedule a meeting to review stretches, exercises, use of heat/cold, rest and other self-care techniques.

This type of intervention does require strict adherence to guidelines that ensure compliance with workers' compensation laws. You need to know exactly when to report an incident and/or injury and when to refer the employee to your work-related injury reporting process.

For example, if an employee reports back pain, you could schedule a job coaching session to give them a few tips about their lifting technique. Then, you might have a one-on-one meeting to review recovery exercises and make sure they are done properly. You could review basic ergonomic principles for driving and sleeping, and encourage them to use heat or stretch at home.

In some cases, this will be enough to resolve the discomfort, which means an injury was probably avoided. But, if symptoms do not resolve in a specified timeframe (i.e., one-three visits or within a few days), it's best to refer them for a medical assessment. The timeframe and types of interventions you provide to the employee are the criteria that need to be reviewed to ensure compliance with your workers' compensation laws (in addition to OSHA and ADA). If you are using physical/occupational therapists or athletic trainers to provide these services, there are also state practice acts with which to comply.

Managing Injuries

Injury management begins as soon as an injury occurs. The goal is to remove any barriers to healing or returning to full duty to minimize the impact of the injury. Make sure all the tools have been implemented. Has the job been assessed for risk? Have modifications been suggested? Has the person been through a job coaching session?

In some cases, medical providers will make recommendations (job restrictions) that should help the employee heal. If that hasn't happened, you might provide additional time to perform exercises or self-care, reduce productivity demands, etc. Using these tools for injury-prevention efforts can help you gain structure and control over the often challenging RSI.

[Healthworks Ergonomics provides comprehensive ergonomics programs for all industries. If you would like help with your injury-prevention program, contact: info@healthworksergo.com.]



Ergonomics & Safety

workplace safety programs.

By: Kristen Cederlind, OTR/L, Contributor

Preventing Devastating Repetitive Stress Injuries in the Workplace

Functional Job Descriptions (FJD): A functional job analy-In a world where there is an unprecedented labor shortage and more employees seem to be going than coming, it is crucial to sis is the process of evaluating and objectively measuring the keep the employees you do have. But, more than just retaining critical physical demands of a job. The analysis involves interthese employees, you need to keep them healthy, productive viewing the workers who perform the job and supervisors who and injury-free. You can accomplish that by enhancing your understand the job, and then observing and assessing aspects of the work and worksite to identify a job's essential functions and critical physical demands. Data and measurements, such It's not surprising that repetitive stress injuries (RSIs) are the as weight, force, distance and repetitions, are collected and fastest growing category of workplace injuries. Caused by repetcompiled into a document that is validated by the workers itive movement and overuse, RSIs can result in debilitating pain who perform the job.

RSIs usually develop gradually, but their impact can be long-lasting. Early signs may include muscle fatigue and soreness, episodes of numbness or tingling, or joint stiffness. Unaddressed, symptoms will progress to where pain and inflammation cause severe impairment. RSIs most commonly occur in the upper extremity joints-hands, wrists, elbows and shoulders. However, they can also affect the neck, back and lower extremity joints. These injuries can be devasting and, at worst, can negatively impact work productivity and even basic daily activities at home.

and loss of function in performing even simple tasks.

Knowing Where Workers are Vulnerable

Job tasks particularly vulnerable to RSIs include assembly line work, data entry or other computer use, warehouse/store inventory stocking, lab-type work, operating heavy machinery or power tools, and driving. Management of RSIs often includes anti-inflammatory drugs, physical therapy, ergonomic interventions and sometimes even surgery.

RSIs are part of the broader category of musculoskeletal injuries, which represent upwards of 30% of all workers' compensation claims and cost employers \$20 billion annually in direct costs, including benefits and legal costs. One reason these types of injuries are so costly is they take a long time to heal. Indirect costs are estimated to be four-five times that of direct costs, i.e., recruiting and training replacement workers; accident investigation; loss of productivity associated with absenteeism; and reduced employee morale. And that is just the impact on the employer. The long-term effects on the injured worker are distressing, with the loss of function, chronic pain, loss of wages, etc.—all of which can lead to depression and anxiety.

Let's take a closer look at programs that can help prevent these catastrophic injuries from happening in the first place:

The primary purpose of the FJD is to document and confirm the minimum physical requirements necessary to perform the job safely. Yet, in the process, it can often uncover potential ergonomic issues and risks that might eventually contribute to worker injury if not addressed. These risks can be filtered to ergonomics or safety teams for further assessment and elimination. The FJD can serve as the foundation for many workplace safety initiatives.

Ergonomics Assessments: An effective ergonomics assessment will help identify risks associated with RSIs. Risk factors, such as force/duration, repetition, awkward and/or sustained postures, or contact stress, are often contributing causes for RSIs. Whether the assessment was prompted due to a risk identified during job analysis or because of an injury that occurred, the most important part of the ergonomic assessment is the resulting action plan. Solutions may range from simple to complex. When possible, the goal is to mitigate the risk entirely, though that may not always be possible (at least initially). In any case, implementing measures, such as workstation adjustments or work process changes; job or task rotation; routine microbreaks to help counteract awkward or sustained postures or repetitive motion; or protective equipment (such as gloves or enlarged grip tools), can reduce the severity of the risk factor and improve safe task performance.

Onsite Physical Therapy Clinics: Onsite PT programs can provide immense value in identifying injury risks in the worker population and address work-related musculoskeletal symptoms-before they become injuries that impact people's economic livelihoods. Onsite physical therapists provide job coaching that reiterates best practices for safe body positioning and movement and can consult on helpful workstation modifications. Workers can visit the onsite physical therapist to address minor aches and pains that can turn into those devastating injuries, if not dealt with early. In most cases, a

combination of interventions—including OSHA first aid, employee education, ergonomic evaluation and job coaching can lead to complete resolution of the worker's discomfort. This proactive early intervention and support for the worker can change the trajectory of their future by mitigating the issue. An onsite physical therapist can also become a valued partner in ergonomics teams and safety programs by approaching ergonomics recommendations from a biomechanical and behavioral perspective.

Work Wellness and Fitness Programs:

Providing workers with targeted education and resources to promote healthy movement and activity can positively impact their physical and mental well-being. Educating workers on the importance of movement, such as taking short micro-movement breaks throughout the day to offset sustained or awkward postures or engaging them in dynamic warm-up routines to prepare their bodies for work, can serve to promote blood circulation which, in turn, can help reduce risk for injury. Total employee wellness encompasses many aspects, including physical, spiritual, social, financial, occupational, emotional, intellectual and environmental health.

In the event an injury has occurred, several measures can be taken to help the worker restore physical readiness and prevent reinjury.

Work Conditioning: When there is a performance gap between the worker's physical abilities after rehabilitation and the physical requirements of the job, a worker may benefit from work conditioning. Work conditioning is an intensive therapy program geared toward building the worker's physical strength and functional abilities in relation to their documented job requirements.

Functional Testing and Return-to-Work Programs: Following treatment for injury, workers may need additional support to safely transition back to work. These programs may include return-towork planning, fit-for-duty testing and/or Functional Capacity Evaluations (FCE). A team approach, with collaboration and open communication among the worker, supervisor and care provider(s), to modify work or set expectations for transitional work duties can be helpful. An FCE, performed by a PT or OT, is a comprehensive functional test designed to objectively evaluate the safe maximum functional abilities of a worker across a broad range of tasks. It is used to describe worker abilities and generate recommendations for return to work and is often used to assist in workers' compensation cases, transitional duty or return to work placement, and disability determination cases.

Identifying, understanding and reducing work or worksite risks is truly the best approach to prevent repetitive stress injuries in the workplace. Implementing workplace safety programs that facilitate risk identification and reduction can go a long way in keeping workers safe and injury-free.



Occupational Therapist Kristen Cederlind currently serves as the Director of Clinical Services for WorkWell Prevention and Care.

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Respiratory Protection

By: Dentec Safety, Contributor

Upgrade Respiratory Protection—Now!

COVID is not going away any time soon.

Omicron cases continue to surge in the U.S. and other countries worldwide. On January 23rd, 2022, an article in cityam. com announced:

"Various media across Scandinavia and the UK are reporting the emergence of a new Covid variant that is so infectious and spreading so fast that nearly half of all cases in Denmark are now the new mutation, named BA.2, with more than 400 confirmed infections across the UK. The new mutation has reportedly also popped up in Norway, Sweden, Singapore and India."

In terms of Omicron, health officials believe the vaccines are still working against it, but the bad news is even fully vaccinated people are still contracting COVID. The COVID-19 vaccinations significantly reduce your chances of severe illness and death (across multiple age groups), but to avoid contracting or spreading COVID you NEED to wear a proper mask.

New variants will continue to pop-up until we contain and stop transmission. That's why proper mask protection is a critical piece of the overall strategy to control the rapid spread of the



A reusable elastomeric rubber respirator is reusable, safer, more comfortable and more economical than disposables. They can be used in healthcare applications, general industry or wherever workers are in close proximity. (photo courtesy Dentec Safety)

virus; take pressure off our healthcare systems; and prevent future variants. Vaccines are a safeguard measure and the last line of defense, but they don't prevent the spread. If we don't control and stop the spread, we will keep getting new variants, and the endpoint to the pandemic will keep moving farther and farther away.

Medical and 3-ply masks aren't cutting it.

To summarize the point above: If you don't want to contract or spread COVID, wear a mask, but it's important to note that more data is proving that a higher grade of protection is needed to prevent the spread. What's even scarier is that 3-ply medical masks that are being sold to the medical industry are proving ineffective in protecting frontline workers.

SARS-CoV-2, the virus that causes COVID-19, is airborne. Airborne pathogens require high-quality respirators that provide an airtight seal to our faces that will filter out airborne particles better than medical masks and disposable N95 respirators. We need to encourage everyone to wear masks that provide an airtight seal. According to an article in *Healthy Debate*:

"Early in 2021, sociologist Zeynep Tufekci, who initially called for universal mask wearing in March 2020, wrote about the need for the public to upgrade to better quality masks.

Students and high-risk workers (e.g., health-care staff, teachers and warehouse workers) still face barriers to accessing this essential equipment, while having to spend time in settings that present some of the highest levels of exposure to the virus."

Three-ply, cloth and gator-style masks are ineffective against the spread of COVID, due to the fact they do not provide filtration; are loose fitting; and cannot provide a tight seal. Dr. Sanjay Gupta and Dr. Anthony Fauci reported that the only effective respirator to use is an N95 (or better) respirator that provides a tight seal.

COVID-19 has been unlike any pandemic the world has experienced. It has affected not only our health but our supply of critical PPE and, most importantly, respirators. Due to North America's dependency on foreign supply of disposable N95 respirators, many workers contracted the virus and died as a result. The CDC reported *not* to use respirator protection with an exhalation valve, as it allows the air to exit the mask.



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Respiratory Protection

EFFICACY OF VARIOUS MASKS AGAINST COVID-19

(1)	RECEIVER IS WEARING						
SOURCE IS WEARING		Nothing	Cloth FC	Surgical Mask	N95 FFR (10%)	N95 FFR (1%)	
	Nothing	15 MIN	20 MIN	30 MIN	2.5 HR	25 HR	
	Cloth FC	20 MIN	27 MIN	40 MIN	3.3 HR	33 HR	
	Surgical Mask	30 MIN	40 MIN	60 MIN	5 HR	50 HR	
	N95 FFR (10%)	2.5 HR	3.3 HR	5 HR	25 HR	250 HR	
	N95 FFR (1%)	25 HR	33 HR	50 HR	250 HR	2,500 HR	

A cloth face covering (cloth FC) may be appropriate for the public to wear as source control, but they should limit proximity to others and time spent in an indoor space.

It has been an important goal to design a respirator that is reusable, safer, more comfortable and more economical than disposable, such as a reusable elastomeric rubber respirator without an exhalation valve. Such respirators can be used in healthcare applications, as well as general industry—or wherever a group of workers of any type must work in close proximity.

Anyone can be a source. Anyone can be a receiver.

With a cloth face covering, the user has 75% inward and outward leakage. A cloth face covering may be appropriate for the public to wear as source control, but they should limit proximity to others and time spent in an indoor space.

With a surgical mask, the user has 50% inward and outward leakage. A surgical mask may be appropriate for patients to wear as droplet protection source control. However, it does not provide adequate protection for workers from inhalable infectious particles.

With an N95 filtering facepiece respirator (FFR), the user has 1-10% inward leakage and outward leakage. Workers need a fit-tested respirator to prevent inhalation of infectious particles. Better respirators with higher protection factors should be used for high particle concentrations. (*See chart "Efficacy of Various Masks Against COVID-19"*)

No source control: We're not prepared for another pandemic.

At the start of COVID-19, many manufacturers jumped into the PPE space. However, without formal support and ongoing domestic contracts, many of these businesses have been forced to close. This will result in the North American market having to return to relying on supply coming from offshore manufacturers. The supply chain problems are very concerning, because there are so many downstream effects that can be easily avoided. If workers are given masks with reliable protection against infection, problems along the supply chain would be minimal, and the economy could start to repair itself. This pandemic has proven that we need to be able to control our domestic manufacturing. It's not a question of if, but when the next pandemic hits, and we are not prepared to protect our healthcare workers and population.

The environmental impact of medical masks & disposable N95s is alarming!

The COVID-19 pandemic is estimated to generate 72,000 tons of medical waste everyday, most of which are disposable masks. Healthcare professionals are required to toss their disposable N95 after each patient interaction. Disposable N95 waste alone will generate 6,700lbs/1,000 people/year. How can we make public health a priority while simultaneously destroying the health of our planet?

Elastomeric respirators are a sustainable solution and are designed to be cleaned, decontaminated and reused. Because of this feature, one elastomeric can do the work of hundreds, if not thousands, of disposable N95 masks. Many hospitals and healthcare facilities have already converted to elastomeric half mask respirators programs. Allegheny Health Network, as an example, found that within one month, it was able to decrease the number of N95 masks it needed by 95%.

The time to upgrade is now.

In terms of right now, and with the rapid spread of the new Omicron variant, any public space and business could and should move to elastomeric masks. In order to slow and stop the spread, we need to make high-grade mask protection a priority for all healthcare workers, teachers, grocery store employees and workers on factory lines. Anywhere you are near others, you should be wearing an N95 respirator. We can keep businesses open and the economy going by using this strategy of making high-grade respiratory protection a priority.

The U.S. government is looking to now put elastomeric respirators into widespread use. We can promote higher grade protections for the public with PSAs, government recommendations and regulations—including banning cloth masks in the workplace and having social media giants like Facebook and Twitter letting users know. Mainstream news organizations can work together to highlight the need for everyone to upgrade to masks that offer reliable protection.

*Image used for illustrative purposes only; AccuTec-IHS does not imply nor endorse any specific type of Respirator for any given application



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About AccuTec-IHS

AccuTec-IHS was founded by a passionate, experienced team of Respirator Fit Test experts to introduce a new and better choice in particlecounting Respirator Fit Test devices. We're truly honored to help professionals making a difference in the post-SARS-2 CoV world.

Noise Control/Hearing Conservation

By: Phillip Rauscher MPH, CIH, CSP, Contributor

Noise Control in the Workplace

When one thinks of an effective hearing conservation program, there are a few things that often come to mind. The first elements are an in-depth audiogram in which a skilled technician or medical professional provides feedback on results—good or bad—to help the employee make sound decisions when in noisy environments. You may think of a robust noise-sampling program where data is routinely used to make decisions to protect employees. You might even think of a great personal attenuation check to ensure that each employee has a hearing protection device that is well-fitted; gets them the required hearing protection factor; and is well-received. However, there is a time-tested element that is often overlooked in practice in otherwise robust programs: engineering controls.

There are several reasons we need to ensure that noise control is given its due in our hearing conservation programs (HCP). I am a firm believer that, when looking at the hierarchy of control, we all carry the professional pride to heed its warning; elimination, substitution and engineering controls should always reign supreme to ensure that employees are as protected as possible. By this point, we have all been told of the variability and reliability of person protective equipment (PPE), and hearing-protection devices are no exception to the rule. Earmuffs seals will wear out; foam ear plugs may not expand properly; and employees may simply forget to put flanged plugs in when distracted by work. This makes engineering controls the responsible choice.



With continued vigilance and sound programs, we can identify noise sources that contribute to the overall noise exposure of employees. (photo courtesy Adobe Stock)

If the morality of protection is lost on a seasoned employee or a particularly shrewd accountant, there is another undeniable benefit: lower cost. Some of the simplest fixes that will reduce noise also help to prolong the life of equipment or increase its productivity. Unlubricated bearings wear quickly; old belts slip; and improperly mounted equipment vibrates, causing stress. (More on some of these later.)

If this still doesn't convince someone, remember, in the U.S., the OSHA regulation states that engineering controls need to be utilized when employees are exposed at or above the permissible exposure limit (PEL). Though there is a long-standing compliance memo that states the rule will not be enforced until 100dBA, this could change, given today's tumultuous political landscape. Although it didn't happen, a recent administration considered changing this long-standing memo and could do so with little warning.

Solving the Problem

In my time in the field, I got over the fear of engineering to help diagnose problem areas and came to realize not all problems need to be solved by a trained noise-control engineer (though if you have one lying in wait, that would be a great resource). The first step to determine the best place for noise-control effort was always to review employee sound exposure.

When looking facility-wide, personal exposure to employees, when measured, allows for the advantage to account for employee movements throughout the day. Though there may be a significant source of noise, sometimes these are naturally segregated from employees. For example, a pump room employees routinely avoid may be a significant source of noise but not a significant source of exposure.

When exposures to higher levels of noise are found in employee exposure, the next step is to do a walk-through of the employee work area. Like other qualitative assessments of the workplace, a noise- exposure assessment can start simply. Using our own hearing, we can likely determine a standout noise source simply by noticing that it is indeed very noisy surrounding that piece of equipment or, at the very least, a general area of concern in which the employee works.

If there are several sources that could be of concern, the next step is to start measuring. With a small amount of background knowledge, we can use a basic sound level meter (or a dosimeter with an instantaneous display, if that's on hand) to help determine the characteristics of a particular problem. When set to the A-weighted decibel setting, a sound level meter will likely measure the same exposures that were collected by the dosimeter worn by the exposed employee during noise assessments.

The work area can be split into even-sized zones and noise levels; this will allow for a "map" of noise levels throughout the employee work area. Problem areas for noise generation will be of higher concern. Once a general area is identified, we can isolate a component of a complex machine in several ways.



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The easiest way to determine which component of a machine is causing the concern is to turn systems on and off while other confounding noise sources are turned off. This could be after a shift or during lunch; a maintenance employee can help to turn on and off systems to help determine the source. This can isolate compressed air, gears, fans, bearings or belts causing noise.

If turning systems on and off isn't an option, another option that requires more specialized equipment is utilization of an octave band analyzer. This could be integrated with a sound level meter or could be a "filter" that is attached to help separate the entirety of noise measurement into narrower "bands." This can isolate high- and low-pitch noise.

Understanding the characteristic of the noise exposure can help to determine which component is likely the problem. If there is one octave that is particularly high, the sound level meter can be utilized to isolate this component. As we head into the future smaller equipment can do more on a smaller platform—some personal noise dosimeters now have the option to measure octave bands, while simultaneously measuring A-weighted exposures required for compliance. This has the advantage of, rather than speculating the frequency of reoccurring noise exposures from throughout the shift, we can *see* these exposures all day. Once identified, there are several control measures that can be employed to lower overall exposure to employees.

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Often, one of the great drivers of any shop is compressed air. However, this is also a common source of noise. This is a case where more definitely isn't better. I suggest examining the amount of air use for all functions in a facility. Reduced air usage comes at a reduced cost (compressor runs less often in addition to a lower noise-generation rate). If there are part



If a fan is determined to be a source of noise, a new fan with different blade can change the frequency and noise generated, while still moving enough air to keep components cooled. (photo courtesy Adobe Stock)

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ejection sites that use air, a modified nozzle or even just a lower flow rate that still does the job can help to reduce noise.

When purchasing nozzles, manufacturers can often tell you how much noise will be generated at the air flow rate you need to get the job done. Nozzles that reduce turbulence in air will also reduce the noise generated. When air flow is not needed, and instead is an exhaust from the process, exhaust silencers can be used that will greatly reduce noise generation.

Machine Guarding

Another common problem in the field is vibration of guarding: Every solution has a problem, right? Fortunately, there are several things that can help to alleviate some of the noise that is generated from guarding panels. If vibration is the major cause of noise from the panel, expanded metal can help to reduce the amount of noise generated by the panel.

If this is not possible, or if it does not reduce the noise level to the amount desired, we can reduce the amount of vibration in the panel with vibration-suppressing mounts. If a solid panel is utilized, adding mass to the panel in the form of stick-on rubber pads can help. Which side of the panel is treated will not matter in this case, as it will have equal effect no matter where applied. If the panel is part of a total enclosure of equipment, this could also double as a sound-attenuation device. Be sure gaps are closed and felt or rubber are used to minimize vibration between panels.



Once a general problem area is identified, it's possible to isolate a component of a complex machine in several ways. (photo courtesy Adobe Stock)

Gear Noise

Every time a gear strikes another, it will cause an impact noiseincreasing the number of teeth will reduce the force applied by each tooth and will reduce noise. Better yet, use a belt that has no impact noise from contact. Just keep the belts properly maintained, or else you will get slippage that will become a problem all by itself.

Fans

A minimal amount of math can be used to determine the frequency of noise generated by an axial fan. If we multiply the

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number of blades by the fan's rotations per second, we will result in the frequency in hertz. If this is the predominant source of noise in the analysis, the simplest solution is to change out the fan. A new fan with different blade can change the frequency and noise generated, while still moving enough air to keep components cooled.

Centrifugal fans used in ventilation can also cause a problem. The amount of energy required to change the direction of air flow is one of the greatest challenges ventilation system fans are required to overcome. Every inefficacy in a ventilation system will create some kind of noise, but this is especially true when a duct turns too closely to the fan. In this case, proper use of a smooth duct with no turns at the inlet and exhaust of the fan will greatly reduce fan inefficiencies and noise.

With continued vigilance and sound programs, we can identify noise sources that contribute to the overall noise exposure of employees. Small measures taken daily by those in the field can help to eliminate noise-induced hearing loss as one of today's most common occupational health conditions. These small measures do not require massive overhaul of facilities in most cases and, with a bit of thought and intention, can reduce equipment wear; reduce employee exposure; and become a vital component of a top-tier hearing conservation program.

[Phillip Rauscher, MPH, CIH, CSP, is Senior Director-Science, Education & Publications, at ACGIH[®].]



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Impulsive Noise: A Challenge to Measure

Bang! Crack! Pop! Impulsive noise is generated by firearms, hammer strikes and even balloons. Technically, gunshots and explosions (including firecrackers or balloons) produce "impulse" noise, while objects that collide (such as hammers, punch presses and drums) generate "impact" noise.

While the manner of sound generation is different for impulse and impact noise, there are commonalities in the actual waveforms. Collectively, "impulsive" sounds are short in duration yet high in peak amplitude. The total duration of impact noise is generally less than one second, while the duration of an impulse may be less than 10 microseconds. Characteristic of impulsive noise is an initial rising component of the wave, which may only last for a fraction of a millisecond, yet be of extremely high amplitude (see Figure 1).

These signal characteristics make measurement of impulsive noise challenging. To accurately capture impulsive noise, a measurement system must meet demanding technical specifications. Such specifications include an extremely fast rise time (optimally less than 10 microseconds to peak); a wide dynamic range (with a very high maximum sound pressure level [SPL]); and a frequency response maximum of at least 80kHz.

Commercial sound level meters typically have technical limitations that can result in underestimation of peak SPLs (see chart, below). For example, a measurement microphone of ½" diameter will have a lower maximum SPL and a limited frequency range as compared to a ¼" microphone that is not typically specified for most commercial sound level meters. For

Poor signal-noise ratio

Data processing issues

an impulsive waveform where an ¼" microphone yielded a peak level of 184 dB SPL, a ¼" microphone may yield a peak level of 180dB SPL, while a ½" microphone may show a severely underestimated peak level of only 168dB SPL.

Failing to meet technical specifications for measuring impulsive noise can result in underestimation of peak SPLs, yielding inaccurate conclusions related to noise exposure.



- Gregory A. Flamme, Stephenson and Stephenson Research and Consulting
- Researchers and National Hearing Conservation Association (NHCA) Experts

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Common Problems	Cause		
Clipping & saturation due to inadequate dynamic range	 Large-diaphragm, high-sensitivity microphone Inadequate power supply for microphone preamplifier 		
Slow rise time	 Inadequate slew rate on microphone preamplifier Time constants (slow, fast, impulse) are too slow 		
Inadequate (too low) frequency range	 Sampling rate below 200 kHz Low-Pass weighting and anti-aliasing filters 		
Aliasing	• Undersampling		

• Less than 24-bit quantization for analog-to-digital conversion

• File format may be compressed and/or proprietary

Potential Limitations of Commercial Sound Level Meters for Measuring Impulsive Noise



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By: Dr. Ang Keng Been, Contributor

Connectivity: Transforming the Industrial Hygiene Sampling Pump How Bluetooth technology and mobile applications provide smarter, more streamlined sampling

Industrial hygiene monitoring is transforming in the advent of this digital age, bringing to the hands of practitioners more efficient tools than ever before. Wireless technology in personal air sampling pumps is becoming one of the most popular advancements for the industrial hygiene professional in traditional workplaces. This technology offers autonomous monitoring, enhanced validity of results, and forges new partnerships between technology and the professional—for smarter, more streamlined processes.

The personal sampling pump is the foundation of compliance air sampling in the workplace for exposure to airborne dusts, gases/vapors, bioaerosols and more. While traditional regulatory methods deploying basic sampling devices will not change quickly, recent developments in pump technology are already easing compliance while retaining high accuracy.

As the industrial hygiene industry continues to embrace and adopt advancements, wireless technology, in particular, improves the user experience while ensuring workplace safety and sampling accuracy. This technology allows pump manufacturers to develop and offer mobile applications to operate pumps remotely via Bluetooth[®].

To reduce power consumption and meet unique connectivity



effective integration of lithium-ion batteries in some pump models, such as the AirChek[®] Connect touchscreen pump, the overall operating time can be extended beyond 40 hours with a *single charge*. With such advantages, the industry will likely see even more devices equipped with BLE or similar technology.

With BLE and mobile applications, users can leverage their mobile phones and tablets to connect to multiple sampling pumps simultaneously and monitor each detected pump's run time, current flow rate and total sampled volume, fault indication, inlet pressure, and atmospheric temperature and pressure in real time. In addition, users can select either a constant flow or constant pressure mode; set flow rate or pressure; start/stop/pause/resume a pump run; select temperature and atmospheric pressure display units; and even rename detected pumps to provide task or location context. These applications also offer security features to prevent unauthorized access to the pump and help eliminate tampering with settings during the sampling run.

The ability and convenience to receive information on pump condition and sample run status, as well as to control the pump remotely without interrupting the worker, provides even greater confidence and validity in sampling results.

To illustrate what this latest technology looks like, let us take a glance at the industry's first wireless touchscreen, low-flow sampling pump—Pocket Pump* TOUCH—and the SmartWave app (available in online app stores). With intuitive touch operation and BLE connectivity, the sampling pump can be connected, monitored and programmed remotely through the convenience of the app installed on mobile devices. This synergistic pairing of the hardware and software features has expanded the field of sampling applications from traditional personal workplace compliance sampling of gases/vapors, with its attendant inconveniences, to convenient mobile app control and monitoring of sampling data from the pump.

With the proliferation of pumps with BLE and mobile app technology and experience with their conveniences, the industry has seen a higher user acceptance of these new generation pumps.

Manufactures have designed the new generation of wireless sampling pumps principally to the ISO 13137:2013 standard



for performance requirements of personal sampling pumps in workplaces. Manufacturers program these pumps to compensate for environmental influences (atmospheric pressure and temperature), to assure accuracy and provide confidence in sampling results. In applications where intrinsic safety is paramount, UL/ATEX intrinsically safe-certified pumps are available. These

A convenient app on mobile devices provides for remote monitoring and operation of connected sampling pumps. (photo courtesy SKC Asia HSE Sampling Technologies Pte. Ltd.)

pump models usually feature a polymerized rubber overmolded case designed for operation under harsh conditions.

In summary, Bluetooth BLE technology and mobile applications have advanced industrial hygiene sampling by providing enhancements to the user experience, chiefly the ability to monitor multiple modern personal sampling pumps from a mobile device. This reliable data transmission facilitates a faster response by industrial hygiene professionals and increases confidence in and the validity of results. The technology enables autonomous monitoring and forges new partnerships between technology and the professional in delivering smarter user experiences and streamlined processes. **HW**

About the Author

Dr. Ang Keng Been, EUR.ING, Ph.D., MBA, MSc., BEng, is the Executive Director and member of the Board of Directors at SKC Asia HSE Sampling Technologies Pte. Ltd., the Asian office of SKC Inc. that specializes in applied research and development of scientific air sampling equipment. He has worked collaboratively with international organizations on air quality and environmental issues, and as a scientific consultant for forums and regulatory committees, such as National Environment Agency Singapore (NEA), Singapore Accreditation Council (SAC), Singapore Standards Workgroup and for media interviews, www.skcinc.com



Lone Worker Safety

By: Doug Niemtschk, CIH, CSP, Contributor

Keeping Lone Workers Safe

People working in field operations who work alone face different risks than those who work with a team. Safety professionals and industrial hygienists in any industry would not debate this fact. The question comes when someone asks, "What's the risk of me working alone, and what do I do about it?" The first thing to do is help these workers recognize what those risks are and to implement control measures that will mitigate those risks.

Effectively addressing the lone worker risk is important for any business—whether it's petroleum, chemical, utility, trucking, shipyard, agriculture or other industries. The challenge lies in how you address the risk, based on your organization's unique needs.

More people work alone than you think. Berg Insight reports there are 53 million lone workers in the U.S., Canada and Europe combined, which is about 15% of the overall workforce. The International Data Corporation (IDC) estimates that approximately 1.3 billion people worldwide are mobile workers, many of whom work alone continuously or at various times during their workday.

Lone Worker Programs

The goal of any lone worker program is to prevent workers from going undetected if they become incapacitated or trapped in the field and are unable to summon help. Meeting this goal requires that businesses develop a systematic approach that accomplishes several objectives:

- 1. Identify when workers will be in the field alone.
- 2. Establish an alert system should a lone worker become incapacitated.



People working in field operations who work alone face different risks than those who work with a team. It's essential to recognize what those risks are and to implement control measures to mitigate those risks.



3. Develop the means to summon emergency first responders capable of providing rapid response to any medical emergency.

For most of my 25 plus-year career, I have worked in chemical industries, such as refining, fertilizer production, crude storage facilities, etc. Since 2017, I have worked for a midstream petroleum company with pipeline and terminal operations primarily in the western half of the U.S. I have seen the advent of the development and implementation of a systematic approach to addressing lone worker safety. My company uses technology for solving the problem and has an excellent system that addresses the risk. Workers are at risk from potential exposure to hazardous gases, such as hydrogen sulfide and hydrocarbons. Therefore, monitoring technology is critical.

At my company, all lone workers are required to carry a monitor that tracks their location using a real-time GPS, as well as the hazardous gases to which they could be potentially exposed. If a worker becomes incapacitated, an alert is sent to a control center staffed 24/7 by people who can help summon emergency responders, if needed. The system can also notify the worker's supervisor, who can assist in the response.

Other Methods: Keep Connected

There are also other methods an employer can use for addressing the lone worker risk, even if it is simply having a cell phone and a supervisor making sure the employee is OK by checking up on them periodically. However, any system that relies on electronic communication devices (e.g., cell phones) must recognize and address the challenge of connectivity.

Many industrial worksites are in remote locations where connectivity of the electronic device(s) the worker depends on can be an issue. It's essential to know that the safety devices workers are relying upon can work anywhere.

Key to ensuring devices have the connectivity necessary in extremely remote locations is to ensure the devices have not only cellular but satellite connectivity, as well. When using satellite connectivity, the "bridge" should be portable to extend coverage in isolated areas. Consult an expert when designing or implementing these types of systems.

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Lone Worker Safety

Recognize that all systems, whether they take advantage of technology or not, require people who are diligent in managing the lone worker risk.

Simple solutions, such as requiring employees to carry a cell phone while working in a remote work site would



Do take advantage of today's technology, but recognize that there are many safety solutions for lone workers. This is key to developing a program that meets an organization's needs.

be the first step. Second, a protocol that requires workers to check in with their supervisor before they travel to a site and after they finish their task would be prudent. The supervisors, of course, would need to be trained on how to respond to a medical emergency, with the first action being calling 911 and giving the worker's exact location.

In closing, recognize that there a many resources that companies can use to help develop their own lone worker program. For example, the U.S. OSHA Standard on Working Alone addresses this issue (29 CFR 1915.84); it lists the requirements of a good lone worker program. Although the standard only applies to shipyard employers, others can benefit from using it to establish their own programs.

The final question I'll leave with readers of this article is: "How do you determine the right lone worker safety device for your work force?" The answer, in my opinion, is to consult a qualified industrial hygienist or safety professional first. They will help you develop a program or evaluate an existing one based upon your organization's unique needs.

Ideally, you should take advantage of today's technology that manages risk, but at the same time recognize that there are a multitude of safety solutions for lone workers. Choose the one you believe will be most effective in preventing poor outcomes in the case of emergencies.

As any good industrial hygienist or safety professional knows it's imperative for employers to anticipate your lone worker risks. Control the unique hazards your workers face. It could mean the difference between a rapid response to an emergency and one that is delayed—which puts the worker at an increased risk.

[Doug Niemtschk, CIH, CSP, is a Health and Safety Manager, EHS, with Holly Energy Partners.]

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Gas Detection

By: Bob Henderson, Contributor

Fixed Gas Detection: Issues and Answers

Dealing with the actual or potential presence of dangerous gases and vapors in the workplace involves a complex series of decisions. Decisions related to "what to do" should be implemented by means of an integrated protection plan based on a hierarchy of priorities. The most desirable approach—when feasible—is to implement engineering controls and practices that completely prevent the release or formation of dangerous gases and vapors. If it is impossible to completely control or eliminate the possibility, the next best solution is to implement use of equipment and techniques to monitor for the presence of gas and take appropriate action when dangerous conditions are determined to be present.

There are two basic approaches to atmospheric monitoring: portable gas detectors assigned to workers who enter the affected area or fixed detection systems. Fixed detection systems are permanently installed and function 24 hours/day. They can be used to display readings, activate alarm lights and sirens, control ventilation fans, notify internal and external emergency responders, or be used in process control applications. Another important function is demonstrating compliance with regulatory requirements. Monitoring records can be used to document conformity with OSHA or EPA limits, for example.

A fixed gas detection system that monitors 24/7 can often provide better protection than portable instruments used only when qualified workers are present to determine whether conditions are safe. This is particularly true when the area is routinely entered by workers in the course of their normal duties. Fixed systems are often the more cost-effective solution, especially when training and maintenance costs are factored in.

Sometimes the best approach involves the combined use of both fixed and portable monitors.

Deciding which approach to use is not always a trivial exercise. The following questions provide a guide for making this decision.

What kind of atmospheric hazard is potentially present?

The hazard to be measured determines the type of detector. Although some detection techniques are more commonly used than

The GMA200 MW4 is a complete one-to-four point controller system that includes display, push-button controls, programmable relays, and built-in alarm lights and high-intensity alarm. It can be used as a complete standalone system or integrated into a larger monitoring network. (photo courtesy GFG Instrumentation)

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others, fixed systems are available with virtually every commonly used gas detection technology. In fact, there are more detection options available with fixed as opposed to portable instruments, since power requirements, as well as the size of fixed systems components, are less of a concern.

The batteries used in portable instruments can only store so much power, and the low-power sensors used in portable instruments to extend operation time are often more vulnerable to sensor poisons and operation in adverse conditions. On the other hand, fixed systems are usually powered by means of a line power connection, so power requirements are generally not an issue—making it possible to use more robust detection technologies.

The type of atmospheric hazard also determines the type of warning needed. The more rapidly the hazard affects workers, the more urgent it is for the system to provide an immediate warning. For instance, a concentration of only 1,000ppm is enough to "knock down" workers with a single breath. While oil industry workers are routinely equipped with personal H2S monitors, many sites are additionally equipped with fixed detection systems that monitor the general area for this hazard. This "belt and suspenders" approach ensures that both general conditions affecting everyone in the area, as well as localized conditions affecting a single worker, are discovered as quickly as possible.

How do you determine what to measure and when?

Make sure to fully assess the causes and risks before you decide on the monitoring response. Is the source of the hazard readily identifiable? Is the hazard associated with the work being performed? Is the danger present all the time or only under

> certain circumstances? What industrial processes are occurring that might generate or affect the presence of the hazards? Are there additional risks under emergency circumstances? Fixed detection systems should always be considered as an option when hazards are known to be chronically present in areas where workers routinely enter without special precautions.

What is the physical nature of the area affected?

Is the entire facility affected or only specific areas? Are the areas of concern out-of-doors and subject to good ventilation? Are the areas of concern indoors or in localized areas that prevent rapid dispersal of contaminants? Is the area congested by equipment or structures that prevent or interfere with worker evacuation? Monitoring programs need to provide workers adequate time to "self-rescue"



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– Greg Hodgson, B.A.Sc, CRSP, CIH, Alberta Local Section

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The IR-29 is an intrinsically safe, fixed-system gas transmitter used to measure LEL gas. The intrinsically safe design does not depend on an explosion-proof housing, which reduces noise and improves performance. (photo courtesy GfG Instrumentation)

during an emergency. The harder it is for workers to leave the area, the more desirable it is for a 24-hour-a-day "sentry" system to provide the earliest possible alarm.

Should the affected area be maintained safe for continuous worker occupancy?

Entry into hazardous locations is controlled by means of permits, training, need to enter and physically limiting access. Anyone entering "controlled" areas must use special procedures, as well as the required equipment, including portable gas detectors. When workers routinely enter the area without special procedures or precautions, if the hazards cannot be permanently eliminated, the better approach is often to make the area safe for continuous occupancy. Addition of a fixed detection system coupled with other engineering controls, such as permanently installed ventilation, may allow the reclassification of the area as a non-hazardous location.

The cryogenic storage systems in the basements of many hospitals are good examples. Tissue samples and other biological materials are stored in liquid nitrogen in large thermos-like Dewar vessels. When the lid is opened, or in the event of a leak, the release of nitrogen vapor can rapidly create a deadly oxygen deficiency. Typically, fixed O2 monitoring systems that include a display visible from outside the cryo-bank area are used to alert hospital staff before they enter. There are many industrial areas, such as the pits under automotive assembly lines and occupied areas of sewage lift stations, where the same ventilation and monitoring strategy is used to verify the area is safe at all times.

What is the level of control over worker activities in the affected area?

The lower the level of control over worker activities, the more desirable a continuously operational fixed detection system becomes.

What is the level of training of potentially affected workers?

One of the advantages of fixed detection systems is that workers entering the monitored area usually are not involved in the day-to-day operation of the system. All workers entering the area need to do is follow company procedures in the event an alarm sounds.

What are the trade-offs in cost?

Equipping workers individually with gas detectors can be expensive. A permanently installed system can often reduce gas detection costs. The image that usually comes to mind of a fixed gas detection system includes dozens of gas detector transmitters in explosion-proof housings that are connected by cabling installed in expensive, stainless-steel conduit and connected to a controller or expensive programmable logic controller (PLC) in a central location. That is only one alternative. Many fixed systems are simple one- or two-sensor standalone systems that include built-in, high-intensity alarm lights and horn. Even the sensors can be built into the standalone housing. Installation of smaller, self-contained systems can be as simple as terminating them to line power. Of course, they can still be connected to a controller or PLC or to the Internet if the realtime monitoring information needs to be communicated to additional remote locations.

What about fixed systems installed in hazardous locations?

The equipment used to monitor for the presence of flammable gas must be designed for use in the intended hazardous location and must carry an appropriate certification from a qualified testing laboratory or agency. In North America, qualified testing laboratories are referred to as Nationally Recognized Testing Laboratories (NRTLs). OSHA maintains and publishes the list of currently recognized laboratories at the following website location: https://www. osha.gov/nationally-recognized-testing-laboratory-program/ current-list-of-nrtls.

Equipment that is used in areas that potentially contain flammable gas must be designed so that hot surface temperatures, electrical discharge and other forms of stored energy associated with the equipment are not capable of causing ignition of the flammable gas, given the type and severity of the hazardous conditions in which the equipment is installed or operated. The product documentation, as well as the certification label, include the protection method, ambient operating temperature range and types of gas to which the certification applies.

What are the protection methods for fixed system components?

There are three commonly used protection methods used to prevent the ignition of flammable gas by equipment designed for use in hazardous locations: (1) contain the explosion by means of "flame-proof" or "explosion-proof" conduit and enclosures; (2) physically separate or isolate electrical parts and hot surfaces from the ignitable gas by means of techniques such as encapsulation, pressurization and use of electrical (Zener diode) barriers; and (3) limit the energy.



Intrinsically safe equipment is designed to limit the energy (thermal and electrical) capable of being released by the equipment. Certification for intrinsic safety is based on the maximum energy that is capable of being released both during normal operation, as well in fault conditions. Equipment that is certified as intrinsically safe is not capable of releasing the minimum ignition energy necessary to ignite the type and temperature class of gases, over the ambient operating temperature range to which the certification applies.

What are some of the other fixed system benefits?

Fixed detection systems monitor the atmosphere continuously. An advantage of installing a fixed detection system is that workers entering the monitored area are not usually involved in the day-to-day operation of the system. Procedural issues are much more complex when workers are required to use personally assigned portable gas detectors. Addition of a fixed detection system coupled with other engineering controls, such as permanently installed ventilation, may render otherwise hazardous areas safe for continuous occupancy and eliminate the need for procedural controls, such as entry permits.

Don't be afraid of considering fixed system solutions!

Larger systems can be complicated, but your manufacturer partners are there to help you through the specification process. The most common solutions are often based on small systems with 1 to 4 points of detection. And don't go it alone. The manufacturer, distributor and consultants are all there to help.

[*Editor's Note:* This article continues on IHW's website. Go to https://industrialhygienepub.com/fixed-gd to read the article in its entirety and learn more about the benefits of fixed gas detection systems.]



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Environmental Compliance

By: Justin Scace, Contributor

How Has COVID-19 Affected Environmental Compliance?

The global COVID-19 pandemic has thrown a spotlight on the modern environmental, health and safety (EHS) function—and its professionals—more than ever before. COVID-19's impact on employee health and safety is often discussed, but what about the impacts on environmental compliance?

As we near the two-year anniversary of the declaration of COVID-19 as a worldwide pandemic, we have learned a great deal about how this milestone event has affected the environment and how these events have changed the course of organizational EHS. Here, we take a look at how the pandemic has affected key challenges, including waste, management systems and the environmental profession as a whole.

Negative (and Positive) Environmental Impacts

Multiple reviews of the available scientific literature have identified both positive and negative impacts to the environment in the wake of COVID-19. A variety of factors contributed to these effects, including the slowing of economic activity; fewer motor vehicles on the road; and increased usage of personal protective equipment (PPE) and other medically necessary practices as the virus spread.

Positive environmental impacts included:

• A decrease in fuel consumption as well as reductions in greenhouse gas (GHG) and other emissions. To cite just one example, nitrogen dioxide (NO2) emissions in the U.S., 80% of which come from motor vehicle exhaust according to the Environmental Protection Agency (EPA), dropped 25.5% in the early months of the pandemic compared with historical data.

- **Reduced noise pollution and ecological restoration.** The decreased mobility caused by the pandemic reduced noise from traffic and resulted in evidence of ecological restoration, especially in tourist destinations that had been heavily trafficked, pre-COVID.
- **Improved water quality.** Reduced industrial activity resulted in improved water quality, especially in countries with minimal or no wastewater treatment protocols.

Negative environmental impacts included:

- A vast increase in medical waste. The COVID-19 crisis resulted in a large increase in medical waste, which in turn may present environmental compliance challenges (discussed further below).
- Soil and water pollution from plastic waste, especially discarded PPE. Beyond medical waste, increased consumption of PPE led to haphazard disposal after use, resulting in pollution issues.
- **Disruption of recycling activities.** As medical and municipal waste increased amid the pandemic, waste management organizations were disrupted the same as all other businesses. One study cites a nearly 46% restriction of recycling programs in the U.S. due to fears of the virus spreading in recycling facilities.

Compliance and Management System Challenges

In the early months of the pandemic, the EPA issued a tem-

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An MIT analysis estimates the pandemic could generate up to 7,200 tons of medical waste per day.

provided some leniency for organizations struggling with logistical disruptions in compliance, such as travel restrictions and facility shutdowns. Yet, while this policy expired over a year ago, COVID-19 remains with us. This presents many challenges for environmental professionals.

porary enforcement policy that

The telework revolution brought on by the pandemic is not ubiquitous in the EHS space, as its feasibility

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depends on the specifics of an operation and its compliance obligations. While many environmental monitoring systems, as well as certain recordkeeping and reporting duties, may be managed remotely, other potential requirements, such as environmental inspections (e.g., of central accumulation areas for hazardous waste) or function-specific training for hazmat employees, must be done completely or partially in person.

Voluntary environmental management systems (EMSs), such as ISO 14001, also saw the need to adapt in the face of COVID-19. Auditing plays a strong role in these systems, and

the International Organization for Standardization (specifically, the ISO 9001 Auditing Practices Group) issued guidance for remote audits early on, in April of 2020. These practices rely heavily on information and communication technologies (ICT) and, while larger organizations may have these resources at the ready, small- to mid-sized businesses may face challenges investing in and implementing appropriate ICT tools. Further, many sustainability programs related to EMSs require partnerships with and audits of third parties and vast supply chains—many of which faced partial or full shutdowns during the pandemic.

Environmental compliance is also challenged by all the other day-to-day business disruptions presented by COVID-19. Staffing shortages due to exposure or sickness pose threats on multiple fronts; employees who are overworked, rushed or distracted may cut corners with hazardous materials or other compliance procedures. If the organization has a small EHS staff, it can get very messy, should COVID find its way into the team.

Without ownership of the function for a period of time, environmental compliance is likely to suffer.

Beyond individual organizations, these same challenges extend to every other layer of compliance, including permit writers, waste transporters, agency inspectors and source testers.

Plan for Continued Disruption

While vaccination efforts and new treatments have provided some positive headway against the pandemic, it's likely that COVID-19 will be here to stay, as new variants emerge and the virus eventually becomes endemic. It's important that environmental compliance professionals plan to experience continued disruption amid regular enforcement activity.

The following best practices are essential:

• Ensure that every environmental compliance task has an owner and that there is at least one backup for each owner. This may be particularly challenging for small teams or environmental "departments of one." Look to your operations and health and safety teams (if separate from environmental) for those willing to learn about compliance tasks and crosstrain in the event of a problem. In fact, this should remain a best practice, even post-pandemic.

- Keep lines of communication open across your supply chain. Third-party vendors and providers are equally vulnerable to COVID-19, so ensure that you remain in contact with key stakeholders to keep operations, such as waste management and water-quality sampling, as seamless as possible—and know who to talk to and what to do should something go wrong.
- Assess processes and upcoming obligations to mitigate



The use of PPE, especially masks, creates waste across businesses and in individual households. Environmental professionals must consider what this means for sustainability efforts and solid waste programs. (photo courtesy Adobe Stock)

the impact of disruption from COVID-19. Review all permits with an eye for when renewals are due; check to ensure that waste is shipped offsite on time according to regulations and your generator category; and know what else may be upcoming on your compliance calendar. Also, review to see if anything has changed at your organization due to COVID-19 that may cause you to re-evaluate your compliance tasks, especially when it comes to waste.

Waste, Waste and More Waste

Perhaps no aspect of environmental compliance has been more complicated by COVID-19 than waste. Medical facilities have seen an increase in waste output, and other organizations may have created entirely new waste streams during the pandemic. Here are just a few of the ways COVID-19 has affected waste considerations.

• Medical waste. According to an MIT analysis published in the *British Medical Journal Open*, the pandemic could

generate up to 7,200 tons of medical waste per day. While a large portion of this is made up of disposable masks, waste from testing and vaccination also plays a part. The issue may extend beyond hospitals and other medical facilities, as some organizations have set up onsite testing and vaccination clinics. While these are often conducted by third-party providers, environmental professionals should communicate with these partners so it is clear who takes ownership of the resulting waste management, including considerations surrounding sharps bins, bloodborne pathogen control, as well as any additional state regulations governing the handling of medical waste.

- Disinfectants. Hygiene takes center stage during a pandemic, and disinfectant use has skyrocketed. EPA's List N: Disinfectants for Use Against SARS-CoV-2 provided a reliable resource for selecting products, but when introducing new chemicals into the workplace, environmental compliance pros must consider potential impacts to wastewater, as well as disposal of unused chemicals.
- **PPE.** The use of PPE, especially masks, creates waste across businesses and in individual households. Efforts to reduce plastic waste in particular have been affected by COVID-19; while there may be fewer plastic bags and utensils, they have been replaced in the waste stream by single-use polypropylene masks. Environmental professionals must consider what this means for their sustainability efforts as well as their solid waste programs.

Looking to the Future

As of this writing, the omicron variant poses another potential obstacle as case numbers increase ahead of 2022, with the possibility of further variants still an ongoing risk. Despite the enduring challenge of COVID-19, environmental compliance obligations must remain a priority for organizations large and small. With proper due diligence and planning for the worst, environmental professionals can have confidence that their efforts will result in the best possible outcome for their programs.

About the Author:

Justin Scace is an Environmental Editor on the EHS content team at J. J. Keller & Associates, Inc., where he researches, writes and edits content on a wide variety of topics concerning environmental compliance and best practices, from regulatory developments to waste



management to sustainability. He is an editor and contributor for J. J. Keller's Environmental Regulatory Alert newsletter.



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Thought Leadership: Facility Maintenance

By: Michael Zalle, Contributor

The Importance of Hygiene in the Future of the Workplace



Did you know that private industry employers reported a decrease of 5.7% in non-fatal workplace injuries and illnesses between 2019 and 2020? This seems to be promising for the future of safety in the workplace but, in actuality, this statistic coincides with a startling fact. According to the Bureau of Labor Statistics, although injuries went down, reported illness cases more than quadrupled—from 127,000 cases in 2019 up to 544,600 cases in 2020. It is evident that, now more than ever, not only occupational safety, but also occupational health in the workplace, needs to be taken seriously in order to ensure these rates do not get worse in the coming years.

Course Correction

So how can we correct this? There needs to be a change in the ideology that health and safety checks are tedious for companies to complete, so there is more willingness for businesses to have their risks decreased. In the long run, it will save them and their employees time and money to check if their occupational health (also called industrial hygiene) protocols are up to required standards—before getting an OSHA violation and putting employees in danger.

One of the main difficulties for companies is getting the checks they need to be sure their hygiene standards are up to date. The process of connecting businesses with health and safety professionals can often take weeks, resulting in it being drawn out and opening them up to being more susceptible to health issues. Additionally, figuring out what jobs suit your expertise and certifications can be tough. This is not the fault of either side, but an outdated system of helping EHS professionals get connected with the companies they can help.

I saw this need back when starting up YellowBird. I saw how important EHS professionals' work is and wanted to offer opportunities with a nationwide gig economy marketplace to match vetted risk and EHS professionals with businesses on-demand. The AI-powered digital platform helps companies eliminate wasted time searching for qualified professionals who keep people safe by conducting inspections; developing and implementing training policies; handling OSHA reports; and other necessary tasks. We are able to match professionals and companies within minutes and know the job suits the expertise of the professional taking the job.

Partnership with AIHA

We recently began a partnership with the American Industrial Hygiene Association (AIHA) in order to help even more professionals connect with industries in need. We share a common goal of wanting to keep high-risk industries and their employees safe with the help of qualified health and safety professionals. AIHA aims to empower and advance those who apply scientific knowledge to protect all workers and their communities from occupational and environmental hazards.

Adding AIHA members who have earned their Certified Industrial Hygienist[®] (CIH[®]) designation to our growing list of vetted professionals allows us to serve even more companies that are in need.

We were able to see this in action during the pandemic. YellowBird's EHS professionals helped small businesses, schools and religious organizations develop safety protocols and training with a COVID-19 return-to-work program. We were able to provide experts within 24 hours to conduct on-site inspections, assess surfaces, test air quality and compile recommendations. They were even able to help train the staff, giving employees the confidence to return to work. Additionally, with how hard the pandemic hit many businesses, it was great to be able to offer gig opportunities to help EHS professionals supplement their income when people were having to take so much time away from their jobs.

This is a step in the right direction for the health and hygiene of America's workers to help improve the statistics for the upcoming year. The health, safety and hygiene industry has become invaluable to the function of America's workforce, as we move through the pandemic and the beginning of 2022.

About the Author

Michael Zalle is Founder and CEO of YellowBird, a gig-economy marketplace that quickly and easily connects risk and safety professionals with businesses on-demand. By providing a fast, efficient method for insurance companies, business leaders and skilled professionals to consult, YellowBird matches the right people, in the right location, with the right experience for the job.

Lawrence D. Sloan, FASAE, CAE, is CEO of AIHA.

Let us focus on your thoughts! Industrial Hygiene in the Workplace's "Thought Leadership" column is a great way to get the word out about a new process, technology or approach that serves the industrial hygiene space. For more information or to talk about participating in an upcoming issue, contact Barbara Nessinger, Editor-in-Chief, bnessinger@workplacemhs.com.



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