IChemE Major Hazards Management Priorities

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Abstract

Preventing industrial accidents, and harm to people and the environment, has always been at the core of the chemical engineering profession. In its 100-year history, the UK's Institution of Chemical Engineers (IChemE) has been in the vanguard – establishing professional and academic requirements and promoting good practices. Our industry continues to evolve and new technologies bring new challenges, but our responsibilities as professional engineers and the fundamental principles for managing risk are enduring.

As part of IChemE's ongoing strategy to impact critical global challenges, three priority topics have been identified:

- Responsible Production – promoting good practices to deliver sustainable and ethical outcomes aligned with climate goals
- Major Hazards Management – advancing the understanding and application of safety and risk management to contribute worldwide for the benefit of society
- Digitalisation – promoting the adoption and advancement of digital tools in processes, for economic and societal benefit.

The Major Hazards Management priority topic focuses on three areas:

- People – developing process safety knowledge and professional skills, and leadership capabilities to manage hazards
- Practices – promoting the application of learning to make "good practice, common practice"
- Emerging Challenges – embracing the changes in industry, technology and society so that chemical engineers can play their part in the fundamental transition that is underway.

To deliver on these challenges, IChemE has brought together partners and people from across the institution to develop practical tools and to support members on this journey. For example, we are actively working on:

- Process Safety Competence - what competencies will chemical engineers need throughout their careers in the future?
- Learning from Incidents - how do we keep lessons from the past alive as industry evolves?
- Cross-Sector Challenges – partnering with key engineering institutions and others to support a safe transition and promote cross-sector learning.

This presentation will provide an update on the work being progressed by IChemE and how we are working with others to drive change in areas as diverse as policy, technology and institutional collaboration.

1. Introduction

The Institution of Chemical Engineers (IChemE) is 100 years old this year and has 30,000 members around the globe. It exists to advance chemical engineering's contribution worldwide for the benefit of society. One of the four aims in IChemE's strategy (Ref 1) is to be a "vibrant learned society that materially impacts on the UN's Sustainable Development Goals (Ref 2) and the Grand Challenges for Engineering (Ref 3)".

Technical aspects of the institution's work are overseen by the Learned Society Committee, which has identified three Priority Topics for IChemE to focus on (Ref 4):

- **Responsible Production** – promoting good practices to deliver sustainable and ethical outcomes, aligned with climate goals
- **Major Hazards Management** – advancing the understanding and application of safety and risk management to contribute worldwide for the benefit of society
- Digitalisation – promoting the adoption and advancement of digital tools in processes, for economic and societal benefit.

Since the Priority Topics were published in 2020, there have been advances in all areas. While this paper focuses on Major Hazards Management, the topics are interdependent and it is worth sharing progress in the other areas as context.

1.1 Responsible Production Progress

This topic is focused on promoting improved technologies which minimise societal and environmental impact, while improving the sustainability of the processes used. There is a particular focus on climate change, but work is also underway on diverse topics such as life-cycle analysis, energy transition to net zero, and engineering ethics. During the COVID-19 pandemic chemical engineers worked with other engineers to advise policy and decision makers on various aspects of the response. Examples of progress include:

- IChemE consulted with members to formulate IChemE Climate Change Position Statement, published in Novemebr 2020 (Ref 5)
- Climate Change Action Plans have been developed by IChemE special interest and member groups in 2021
- IChemE attended and presented at COP 26 in 2021
- Carbon Capture Science & Technology journal was launched in August 2021
- A 'Sustainability Hub' was launched in February 2022 as a resource for training and reskilling chemical engineers on sustainability topics
- IChem E contributes to varied policy related activities, principally through the National Engineering Policy Centre in the UK, but also directly to government. This has included policy responses in Australia and New Zealand and all contributions are available on the IChemE Website (Ref 6).

Future activities will include further climate change related actions and focus on circular economy, life-cycle considerations and energy transition.

1.2 Digitalisation:

The Digitalisation priority topic is helping members develop skills and participate in the widespread application of digital tools in chemical engineering design, operations, process control and management. These tools include data analytics, machine learning, artificial intelligence, process control, automation, visualisation, digital twins and internet of things. Recent progress includes:

- Establishing the Digitalisation Technical Advisory Group, an international, diverse group of IChemE members with digitalisation expertise, to provide leadership and advice;
- Raising awareness of digitalisation across IChemE membership with articles in The Chemical Engineer magazine, including
- Promoting the inclusion of systems thinking, artificial intelligence, security, and ethical leadership of digital technologies in IChemE accredited chemical engineering degrees
- Launching a new open access academic journal, Digital Chemical Engineering;
- Delivery of the 2021 virtual conference Advances in the Digitalisation of the Process Industries.

Going forward further awareness building, training and education opportunities will be pursued in collaboration in various collaborative efforts.

2. IChemE Major Hazards Priorities

Management of major hazards has always been at the core of chemical engineering for both industrial activities and professional requirements. Although industry is evolving and new technologies are emerging, the fundamental principles of managing risk, and learning and improving, are enduring. IChemE has a diverse range of teams engaged in activities related to process safety including:

- Safety and Loss Prevention Special Interest Group (S&LP SIG) – focused on supporting members (Ref 7)
- IChemE Safety Centre (ISC) – working with industrial partners and others to develop tools, training and guidance (Ref 8)
- Hazards Conference – world class forum for sharing the latest advances and lessons learning on all aspects of process safety
- Journals – including Loss Prevention Bulletin and Process Safety and Environmental Protection

In 2020 the IChemE Board of Trustees established the Major Hazards Committee to coordinate work across all of these activities and provide a unified approach. The committee facilitates IChemE's goal to advance the understanding and application of major hazards management techniques and contribute worldwide for the benefit of society. In doing this we aim to play a leading role among professional institutions and beyond, in enhancing and promoting process safety and risk management practices and skills. In 2021 the committee published it's Major Hazards Management Agenda (Ref 9). The committee recently reviewed progress and plans, and agreed to three main themes going forward:

- **People** - Developing full lifecycle professional and technical competence, and leadership skills for both institution members and across relevant areas of industry, education and society in response to the challenges of today and into the future.
- **Practices** - Establishing and applying tools and good practices for major hazards management, and promoting sharing and learning, to drive continual improvement.

- **Emerging challenges** - Supporting members, industry and society in responding to current and emerging safety challenges for a sustainable future from the evolving technological and industrial landscape by adapting and developing knowledge, skills and tools.

The following sections describe some of the progress in each of these areas.

3. Major Hazards Management Progress and Plans

3.1 People

Education, university course accreditation, professional qualifications and continuing professional development are a major part of the work of the IChemE for many years. Some key developments include:

- A Student Process Safety Diary has been developed by the ISC to help capture practical experience
- S&LP SIG have developed a process safety workshop to support chemical engineering university students
- ISC's Leadership and Culture workshops remains a mainstay of the IChemE safety training programme

In order to better protect society, IChemE introduced the Professional Process Safety Engineer registration which provides public recognition to peer-reviewed practitioners working in process safety related roles. IChemE is currently revising its professional qualification processes and is introducing a new membership application system, but Professional Process Safety Engineer registration will be available to both existing IChemE Chartered Members and those wishing to become IChemE Chartered Members when this is complete.

A new project has been initiated by IChemE Major Hazards Committee to establish process safety competencies that chemical engineers require through the course of their careers, to be completed by 2023.

3.2 Practices

In this area our goals are to help make 'good practice, common practice' and to promote application of learning from past incidents. Our journals and the Hazards Conference is fine example of how we seek to promote good practices and learning. Some recent developments include:

- To promote learning from incidents and application of good practices the IChemE's Loss Prevention Bulletin is now available to all IChemE members, free of charge
- IChemE Safety Centre has published a number of guidance documents and recent additions include guidance for application of process safety indicators and enhancements to HAZOP. (Ref 8)
- To celebrate IChemE's centenary year in 2022, a book of fifty-two one-page incident summaries has been published. This book is available in electronic format (Ref. 10). The summaries are excellent for 'Safety Moments' or education and it also contains links to publicly-available incident investigation reports for those looking for more detailed information.

A project to enhance the application of learning from incidents has been established by the Major Hazards Committee, that aims to make better use of available information. Having identified key resources, the team will look at good practices for application in 2022 and cross sector learning in 2023.

3.3 Emerging challenges

As industry and society evolve, new technologies and ways of working bring challenges of their own. IChemE is committed to working with its members, governments and other institutions to support a safe and just transition as the world responds to climate change and delivery of the Sustainable Development Goals. High profile events such the Grenfell Tower Fire, COVID-19 pandemic and concerns of energy supply, point to the need for more resilience and interdisciplinary collaboration to resolve system-wide challenges. Some recent IChemE activities include:

- Potential hazards from emerging technologies and the energy transition have been incorporated into various webinar programmes to build member awareness. For example, an expert panel discussed safety in the context of the future of industry when sustainability is increasingly important (Ref. 11). IChemE is also offering new training on Hydrogen Safety.
- IChemE volunteers are working with several external institutions and other organisations on collaborative projects. For example, IChemE is part of the UK Hazards Forum (Ref 12), which brings together different professional engineering institutions and relevant cross-sector organisations. Joint projects in the next two years will include natural hazards, emerging technology hazards and consistent application of good practices.
- Royal Academy of Engineering (RAE) has brought together 42 engineering organisations to establish the National Engineering Policy Centre to provide insights, advice, and practical policy recommendations on complex national and global challenges (Ref 13). They are also working on programmes to bring together partners from around the world to tackle the most pressing engineering, safety and sustainability problems.

4. Summary

The management of industrial hazards has been one of the foundational aspects of IChemE for 100 years. While industry and technology are changing, the principles of risk management and the learning from the past are just as relevant in the future and there are wide range of ways for chemical engineers to contribute. The institution is committed to support members and society as we all respond to this evolution.

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