White Paper

Multilayered Defense
Against Brain-Centered Hazards

DEKRA 100 YEARS

For 100 years, **DEKRA** has been chosen to partner in proactively **keeping organizations safe** around the world as the **largest safety company in the world.**

Exposure to hazards can increase at any moment and place a worker at risk of severe injuries. The International Association of Drilling Contractors (IADC) Incident Statistics Program (ISP) tracks and analyzes incident data in the oil and gas drilling industry. According to IADC Incident Data from 2024, as with previous years, the floorhand position incurred the largest percentage of Lost Time and Recordable (LTR) injuries of all the categories tracked. Tripping In/Out and Rigging Up/Down accounted for the most LTR incidents.

Why the frequency of incidents? Consider an example of a 36-year-old floorhand with five years of rig experience from the oil & gas extraction industry. The floorhand is a member of a contracted drill crew that frequently performs tripping operations to remove drill pipe from the wellbore. Generally, the crew performs tripping operations without incident under most conditions. The typical process involves lifting drill pipe out of the wellbore 90 feet at a time using the rig's hoisting system and hinged drill pipe elevators that clamp around the top end of each 90-ft drill pipe stand. Once the driller running the rig vertically lifts the full 90 feet of drill pipe through the rotary table, three floorhands set the drill pipe slips on the remaining drill string hanging below the rig floor. Floorhands #1 and #2 then place manual tongs into position on the drill pipe to break the torqued threads on the upper and lower halves of the tool-joint connection. The driller directs the floorhands to make the tongs bite before the driller, takes the tongs to mechanical power to break the torqued tubular connection.

The operation of tripping drill pipe requires some steps to be performed sequentially, while some others can be performed concurrently by different crewmembers. Conditions during several hours of tripping drill pipe can also quickly change and increase exposure to hazards. The repetitive nature of tripping thousands of feet of drill pipe 90 feet at a time can also become monotonous. Additionally, because tripping operations delay the primary objective of drilling ahead to the targeted pay zone, leadership sometimes places pressure on the drill crew to perform the tripping operation quickly to resume drilling ahead.

While the crew was removing the next 90-foot stand of drill pipe from the well bore, Floorhand #1 unconsciously decides to place the tongs on the drill pipe early, before the driller stopped hoisting the drill string and the slips are set. Realizing the mistake of Floorhand #1 prematurely placing his tongs on the drill pipe, Floorhand #2 foresees a train wreck about to happen and instinctively attempts to manually unlatch the tong jaws from the moving drill pipe as he has done on occasion in the past. Floorhand #2's hand and wrist become pinched between the tong jaws and the vertically moving drill pipe, which crushes his hand. He sustains multiple fractures and severe tissue damage to his hand and wrist.

How our brains can work against us

This example illustrates how the human brain can lead workers astray and increase a worker's exposure to hazards. The first brain-centered hazard is called "fast brain." In the example, the floorhand was performing a routine job task that had not previously resulted in issues or injuries. This left the worker susceptible to relying on habit and muscle memory to get the job done. Fast brain, which is part of the paleomammalian cortex, is designed to process information quickly and move people into behavior based on reaction and habit, without having to consciously think through a situation and the information available. Fast brain is most likely to activate when a worker completes repetitive tasks, and when experienced workers fall prey to the trap of doing

things the same way they have always done them. Generally, the brain defaults to fast brain in order to conserve energy. This can be problematic because fast-brain functioning can lead to errors that result in serious injuries and fatalities (SIFs).

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Organizations can combat fast-brain functioning by activating a different part of the brain we call “slow brain.” Slow brain, which is part of the cerebrum, is designed to consciously process information. The slow brain helps to analyze information, problem-solve, and make decisions. Workers that operate in slow brain have greater attention to detail and better memory recall, plan ahead, and can think analytically. Enhancing slow-brain functioning is crucial in complex, fast-paced, and dynamic work environments like the oil and gas extraction industry.

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The second brain-centered hazard is called “visual recognition.” In people’s day-to-day lives, it might seem like we can see everything around us perfectly. However, neuroscience tells us a different story. Neuroscience classes commonly show a video that illustrates the limits of humans’ visual recognition abilities. In the video, the narrator asks the audience to count the number of times a group of kids in white shirts pass around a basketball while excluding passes made by kids in black shirts. After a brief period, the narrator provides the tally of how many passes were completed. Then, the narrator asks the audience if they noticed a gorilla passing through the middle of the video. Many people do not notice the gorilla because they are focused on the counting task even though the gorilla crosses through their visual field.

This might seem like a silly example, but it illustrates how the visual recognition system can fail. It turns out the brain plays a big role in what we see. The brain tells our eyes to search for information and engage in behavior that best suits the situation. When people act out of habit or are under pressure, they tend to notice things within the center of their visual field and close to them. This is dangerous because it leaves people vulnerable to missing critical information.

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Counteract brain-centered hazards with multi-layered defense

Brain-centered hazards, like fast brain and visual recognition, impact everyone regardless of their level of experience. Following an incident, organizations tend to take corrective actions like retraining, disciplinary action, or job reassignment. However, these approaches do not address systemic issues that are the root causes of these incidents.

Organizations can account for and control brain-centered hazards by creating effective layers of protection. A critical

first step is to identify work processes, by analyzing historical incident data, that would likely be impacted by brain-centered hazards. Additionally, DEKRA's Layers of Defense model can help organizations take actionable steps to reduce error and create safer workplaces.

DEKRA's Layers of Defense model includes strategies to improve systems, capabilities, education, and alignment.

Systems:

- Complete pre-task exposure assessments using a strategic method for identifying exposures.
- Create a process to discuss pre-task safety briefs for specific tasks.
- Rotate routes and tasks to prompt slow-brain functioning.
- Provide visual cues that highlight changes in the work environment, focusing on areas that have remained static over time.

Capabilities:

- Train employees on how to recognize and control brain-centered hazards.
- Use a technique called "commentary drive" to speak through proximal exposures during routine activities.
- Train employees on SIF hazard recognition with a special emphasis on recognizing changes in the levels of exposure.

Education:

- Integrate event-learning methods to identify underlying factors that can result in human error.
- Integrate human performance reliability training events for all employees.

Alignment:

- Build human performance reliability techniques into all local governance processes, focusing on reducing human error in exposures with SIF potential.
- Build human error into incident investigation protocols so that human reliability becomes part of your organization's methods.

Giving our brains the help they need

The brain plays an instrumental role in our day-to-day life because of its ability to help us navigate the world. However, like most things, the brain and the way it works is not perfect and can make mistakes. Organizations can help workers stay safe by understanding and anticipating brain-centered hazards and building multi-layered safeguards into their programs, processes, and practices to help keep people, property, and communities safe.

References

[1] IADS ISP Program 2024: Summary of Occupational Incidents (Industry Totals), issued 5 February 2025. **IADC-ISP-Report-2024.pdf**

[2] Simons, D. (2010, April 28). The Monkey Business Illusion [Video]. YouTube. **https://youtu.be/IGQmdoK_ZfY?si=ySsRd_S6LNouAEBA**

Interested in learning how identifying brain centered hazards can help your organization?