



WHITE PAPER

# Meeting the Challenges of Process Safety Training

Author: Arturo Trujillo, Global Director Process Safety Consulting, DEKRA Service Division Consulting

## Why is Process Safety Training So Important?

Back in 2004, Angela S. Blair, one of the chemical incident investigators at the U.S. Chemical Safety and Hazard Investigation Board (currently the U.S. Chemical Safety Board, or CSB), was interested in the different kinds of failures involved in the incidents the board had investigated [2]. Her research yielded a range of statistics, among them four broad categories of failures: engineering, procedures, oversight and training. She concluded that in 12% of the incidents (10 out of 83), a lack of training was mentioned in the CSB investigation report as either a root or contributing cause.

Meanwhile, various organizations have been busy designing **process safety management** systems that identify and control process safety risks. In every one of these systems, training is a key element. For instance, the Center for Chemical Process Safety

(CCPS) [3] has developed a widely accepted system that includes “training and performance assurance” as one of its twenty core elements, while an essential feature in several of the remaining nineteen is “involve competent personnel”<sup>1</sup>. In other words, the CCPS considers training so important, that not only is it a dedicated element, but its impact on the remaining nineteen is fundamental. Needless to say, in DEKRA’s own **Organizational Process Safety system**, based on that of the CCPS, training plays a very relevant role.

Since every process safety management system includes training as a key elements in preventing process safety incidents and statistical analysis of actual incidents identifies lack of proper training as a root cause, we can conclude that process safety training is important because it helps prevent process safety events—that is, it keeps people alive, and protects the environment and assets.

<sup>1</sup> “Essential feature” is defined as “a set of activities or actions that help support a key principle of an [risk based process safety] element (e.g., involving competent personnel is one essential feature that is required to maintain a dependable practice within most management systems).”

## Why Don't Companies Implement More Training?

At DEKRA, we asked ourselves this very same question, and decided to turn to our clients for answers. We compiled a training survey and distributed it to a large number of managers and engineers with more than ten years of experience in the field of safety. Their company profiles varied considerably, but 40% of them employed more than 5,000 people, and they spanned the globe. We received almost four hundred answers.

The survey sought, in part, to discover the most common obstacles to process safety training. Listed in order, they are:



Figure 1: Most common obstacles for process safety training

## Are These Challenges Unique to the World of Process Safety?

There is plenty of research on the topic of professional training. For instance, the 2018 Workplace Learning Report by LinkedIn [5], includes a survey of approximately 4,000 professionals globally. The survey addresses all types of workplace training, and came to some interesting conclusions:

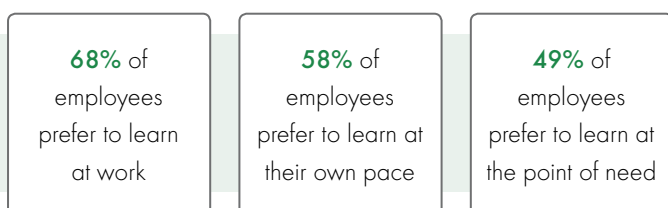


Figure 2: Results of the Workplace Learning Report by LinkedIn in 2018

The survey also asked about the biggest challenges to talent development in 2018:

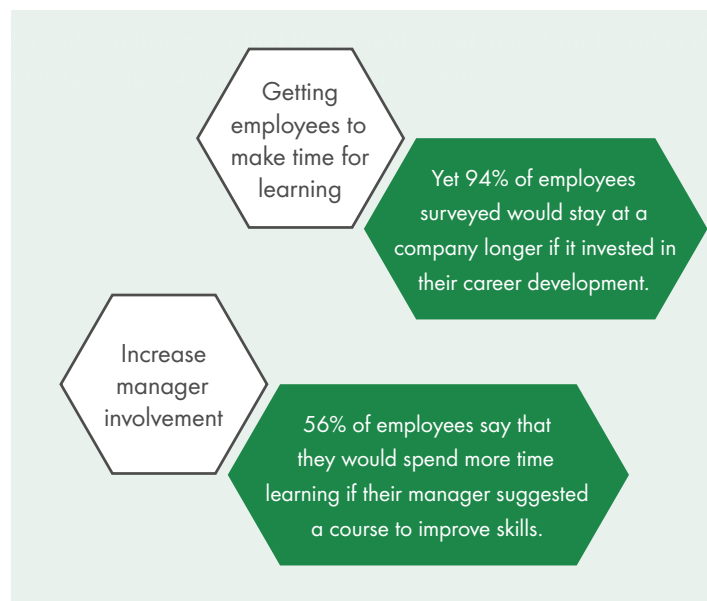


Figure 3: Results of the Workplace Learning Report by LinkedIn in 2018

The findings of those challenges are (un)surprisingly close to those obtained by DEKRA in the more specific process safety training survey. It seems that properly training employees is as much a challenge in the corporate world as it is in process industries, and the obstacles are very similar in the two sectors.

## What is the Solution to These Challenges?

Globally, the corporate training market is worth over 200 billion USD [1]. This volume incentivizes a search for ways to overcome these obstacles. Indeed, there are solutions available along two different but complementary axes:

- > Improve the delivery channel.
- > Improve content efficacy.

In terms of the delivery channel, the paradigm has evolved very quickly over the last decade, from traditional classroom presentation to digital learning, passing through e-learning, blended learning, talent management and continuous learning.

The following table summarizes some of the main characteristics of each methodology:

	Traditional classroom	E-learning and blended	Talent management	Continuous learning	Digital learning
Format	Course catalogue	Course catalogue Online university	Learning path Career track	Video Self-Authored Mobile YouTube	Micro-learning Real time Video courses Everywhere
Philosophy	Instructional design	Instructional design	Blended learning Social learning	70-20-10 model <sup>2</sup>	Design thinking Learning experience
Users	Presential training	Self-study Online learning	Career focused	Learning on demand Embedded learning	Everyone All the time Everywhere
Systems	Classroom	LMS <sup>3</sup> as e-learning platform	LMS as talent platform	LMS as experience platform	LMS invisible Data driven Mobile

Figure 4: Characteristics of several training methodologies, source: Bersin [1].

Some authors [1] see a further evolution into learning in the flow of work. This new paradigm will mimic the organization of the many content providers that we all use on our daily lives, such as Spotify, Netflix, social media, online news services, etc. These platforms are organized around “channels,” “topics” and “recommendations,” and they point users to the next piece of information, based on past consumer history. Likewise, the next learning paradigm will be based on micro-learning “pills,” widely available, and carefully designed to achieve the desired outcome. Trainee feedback will provide enough information for the system to decide the next step.

Unlike the content providers listed above, however, who attempt to generate as much consumption as possible from the user, the paradigm for professional training needs adjusting. The trainees should be able to access the information they need and get back to work rather than remain in a consumption loop.

All these developments improve delivery efficiency while fulfilling employee requirements (Remember: Learn at work, at the point of need and at their own pace).

Meanwhile, along the other axis, there have been many advances in pedagogy applied to professional training. There is now widespread recognition that trainee competence is best achieved when three central channels are activated in a coordinated way:

- > The visual channel: the trainee needs to be exposed to meaningful pictures, drawings and video to reinforce what is being said or explained verbally.

- > The auditory channel: the trainee needs to at least have the option of hearing all the relevant information.
- > The emotional channel: probably the most overlooked, neuroscience has demonstrated that information linked to emotion is registered (and later retrieved) more easily [4]. This is none other than scientific confirmation of the “pathos” identified by Aristotle as one of the three pillars of rhetoric.

### Conclusion: How DEKRA Helps Promote Process Safety Competency

Training is essential to ensure proper management of process safety risks, or, in other words, to prevent incidents that harm people, the environment or assets. To meet the changing demands of a dynamic work environment, training concepts have had to evolve very quickly over the last decade.

A few years ago, DEKRA developed the **DEKRA Process Safety Academy** as a tool to transfer competence from our experts to our clients’ employees. The Academy is based on the combined expertise and experience of our more than 250 experts, offering a comprehensive resource for any process safety discipline. The Academy’s design has evolved in response to the challenges discussed above, and includes a well-assorted toolkit, including “traditional” presentation-based training, to the most advanced online training modalities (including virtual classrooms, video training, etc.). The latest pedagogical developments are also

2 10% of the learning through presentations or online courses; 20% learning by exposure to others (colleagues, mentors, team members...) and 70% learning by experience.  
 3 Learning Management System.

embedded in the training material design. The PS Academy has total flexibility of delivery, from a stand-alone solution to a content provider to integration into our clients' own systems. Needless to say, the training material can be fine-tuned to the needs of our clients. Finally, the Academy has a decidedly global scope, and can be delivered with full consistency worldwide, in many different local languages.

## References

1. Bersin, Josh. A New Paradigm For Corporate Training: Learning In The Flow of Work. <https://joshbersin.com/2018/06/a-new-paradigm-for-corporate-training-learning-in-the-flow-of-work/>. July 8, 2018.
2. Blair, Angela S. "Management System Failures Identified in Incidents Investigated by the U.S. Chemical Safety and Hazard Investigation Board". *Process Safety Progress*, Vol. 23, No. 4, pp 232-236, 2004.
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4. Hamann, S.B.. "Cognitive and neural mechanisms of emotional memory". *Trends in Cognitive Sciences*.(9): 394-400, 2001.
5. LinkedIn Learning. 2018 Workplace Learning Report. *The Rise and Responsibility of Talent Development in the New Labor Market*. LinkedIn, 2018.



## DR. ARTURO TRUJILLO

Dr. Arturo Trujillo is Global Director of Process Safety Consulting. His main areas of expertise are diverse types of process hazard analysis (HAZOP, What-if, HAZID), consequence analysis and quantitative risk analysis. He has facilitated more than 200 HAZOPs over the last 25 years, especially in the oil & gas, energy, chemicals and pharmaceutical industries.



## DEKRA Process Safety

The breadth and depth of expertise in process safety makes us globally recognised specialists and trusted advisors. We help our clients to understand and evaluate their risks, and work together to develop pragmatic solutions. Our value-adding and practical approach integrates specialist process safety management, engineering and testing. We seek to educate and grow client competence to provide sustainable performance improvement. Partnering with our clients we combine technical expertise with a passion for life preservation, harm reduction and asset protection. As a part of the world's leading expert organisation DEKRA, we are the global partner for a safe world.

### Process Safety Management (PSM) Programmes

- > Design and creation of relevant PSM Programmes
- > Support the implementation, monitoring, and sustainability of PSM Programmes
- > Audit existing PSM Programmes, comparing with best practices around the world
- > Correct and improve deficient Programmes

### Process Safety Information/Data (Laboratory Testing)

- > Flammability/combustibility properties of dusts, gases, vapours, mists, and hybrid atmospheres
- > Chemical reaction hazards and chemical process optimisation (reaction and adiabatic calorimetry RC1, ARC, VSP, Dewar)
- > Thermal instability (DSC, DTA, and powder specific tests)
- > Energetic materials, explosives, propellants, pyrotechnics to DOT, UN, etc. protocols
- > Regulatory testing: REACH, UN, CLP, ADR, OSHA, DOT
- > Electrostatic testing for powders, liquids, process equipment, liners, shoes, FIBCs

### Specialist Consulting (Technical/Engineering)

- > Dust, gas, and vapour flash fire and explosion hazards
- > Electrostatic hazards, problems, and applications
- > Reactive chemical, self-heating, and thermal instability hazards
- > Hazardous area classification
- > Mechanical equipment ignition risk assessment
- > Transport & classification of dangerous goods

We have offices throughout North America, Europe, and Asia.

For more information, visit [www.dekra.com/process-safety](http://www.dekra.com/process-safety)

To contact us: [process-safety@dekra.com](mailto:process-safety@dekra.com)

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