

Looking to The Future

What should we do to prevent the next process safety catastrophe?

TRISH KERIN & SAM MANNAN

DIRECTOR ICHME SAFETY CENTRE; EXECUTIVE DIRECTOR, MKOPSC

Lewis Carroll's Alice asked the Cheshire Cat, "Would you tell me, please, which way I ought to go from here?". "That depends a good deal on where you want to go," said the Cat. Wise words, but equally important, you need to know where you are starting a journey from. So where are we at with process safety today, and where do we want to go tomorrow?

We have been practising process safety since the 1960s, but over this time there has continued to be many tragic incidents. Many of us over the age of 40 remember where we were the day we heard about the catastrophic incident in Bhopal, India. But in recent years we have continued to see multiple tragic events occur all over the world. So the question that must be asked of all of us, is what are we going to do to prevent the next process safety catastrophe?

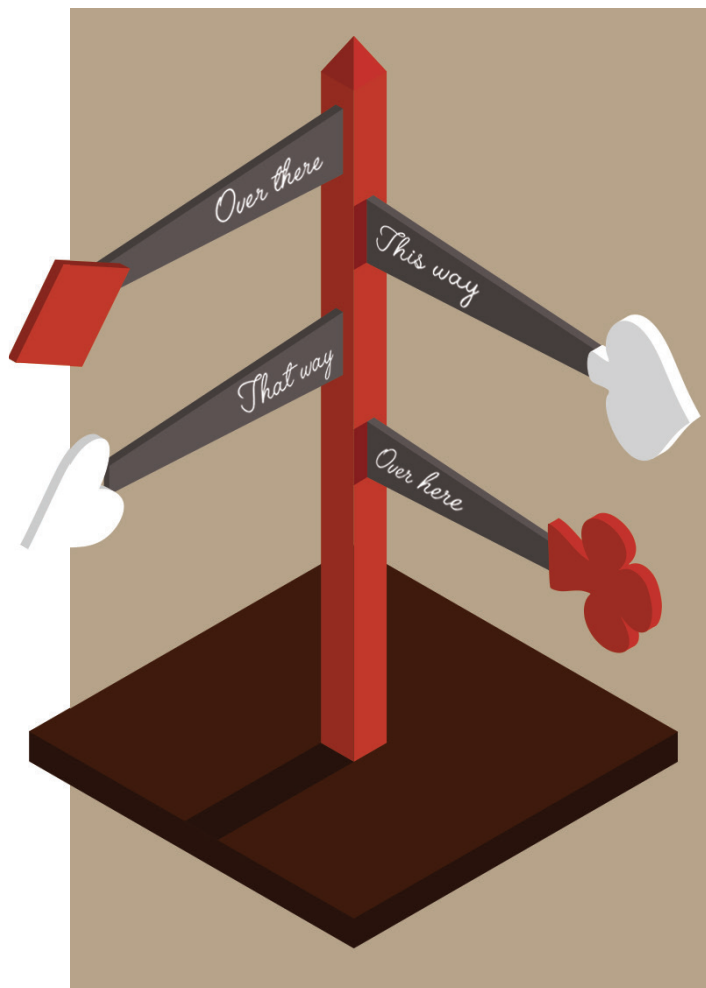
**SO THE QUESTION THAT MUST BE ASKED OF ALL OF US,
IS WHAT ARE WE GOING TO DO TO PREVENT THE NEXT
PROCESS SAFETY CATASTROPHE?**

In 2001, the Mary Kay O'Connor Process Safety Center published *Process Safety Research Agenda for the 21st Century*. Then in 2013, IChemE published a policy report called *Chemical Engineering Matters*. These two documents started to define a path for the future, but there is still a long way to go. This led to the IChemE Safety Centre and the Mary Kay O'Connor Process Safety Center joining forces to lead an international team of experts to envision what the future of process safety may look like. This project launched an interim report in October 2017 at the World Congress of Chemical Engineering in Barcelona, Spain. We encourage you to download, read and comment on the ideas and what you can do to advance process safety.

WHAT WE DID

To imagine what we need to do in the future we need to be clear about the challenges of today. To validate our thoughts on what the challenges are, we asked a range of professionals from across the world what they think – via a series of workshops at international symposia. We sought to understand the challenges from a range of perspectives. This is because there are various stakeholders involved in process safety. These stakeholders included a range of positions within regulators, academics, industry and members of society, from the UK, EU, US, Australia, Asia, and the Middle East.

The key questions in the consultation session were: what



are the key industry challenges for process safety?; what are the key academic challenges for process safety?; what are the key regulatory challenges for process safety?; and what are the key societal challenges for process safety?

KEY CHALLENGES

ACADEMIA	REGULATORS	INDUSTRY	SOCIETY
<i>Collaboration</i>	Competency	Funding and resources	Understanding
<i>Funding and resources</i>	Regulators	Culture	Trust
<i>Experience</i>	Politics	Leadership	Risk
<i>Practical experience</i>	Complexity	Competency	Communication
<i>Content</i>	Compliance	Understanding	Competency

IF THESE ARE THE CHALLENGES, WHAT SHOULD WE DO?

ACADEMIA

Process safety education should be enhanced not only in chemical engineering undergraduate qualifications, but across all relevant disciplines. This must include other engineering disciplines, but must also extend outside engineering (eg, chemistry, physics, industrial psychology, business, public policy). There also needs to be more focus on research in process safety and to embed important principles of process safety in training. New ways of teaching process safety and embedding learning into practical experiments also need to be explored. There are also opportunities for academia to work more closely with industry.

REGULATORS

Regulators play a critical role in delivering positive process safety outcomes. This requires high levels of competency across a range of topics. Enhancing competence provides for a greater level of trust in the community. From a government perspective, regulators also need to drive for consistent science-based legislation, regardless of whether the framework is prescriptive or performance-based.

INDUSTRY

Trevor Kletz said: "If you think safety is expensive, try an accident", and this has been an important way to highlight why we need better process safety outcomes. That perspective is still important and relevant; however, now we should additionally include the value of safety rather than only the cost. Good process safety enhances operational discipline and reliability in facilities, which in turn results in positive contributions to the bottom line. Industry also has a role in supporting education

of future engineers through interaction with academia and enhanced opportunities for internships and work experience. There is also a need to assist with trade qualifications as they develop process safety competency. To support the development of trades and engineers, additional focus is needed to enhance competency throughout companies. This is vital to ensure adequate process safety capability at facilities.

TO SUPPORT THE DEVELOPMENT OF TRADES AND ENGINEERS, ADDITIONAL FOCUS IS NEEDED TO ENHANCE COMPETENCY THROUGHOUT COMPANIES

There has been substantial development in inherently safer design concepts over many years, but there is still a need to embed human factors design into facilities. To support this, more focus should be put on the operational aspects of human factors.

SOCIETY

There is a need for enhanced engagement and transparency with the community and other stakeholders. For effective engagement, there needs to be a certain level of understanding. This means efforts need to be made to develop the understanding of hazard and risk in society. This would then allow for true multi-directional engagement and dialogue, which would support better process safety outcomes. This engagement requires industry, academia and regulators to view the community as an integral part and engage them as active participants to deliver the process safety outcomes. To adequately address knowledge development in society, there should be programmes developed in both primary and high school curricula to explore the differences between hazard and risk and how these play out in everyday actions.

COMMON OPPORTUNITIES

The need to enhance competency across all areas and to make a good business case for process safety leads to some collaborative opportunities.

TO IMPROVE COMPETENCY WE NEED TO BE WILLING TO EMBRACE NEW LEARNING TECHNIQUES, AS THE EXISTING METHODS HAVE NOT BEEN DELIVERING THE NECESSARY COMPETENCIES TO THE RIGHT LEVEL

To improve competency we need to be willing to embrace new learning techniques, as the existing methods have not been delivering the necessary competencies to the right level. It is critical to consider how different people learn best and to develop techniques to match them.

When thinking about making a business case for process safety, it is important to consider all necessary resources.

STRENGTHS AND NEEDS

ACADEMIA	
Strengths	Needs
Educating students and professionals	Closer ties to industry to add operational aspects into training
Public outreach and credibility with society	Show value of research to continue to receive funding
REGULATORS	
Strengths	Needs
Steer direction in application of science-based regulation	Drive continued competency development in regulators
Define requirements and direct research funding	
View a range of industries and see best practices	
INDUSTRY	
Strengths	Needs
Operational and design experience	Clear consistent science-based regulations
Resources to invest in process safety	Competent graduates
SOCIETY	
Strengths	Needs
Effective supervision of industry and regulators	Increased knowledge to allow engagement

This includes human resources as well as financial. Adequate allocation of these resources to manage process safety is critical. There is a role for all parties to ensure that the resources are available and have adequate competencies.

In the past, the role played by different stakeholders, at times was viewed as working at cross-purposes, for example academia versus industry experience. We need to focus on working synergistically to avoid working past each other and working to our strengths to improve process safety performance. When academia and industry work positively together they can enhance each other's knowledge and experience. Each area has particular strengths and needs and these are key areas where they can assist each other. The time has come to enhance collaboration between all parties in process safety.

A CALL TO ACTION

We all need to play our part in improving process safety outcomes, so what will you do to deliver on this? Listed below is a series of ideas for you to take up.

Develop, enhance and maintain competency:

- Build an international surveillance system to track

hazardous materials incidents.

- Build a common understanding of risk among all stakeholders to make risk and safety management a core value.
- Develop a standard process safety curriculum.
- Provide opportunities for practical experience through internship or work experience in industry.
- Provide funding streams for process safety research across academia, government and industry.
- Influence regulators and governments to ensure regulations are consistent and science-based.
- Contribute to the development of an education programme for the community, to increase awareness on process safety by all other stakeholders.
- Engage with leadership of organisations and help them understand how they contribute to process safety outcomes.
- Support continuing professional development (CPD)

Making a good business case:

- Discuss process safety in terms of business performance.

Collaboration:

- Look for opportunities to work with others to advance process safety.
- Reward positive collaboration in process safety rather than competition.
- Promote successful collaboration in your workplace or community.
- Enhance communication through workshops and forums and promote the role of safety engineers.

ISC and MKOPSC are issuing this call to action. The time is now and we all need to act. Our question is, what will you do to shape process safety for the 21st century and beyond? ■

Download the full paper at bit.ly/ISCPS21 or bit.ly/MKOPS21. We are interested in your feedback on the call to action and what you can do to improve process safety in your sphere of influence. Contributions welcomed at safetycentre@icheme.org, or mkopsc@tamu.edu.

ACKNOWLEDGEMENTS

The authors would like to acknowledge the contributions of the team members: Paul Amyotte; Ian Cameron; Mike Considine; Cheryl Grounds; Jai Gupta; Judith Hackitt; Alan Hollonds; Christian Jochum; Atsumi Miyake; Christina Phang; Genserik Reniers; Juergen Schmidt; Hans Schwarz; Dongil Shin; George Suter; Vanessa Allen Sutherland; En Sup Yoon; Jinsong Zhao. Also support provided by the staff and graduate students of the Mary Kay O'Connor Process Safety Center: Valerie Green; Zohra Halim; Pritishma Lakhe; Yueqi Shen and Bin Zhang.

Copyright of TCE: The Chemical Engineer is the property of Institution of Chemical Engineers and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.