CEO Health +Safety Leadership Network

Making the Connection

The Link Between How Our Brain Functions and Health & Safety in the Workplace

An Executive White Paper by: CEO Health + Safety Leadership Network
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In Collaboration with Heather West, Fresh Communications and
Susan L. Koeh, Ph.D., DEKRA Insight | May 2017

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Workplace Safety & Prevention Services®

"Our brains are either our greatest assets or our greatest liabilities."

— Robert Kiyosaki, Author, "*Rich Dad, Poor Dad*"

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"In fact, without realizing it, organizations often create structural systems that reduce reliability."

— Mike Mangan
DEKRA Insight

Introduction

Systems, processes, culture and leadership are all significant contributing factors to incidents in the workplace. Human error is also a significant contributing factor. In fact, too often, we are quick to chalk an incident up to what DEKRA Insight calls The Traditional Three: ineptitude, indifference or ignorance. However, recent advancements in neuroscience have given us a greater understanding of some of the root causes of human error.

There is a growing body of evidence to show that how the human brain functions can have a significant impact on decision-making, judgement, errors and mistakes, and can, in fact, play a role in workplace incidents.

In October 2016, leaders gathered at a CEO Health + Safety Leadership Network Roundtable event to discuss the impact of Brain-Centered Hazards* on health and safety in their workplaces.

The session hosted by Workplace Safety & Prevention Services and sponsored by Bruce Power, featured guest speaker Mike Mangan, Ph.D., Vice President of Research and Development at DEKRA Insight.[1]

DEKRA Insight works with clients to help them design operating environments, procedures and work practices that are better aligned with the way our brains work.

"Employers often feel there is nothing they can do about the 'human factor'," says Mangan. "In fact, without realizing it, organizations often create structural systems that reduce reliability. Telling people to pay more attention isn't the answer, and simply retraining doesn't address the root causes of human performance errors."

This was a new topic for many leaders in the room. After the formal presentation, they had the opportunity to reflect on the role that Brain-Centered Hazards might have played in recent events or incidents in their workplaces, and whether their work environments, culture and technology are designed to support the Brain-Centric Reliability™ approach.

In this white paper, we share highlights of the presentation, examples of Brain-Centered Hazards, insights to help employers and employees begin improving reliability in their workplaces, as well as a high-level summary of the roundtable discussions.

* The term Brain-Centered Hazards was first coined by Susan L. Koen, Ph.D., an organizational psychologist and Practice Leader/Executive Consultant with DEKRA Insight, to define this crucial body of workplace safety factors.

Presentation Highlights

Fast Brain, Slow Brain

The discussion of Brain-Centered Hazards is rooted in the understanding that our brain is divided into three parts: the autonomic, which controls our most basic and involuntary functions like breathing and heart rate; the *"Fast Brain,"* housed primarily in the limbic system; and the cerebral cortex or "Slow Brain."

As Dr. Mangan explained:

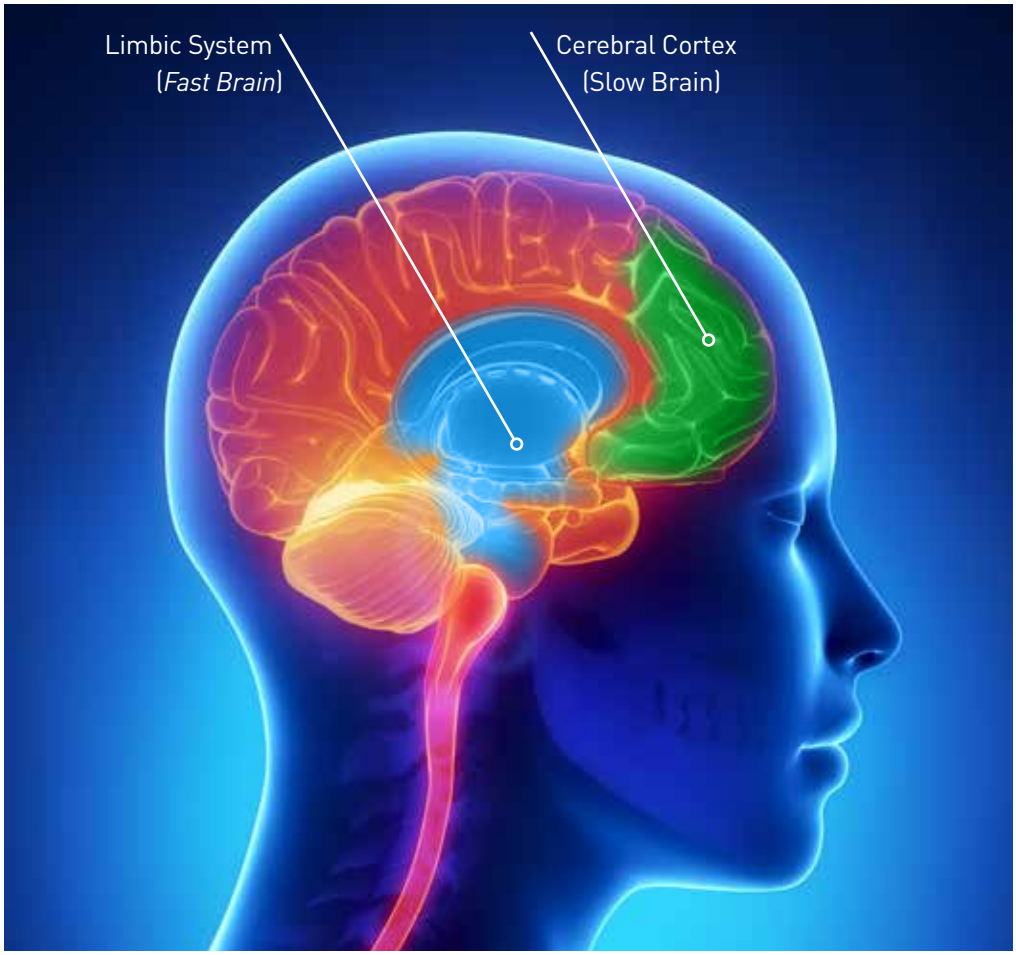
- The *Fast Brain* operates quickly, with little or no effort and without cognition; it reacts, but it cannot think.
- The cerebral thinking part of our brain is slower to engage [hence the term, Slow Brain], and sometimes—like when we're doing routine or repetitive work—it doesn't engage at all. The Slow Brain reserves its energy for effortful mental activities that demand it, like problem solving.


Mike Mangan
Vice President
Research and Development
DEKRA Insight

"When we're operating in *Fast Brain* mode, our actions are preconscious and associative—we are using our past experiences, not present reality, to drive a response. It is a mental reflex which leads to many errors," says Mangan.

In the white paper *Brain-Centered Hazards: Risks and Remedies*, DEKRA Insight explains that the troubleshooting, analytical and problem/hazard identifying powers of the Slow Brain are critical to staying safe at work. Unfortunately, research shows that our *Fast Brain* is in charge at least 45% of the time,[2] which creates significant challenges in our modern workplaces.

When you consider this in the context of activities at work, it's easy to see where issues can arise. The brain is simply drawing on familiar circumstances, habits and experiences to conserve energy, but this creates biases and "blindness", which can affect performance and put people at risk. And, it is extremely difficult to move tasks from the *Fast Brain* to the Slow Brain.



"Knowing this one simple fact about the brain gives us powerful insights about how to prevent many of the human errors currently occurring in our workplaces. This single insight has implications for how we design our visual environments, and how we generate accurate situational awareness among our workforce.

It means that we cannot take a passive approach to essential observational tasks, assuming people will, of course, see what they should see. Instead, to prevent serious injuries and catastrophic accidents, we need to train people to be 'active noticers' of all the weak signals in their visual environments."

— Susan L. Koen, Ph.D.

Examples of Brain–Centered Hazards

Expectations Bias

Our brains have an expected model of reality that doesn't always line up with what we are actually seeing.

Our models of reality are based on culture and experience. The brain looks for what it expects to see. If new information is presented, it doesn't necessarily register, which can block us from seeing all of the elements in the situational field in which we work.

In his book, *The Brain: The Story of You*, David Eagleman sums it up this way: "Instead of using your senses to constantly rebuild your reality from scratch every moment, you're comparing sensory information with a model that the brain has already constructed: updating it, refining it, correcting it."[3]

Sometimes this predictive mechanism is right and other times it isn't. When we're in *Fast Brain* mode, we tend to only look for the 'gist' and if it's close enough, the brain does not detect a difference between its predictive model and current reality. Furthermore, when we do something over and over, the brain pushes that task into *Fast Brain* mode, causing us to act with a limited perception of reality.

Mangan pointed out that we often expect experienced employees to be safest because they know their jobs inside and out. However, repetition and familiarity can cause them to operate more often in *Fast Brain* mode, making them susceptible to Expectations Bias and associated errors.

Situational Blindness

This workplace risk factor stems from hazards generated by the human vision system. We feel like we are aware of everything going on around us while we're doing a task, but this isn't always the case. There are times when situational blindness works to our advantage. Those who have studied or worked in a coffee shop know that the ability to tune out their surroundings can be beneficial. However, it can be dangerous in many workplaces if employees are not aware of changes happening in their work environment.

There is a video that can be found online that demonstrates one type of situational blindness—Inattention Blindness—beautifully. It features a group of people passing basketballs; some are wearing white t-shirts and the others are in black. When asked to count the number of times the players in white shirts passed the ball, nearly 40% of viewers completely miss that a black-shirted player leaves the scene and a person in a gorilla suit enters the scene slowly, stops in the middle of the players, beats their chest, and then walks out slowly as the black-shirted player returns.[4]

It seems hard to imagine that so many viewers would miss such a dramatic change in the situation, but because the brain is so intently focused on the people in the white shirts and trying to count passes, it becomes blind to the unexpected element – a gorilla.

Our brains do not naturally look in broad and deep ways, so we are vulnerable to missing things in our vision field. And, when people are working with such narrow focus, this blindness puts them at risk.

When people are working with such narrow focus, this blindness puts them at risk.

Urgency Upsets

It's not a revelation that time pressures are a major stressor for employees. However, what isn't as well known is that when workers feel this pressure, it limits their ability to work in Slow Brain mode.

It affects the anterior cingulate cortex, a part of the brain that regulates executive functions like decision-making and staying focused on a task.[5] Urgency upsets block these cognitive functions, and shift the brain into fast, reactive, thoughtless and emotion-based action.

If employees consistently receive messages that create a sense of urgency and reinforce the expectation that they need to produce more, faster, it will trigger this response and impair their ability to operate in an analytical or contemplative manner. This can be particularly risky when the exposure environment changes and employees need to re-evaluate the situation and their plan of action. In addition, urgency pressures make it difficult for employees to attend to and investigate the weak signals that can occur in any operation, providing harbingers of upsets in the making.

For some professionals, such as first-responders or military personnel, there is no way to avoid a sense of urgency; it is inherent in the jobs they perform. To mitigate this hazard, they practice drills over and over so that those tasks are tucked away in the *Fast Brain* and can be performed by rote. They are still susceptible to errors that come from being in a *Fast Brain* or rote mode; however, they are more likely to take action and less likely to "freeze" during these emergencies.

Once ingrained in the *Fast Brain*, it is extremely difficult to move tasks to conscious cognition.

Our brains are not equipped to do things simultaneously and equally well.

Divided Attention

Many people wear their ability to multitask as a badge of honour. In fact, multitasking is a myth. Our brains are not equipped to do things simultaneously and equally well. We are capable of dividing our attention, but there is information lost in that division.

In her presentation "Reducing Brain-Centered Hazards in the Workplace," Dr. Susan Koen cites a study in which US Navy flight operators only detected 34% of changes that occurred on their multiple screens. When they were given three tasks to complete simultaneously, their missed detection rate increased to 75%. They missed critical information as their eyes moved from screen to screen.[6]

In modern workplaces, employees must divide their attention among a number of activities and screens. Sometimes this ability is sought out by employers. Think about all of the job ads that require someone who operates well in a "fast-paced environment." However, as a 2004 Stanford study confirmed, "Divided attention comes at a price. People who are regularly bombarded with several streams of electronic information do not pay attention, control their memory or switch from one job to another as well as those who prefer to complete one task at a time."[7]

Cognitive Fatigue

As Dr. Mangan explained to the attendees, if we do not get the requisite amount of Delta-wave sleep each night, our brain will attempt to recapture that required recharging time by slipping into a microsleep.

During a microsleep, the brain shuts down for a few seconds when it feels it is in a safe environment. You are actually in a deep sleep, but you appear to be awake and functioning normally. While the brain may perceive the situation to be safe, it may be far from safe. For example, driving a familiar route would seem routine and safe to the brain, but a microsleep while driving is obviously never safe.

In the roundtable session, Mangan shared video footage of a truck driver in the midst of a microsleep hitting a line of stopped cars without ever trying to brake. It shows the driver looking ahead and seemingly functioning as anyone normally would, checking his mirrors as he prepares to exit the highway. It appears that he is taking in everything around him, but then his eyes get fixated on the road ahead and he suddenly rear ends the vehicle in front of him. Thankfully, no one was killed, but it is a startling example of the dangers of microsleeps.

Mangan noted that cognitive fatigue is considered the leading Brain-Centered Hazard in our workplaces today. In fact, there are, on average, 6-8 episodes of microsleeps among shift workers on night shifts and 3-4 on day shifts among all groups of workers who experience significant sleep interruptions or short sleep lengths.[8]

Getting Started:
Creating a Culture of High Performance Reliability

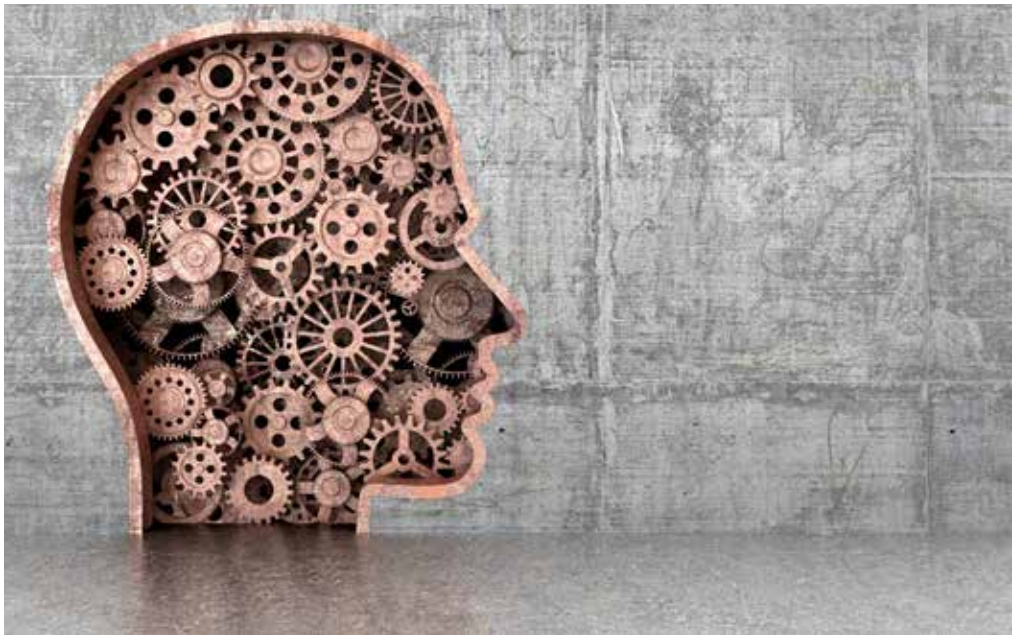
"The time has come to re-examine our systems, processes and procedures, isolate the hazards associated with *Fast-Brain* responses, and put in place solutions that encourage thoughtful action, eliminate reflexive risk and enable employees to reliably respond the right way in every situation."[9]

DEKRA Insight

Leaders can begin by educating managers and employees about Brain-Centered Hazards and biases so that they, too, are more conscious of these internal hazards and the associated risks they pose. Together, with subject matter experts, organizational leaders can review current management systems and work practices, and learn how to better align them with the way our brains work.

In its Brain-Centric Reliability™ Practice, DEKRA Insight helps clients examine their organizations through a new, brain-centric lens in order to identify and mitigate areas of risk caused by the human brain at work. These areas include:

- The organization's culture, values and appetite for operational risk
- Human factors in incident investigations
- Standard operating procedures (SOPs)
- The type of work that is done and associated Brain-Centered Hazards
- Building cross-checks into the ways people communicate and interact with one another at all levels of the organization



It is also critical to create a culture that encourages reporting, checking in and communicating regularly, and to implement the appropriate performance tools to support these behaviours. Leaders can look to high reliability organizations (HRO) to get a better understanding of how these practices can be put into play. Professors Karl E. Weick and Kathleen M. Sutcliffe describe HROs as "organizations that consistently deliver high performance in unpredictable situations where the potential for error and disaster is overwhelming. Examples include aircraft carriers, nuclear power plants, and fire crews."[10]

Communication is another of the key factors in mitigating these hazards. Leaders should ask themselves whether their messages emphasize execution or urgency. Consider the difference between these two phrases: Do it right every time and you always have the time to do it right. The first creates a sense of urgency and pressure, while the second reinforces the expectation that you want employees to take their time and pay attention in order to be successful.

Overview of Roundtable Discussion

While the conversation may have been new for many in the room, the table discussions revealed that the topic resonated with participants. Together they:

- Reflected on recent events in their workplaces and how Brain-Centered Hazards may have contributed to those incidents
- Shared improvements they'd made in their workplaces that support Brain-Centric Reliability™
- Considered how their current culture, technology, policies and processes may be compromising a Brain-Centric Reliability™ approach
- Talked about the alignment of risk perception, risk appetite and risk tolerance in their organizations

Participants readily identified incidents they suspected might have been caused by these hazards. Urgency, fatigue, and expectations bias were mentioned most often. And, many participants talked about the risk of familiar, routine tasks being performed in *Fast Brain* mode, particularly among experienced employees.

When asked about changes and improvements made in their workplaces that would support a Brain-Centric Reliability™ approach, participants identified changes in operating environment, work design, leadership and culture. In discussions about leadership and culture, there was widespread mention of the importance of encouraging and building mindfulness into operations. Other examples included:

Operating environment

- Lighting
- Air quality

Work design

- Pre-start checks (some use third-party providers)
- Job shadowing
- Job and/or shift rotation
- Cross-training
- Certificate of Recognition (COR™) questions and processes to evaluate work design
- Adequate breaks to address fatigue

Leadership and culture

- Encouraging mindfulness
- Moderating expectations and outputs
- Walking the talk
- Providing support to address stress (one participant has a psychologist on site)
- Offering incentives based on safety

With respect to opportunities for greater alignment, some expressed the need to address a sense of urgency that exists due to operating in a competitive environment. Others felt that their work design might be promoting or exposing them to cognitive fatigue hazards, and some mentioned that they thought leadership could do a better job of walking the talk.

In discussions about alignment and misalignment related to risk perception, appetite and tolerance, most tables felt there was misalignment between leaders, managers and front line workers. Age and work styles were discussed as significant factors. A few also mentioned that the pressure managers feel to perform well and produce, may, at times, conflict with organizational risk appetite and tolerance.

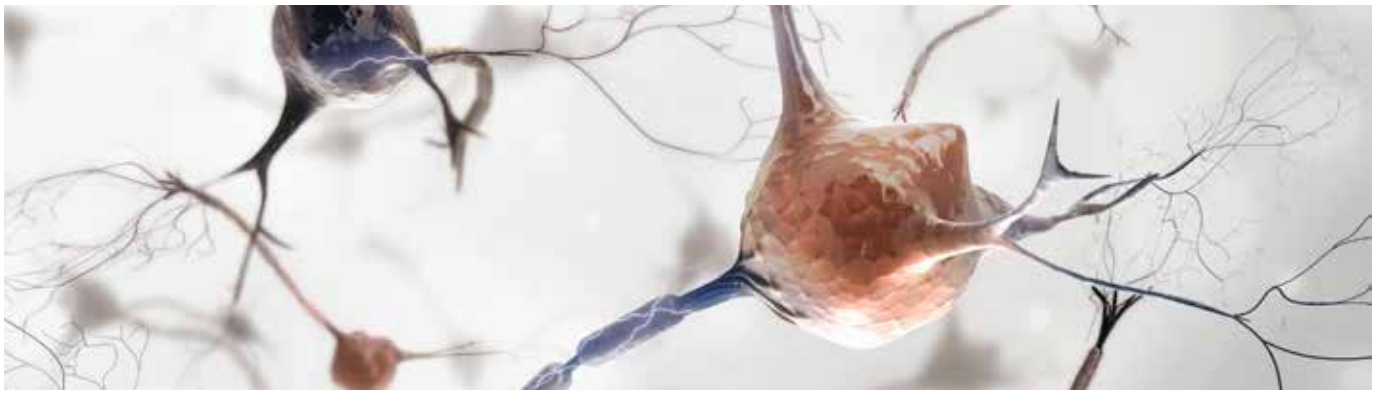
Participant Spotlight

Lincoln Electric Company of Canada

Adel Mir is President of Lincoln Electric Company of Canada. Lincoln Electric has been a world leader in the design, development and manufacture of arc welding products, robotic arc welding systems, plasma and oxyfuel cutting equipment and has a leading global position in the brazing and soldering alloys market. Known as the Welding Experts®, Lincoln Electric's solutions are used across diverse industry sectors in over 160 countries. Headquartered in Cleveland, Ohio, Lincoln Electric operates 48 manufacturing locations in 19 countries. In Canada, Lincoln Electric employs between 360–400 employees including temporary and contract workers.

Q: Why was it important for Lincoln Electric to participate in this session?

I am very interested in the concept of Brain-Centric Reliability™. This opened my eyes to the dangers of repetitive jobs. Our employees work days or nights and many are doing repetitive jobs. Our workplace operates 24/7 so long shifts and cognitive fatigue are also issues for us. Brain-Centered Hazards are definitely something we need to be aware of.



Q: What steps have you taken that would help improve Brain-Centric Reliability™ in your organization?

We conduct ergonomic assessments to help our employees work smart. We've improved the amount of lighting with LED lights to change the environment and provide a better view of machinery and surroundings. Pre-start health and safety reviews are completed by a third party before equipment is used by any operator, and we conduct regular quality and health and safety inspections.

"We encourage innovation; our employees have the opportunity to influence their workspace within defined parameters."

— Adel Mir, President
Lincoln Electric Company of Canada

Some of our people have been with the organization as long as 30 or 40 years. More experience doesn't necessarily mean people are safer. We have introduced processes to prevent the dangers of repetitive jobs. We personalize training to the employee and we retrain so this helps us introduce new skills and processes to all employees, including those who are more senior. We rotate people into different jobs to fill in where needed and provide cross training which helps to exercise the mind.

We encourage innovation; our employees have the opportunity to influence their workspace within defined parameters, so they are not always doing things the same way.

We also have an open culture. Employees are not afraid to speak up to managers and supervisors about the potential for injury. We have an advisory council, joint health and safety committee and a continuous improvement suggestion system. Employees understand we are all on the same team. We are a profit sharing, piece-work culture which empowers our employees to set their wages based on performance. This allows for our employees to work with engineering to find efficiencies in their work areas. Our company culture promotes this across all countries where Lincoln Electric has operations. Our 2020 vision is integral to our continuous effort for excellence in all of our systems and processes that we utilize to provide value to our customers.

Q: How have you or will you use the information you gathered at the Roundtable session?

I have discussed what we learned with managers but we haven't mandated any changes yet. This will be another tool in our tool box. The key will be educating employees on brain-centered hazards and helping them understand that these are real. Bringing awareness to everyone will help generate ideas and initiatives.

Participant Spotlight

Cementation Canada Inc.

Roy Slack is President of Cementation Canada Inc., a mine and facilities contracting and engineering company. The Cementation group of companies delivers underground mine development and infrastructure, as well as surface material handling and processing facilities solutions for mining projects worldwide. In 2016, Cementation received a gold award from Canada's Safest Employers. It was the third year in a row that the company has been recognized.

Q: Is this a new topic for Cementation?

No, I read *Thinking, Fast and Slow* a while ago and the concepts that Kahneman presented were very applicable to all kinds of real life decision-making, including safety related decisions. We created an abbreviated version for our executives with examples from our industry and focused on how it applied to our workplace instead of just presenting theoretical information. We've cascaded this information to our managers and are including it in our leadership development program.

Q: Why was it important for Cementation to participate in this session?

In our industry, there are many factors that contribute to these hazards. Some of our employees work in high-risk, high-stress environments and others are doing jobs where the exposure to risk is lower. Jobs are complex, but there is also a fair degree of routine and repetition. Some work long shifts—three weeks on, three off—often in remote locations, so fatigue is also a big issue. We have people working underground without natural light and some are in the Arctic where it is dark 11 hours a day.

We are very focused on safety, and recognizing and mitigating risks. We need to make sure we have the right safety procedures in place for all hazards.

"We are very focused on safety, and recognizing and mitigating risks. We need to make sure we have the right safety procedures in place for all hazards."

— Roy Slack, President
Cementation Canada Inc.

Q: What steps have you taken that would help improve Brain-Centric Reliability™ in your organization?

Our first focus is on supervisors and providing training to support our culture. It's important to build awareness and provide the necessary training to support continuous improvement.

We focus on whether employees are fit for work—able to travel, have their mind on their job, and whether they are dealing with other issues outside of work, such as home life, drugs or alcohol. We have a strong reporting culture, but we recognize the best reporting culture won't reveal some issues with people. We've provided training to supervisors to help them recognize issues in the workplace.

We've worked hard on transitioning older workers to new practices. Some are comfortable in their jobs and take shortcuts. So we mix more experienced workers with younger workers. We are also working on mitigating risks around shift work. It's difficult to create a work schedule based on the majority. There are always some who will find it challenging.

Q: How have you or will you use the information you gathered at the Roundtable session?

The presentation was timely. I've shared my notes with the executive team. We are about to roll out our 5-year safety plan so we can modify in the next review based on this information. It's hard to know what impact these changes will have, but it is important to focus on awareness and we are starting to gain some traction.

Conclusion

On the surface, designing work processes and structures that support the functions of our brain sounds complex and overwhelming. However, evidence shows that organizations can mitigate Brain-Centered Hazards, and in doing so, enhance productivity and efficiency, and significantly improve reliability and safety performance.

As he closed off his presentation, Mangan reminded the leaders in the room that they have a key role to play in minimizing and mitigating these hazards. Leaders can help build awareness and understanding that we are all wired this way, and can structure their workplaces to encourage rational cognition, full situational awareness, conscious thought and deliberation.

About the CEO Health + Safety Leadership Network

The CEO Health + Safety Leadership Network is a distinguished group of leaders who share a commitment to building sustainable businesses and communities.

This dynamic collaboration offers fertile ground for exchanging knowledge and ideas in the pursuit of performance excellence. In addition to optimizing their own organizational health and safety performance and return-on-investment, members:

- Demonstrate health and safety through their leadership
- Build brand value and enhance corporate reputation
- Influence provincial and national health and safety policies and ensure business requirements are represented in critical conversations
- Contribute to the transformation of health and safety culture in Ontario
- Access exclusive research and information
- Contribute to provincial sustainability and growth
- Celebrate health and safety leadership and encouraging others to contribute to a culture of health and safety

Join Us for the Next Roundtable Event

The next **CEO Health + Safety Leadership Network Roundtable** is taking place **October 2017**. Watch for more information coming soon.

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Appendix A: Roundtable Participants

The following organizations participated in the October 2016 CEO Health + Safety Leadership Network Roundtable:

Best Buy Canada

Bruce Power

Canadian Centre for Occupational Health and Safety (CCOHS)

Canadian Occupational Safety

Cementation Canada Inc.

Compass Group Canada

DEKRA Insight

Electrolab Ltd.

Harding Fire Protection Systems

HASCO Health & Safety Canada

Infrastructure Health & Safety Association (IHSA)

Kitchener-Wilmot Hydro Inc.

Levitt-Safety

Lincoln Electric Company of Canada

Minerva Canada Safety Management Education Inc.

MIRARCO Mining Innovation

Nations Fresh Foods

NB Power

Public Services Health & Safety Association (PSHSA)

Respect Group Inc.

Retail Council of Canada

Skills Ontario

Staples, Inc.

STURM Consulting

Sun Life Financial, Inc.

THINK'n Corp.

Threads of Life

Technical Standards & Safety Authority (TSSA)

Union Gas Ltd.

Workplace Safety & Insurance Board (WSIB)

Workplace Safety & Prevention Services (WSPS)

Workplace Safety North (WSN)

Appendix B: References

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Committed to building a culture of health and safety.
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CEO Health +Safety Leadership Network

Let's Shape the Future of Health and Safety Together

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Workplace Safety & Prevention Services™ is the largest health & safety association in Ontario, responsible for more than 165,000 member firms across the agricultural, industrial/manufacturing and service sectors.

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