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THE SAFETY PROBLEM - Do We Have a Solution?

PART 1 OF 3

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THE SAFETY PROBLEM: Do We Have a Solution?

by ARTHUR R. COLWELL PART 1 OF 3 - JAN 2023

We've all seen them. In fact, every day we see news reports with another story of a fire, explosion, or fatality in the energy and chemical industries, each one damaging our collective reputation a little more. Our industry has seen great improvement in safety performance over the last 30 years. Today, however, despite our best efforts, we seem to have plateaued (**click here** to see Figures 1 and 2)[1,2] – why? Yet, over this same period, fatalities have remained relatively flat - again, why?

In a three-part series of articles, we will discuss this problem and some recent new learnings and insights that, together, suggest a new way to view safety – a view that illuminates a potential new path to solving this vexing problem.

- **PART 1** will discuss the current problem with today's safety management approach along with a few key insights offered by recent research into human factors and neuroscience.

- **PART 2** will focus on seeing safety management from a new perspective – a perspective that has been enabled by the insights created by human factor and neuroscience research and largely driven by several independent researchers with contributions from the new field of resilient engineering. One focus will be the critical factors for successful safety management from this new perspective.

- **PART 3** looks at the "New View" of safety management that is developing from these new perspectives and provides some guidelines on how leaders might "Make it Happen."

PART 1: The Problem and New Insights

The Problem

Every year our industry suffers over $3 billion in losses, many of these losses from companies with good engineering reports to underwriters and minimal loss histories. The root causes of these losses are often found to be unrelated to the risks identified in the engineering report data.[3]

As one senior energy underwriter stated: ***"Millions are spent each year in engineering reports, but I have found that these data don't correlate very well with where I am going to suffer my next loss."*** [3]

Companies report that fatalities come as a surprise – no expectation of it, no warning, no rash of minor accidents that would capture a greater focus from the safety department.[1] In fact, according to Work Injury Source:[4]

"…the BLS's [Bureau of Labor Statistics] workplace injury statistics published in 2019 indicate that while the number of non-fatal workplace accidents has been falling, the number of fatal workplace accidents is on the rise. Over the past five years, the number of fatal accidents has increased each year with just one exception (2017)."

This fact appears counter to traditional safety concepts we've all learned, such as the various safety pyramids that abound. Nevertheless, studies have shown that efforts to reduce incident rates are strongly correlated with a higher fatality rate.[5,6] The implication here is that the things that injure people are not the same things that kill them (or more cynically, people are discouraged from reporting incidents in the pursuit of lower incident rates such as what might occur in the numerous Zero Incident, Goal Zero, etc., programs[7]).

A feeling is emerging in our industry that, in safety management, we may be missing something. If so, what might that be?

If we honestly take measure of our traditional safety management approach, we can readily see that it is plagued by three paradoxes:[1,8]

1. ***The Way Safety Is Studied***

   Accidents are understood to be due to the absence of safety. The **paradox** is that we try to improve our safety understanding and performance by studying areas where we know safety is lacking (e.g., accidents). This methodology is, of course, contrary to all other sciences where the research is carried out when the subject matter is present, not absent.

2. ***The Way Safety Is Measured***

   Our safety measurements today register an improvement in safety performance by a decrease in whatever parameter is being measured (e.g., injuries, fires, explosions, releases, etc.). In the words of Dr. Sidney Dekker: *"We count what we can count of things that don't count."* [5]

   As these numbers decrease, less information is available to help us make improvements. The result is the well-known "***Regulator Paradox"*** *– the absence of feedback ultimately leads to the loss of control.* As a result, the system can "*drift into failure*" (which is another flaw in the various Zero Incident, Goal Zero, etc., programs[9]).

3. ***The Way Safety Is Viewed***

   When we think about safety, certain terms immediately come to mind. Your list may be different but most likely will include the following:

   - **Accident**
   - **Harm**
   - **Damage**
   - **Risk**
   - **Hazard**
   - **Danger**
   - **Blame**

   Notice that most people would consider these terms to be negative (i.e., things that are not safe). According to Dr. John Green ***"This is not safety – it is unsafety."*** [1]

   The result is our third paradox: *We associate safety with things that are NOT safe.*

The presence of a paradox in an organization is a sure indication that some sort of problem exists in the system. When we encounter paradoxes, we have basically two options: (1) we can either ignore them (which places increasing tension in the organization) or (2) face them and recognize that they are a warning sign that the organization needs to address a problem.[9]

Is it time we face the paradoxes of our current safety management approach?

New Insights

To help us navigate through this conundrum, we are fortunate today to have the benefit of new insights developed from advanced research in the fields of **Human Factors** (the science of how people perform under different circumstances) and **Neuroscience** (the study of the structure and function of the human brain and nervous system). A few key findings from these studies are listed below.

Human Factors[10,11]

- We cannot eliminate human fallibility. *Making errors, therefore, is not so much bad as* ***inevitable***.
- Human error is a symptom of trouble deeper inside the system.
- Human error is not random; it is systematically connected (and can be traced back) to features of people's tools, tasks, and operating environment.
- The design and organization of workplaces should *minimize the likelihood of human errors occurring and the impact when these errors occur* (failure to apply human factors is a key aspect of adverse events).

- Systems are not inherently safe. *People create safety through their work practice.*
- People do reasonable things given their goals, knowledge and focus of attention. Known as the "***Local Rationality Principle***," it means people will do what makes sense to them at the time.
- People do their best to reconcile different goals simultaneously (e.g., efficiency, production, safety, etc.).
- In the absence of a clearly communicated company risk profile, individual employees will default to their own risk profile.

Neuroscience [12,13,14]

- People do not act on what they can see, on what is actually there and on what they have been taught; they act on what they perceive, on what they pay attention to and on what they remember.
- Repeated exposure to risk without consequences reduces emotional "red flags" in the Limbic System about unwanted outcomes of risk.
- Risk taking is contagious, meaning the brain's response to high degrees of risk diminishes when we see others take risks and succeed (as we define it).
- Brain-Centered Hazards increase the likelihood that a risk "stimulus" may not be detected by the person encountering a risk.
- Brain-Centered Hazards we are all extremely vulnerable to:

1. ***Dual Process System of the Fast and Slow Brain:*** Actions are primarily directed by the Fast Brain.
    - Fast Brain is more energy efficient and produces automatic, reactive, habitual and emotion-based actions.
    - Slow Brain produces analytical, reasoned, reflective, and thoughtful actions, creating a critical line of defense against hazards.
2. ***Vision Recognition:*** Our eyes deceive us, causing us to miss important information due to the human visual system.
3. ***Divided Attention:*** Human brain cannot multi-task, but we can toggle between tasks.
4. ***Memory:*** Humans operate on information that feels correct in the moment relying on our memory system.
5. ***Social Think:*** We have an innate need to go along with the group. People do not like having difficult conversations.
6. ***Stress and Urgency:*** When we notice hints of urgency from others, we put pressure on ourselves to complete tasks.
    - Causes much higher Fast Brain use
    - Memory is impacted
    - Stress causes parts of brain to shut down
7. ***Fatigue:*** When our brains or bodies are fatigued, our risk for error increases significantly.
    - Causes much larger increase in Fast Brain use
    - Will cause parts of brain to shut down
    - Precursor to other six hazards

These findings, along with a growing dissatisfaction with the established approaches to safety management, led a small group of people to take a closer look at our current approach to safety management. In 2004, they created the field of resilience engineering, which began to see safety from an entirely new perspective. This new focus, in turn, allowed the identification of the critical factors necessary for successful safety management, which will be the subject of Part 2.

ABOUT THE AUTHOR:

Art Colwell has spent over 30 years in the chemical industry. At Pilko & Associates, he has been able to leverage that experience to help companies improve overall EHS performance. Working directly with senior corporate executives, Art has advised and provided guidance on EHS risk assessment, risk mitigation and governance.

Prior to his retirement in 2010, Art was responsible for BASF's largest North American manufacturing facility located in Freeport, Texas. In this role, Art oversaw the daily operation of 24 plants that manufacture 23 different products, including acrylic acid used in textiles, adhesives, and plastics; superabsorbent polymers used in baby diapers; caprolactam used in nylons and solvents; and intermediate chemicals like oxo alcohols (N-Butanol, Iso-Butanol, 2-Ethylhexanol) used to produce polyesters, surface coatings and plasticizers. During Art's tenure, the Freeport site was recognized by the Texas Chemical Council with its two highest honors – the Best in Texas Safety Award (4 of the last 6 years) and the Sustained Excellence in Caring for Texas Award (last 4 years).

Art also served as Chairman for BASF's North American Manufacturing Community (2005-2008). In this role Art was responsible for the development and implementation of operational excellence programs across all North American manufacturing facilities.

An active supporter of the industry, Art served on the Board of Directors for the Texas Chemical Council for 9 years. He held a variety of offices, culminating in his selection as TCC Chairman for 2009 – 2010.

Prior to his role as Freeport Site Manager, Art served as Operations Director for Caprolactam, Cyclohexanone, and Hydroxylamine Production (BASF's Freeport, Texas site), Ethylene Oxide Production (BASF's Geismar, Louisiana site), and Pharmaceutical Production (as Director of Operations for BASF's Knoll Pharmaceuticals in the United Kingdom).

A native of Huntsville, Alabama, Art Colwell earned both a bachelor's degree and a Master of Science degree in Chemistry from the University of Alabama in Huntsville.

Art and his wife Nita reside in Magnolia, Texas.

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BIBLIOGRAPHY

1. Green , John, Change, Challenge and Stay Curious, Task Force Zero - YouTube, 2017.
2. Brown, Jeff, Nearly 50 Years of Occupations Safety and Health Data, U.S. Bureau of Labor Statistics, Beyond the Numbers, Vol. 9/No.9, July 2020.
3. Monty, Rick, Risk Control by Aligning Organizations Board Room to Control Room: The 8IGHT DRIVERS® Process, Pilko & Associates, 2018.
4. Work Injury Source, Workplace Injury Statistics – 2021 Update: Data for Workplace Accidents, Injuries, and Death, 2021.
5. Dekker, Sydney, Safety Differently, CRC Press, Boca Raton, Florida, 2015.
6. Saloniemi, A., and Oksanen, H., Accidents and Fatal Accidents: Some Paradoxes, Safety Science 29, 59-66, 1998.
7. Dekker, Sidney, Employees: A Problem to Control or Solution to Harness, Newswires, Insurance Newsnet, 22 August 2014.
8. Hollnagel, Erik, Safety-I and Safety-II - The Past and Future of Safety Management, CRC Press, Boca Raton, Florida, 2014.
9. Acosta, Martha, Systems Safety and Pain, Todd Conklin PreAccident Podcast Episode 2, 12 April 2015.
10. Johnson, Bill Chief Scientific & Technical Advisor, Human Factors in Aircraft Maintenance Systems, FAA - YouTube, 2012.
11. Dekker, Sydney, The Field Guide to Understanding Human Error, CRC Press, Boca Raton, Florida, 2014.
12. Koen, Susan L., Brain-Centered Hazards: Risk & Remedies, Mary Kay O'Connor Process Safety Center, 19th Annual International Symposium, 25-27 October 2016.
13. Grover, Dan and Walia, Rajni, Enhance Human Performance by Mitigating Brain-Centered Hazards, Webinar-YouTube, DEKRA, 26 September 2019.
14. Hollnagel, Erik, Safety-II in Practice – Developing the Resilience Potentials, Routledge, New York, New York, 2018.