

Ensuring Safety Through Growth: Trends and Innovations

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Next Fifteen Minutes

- Mandate from Gordon Murray, Executive Director, WPAC
 - Provide my perspectives on how safety will play a key role in our ability to meet future demand
- *Ensuring Safety Through Growth: Trends and Innovations*
 - *Ensuring Safety*
 - Making risk tolerable (because nothing is safe)
 - *Growth*
 - Growth requires change, which requires management of change (MOC) from a process safety management (PSM) perspective
 - *Trends*
 - **Fragile social contract to operate in any high-hazard industry**
 - **Increasing prospect of process safety regulation in high-hazard industries**
 - *Innovations*
 - Information/knowledge management, digitilization, artificial intelligence,...
 - **Emphasize fundamentals of inherently safer design (ISD) and safety culture**

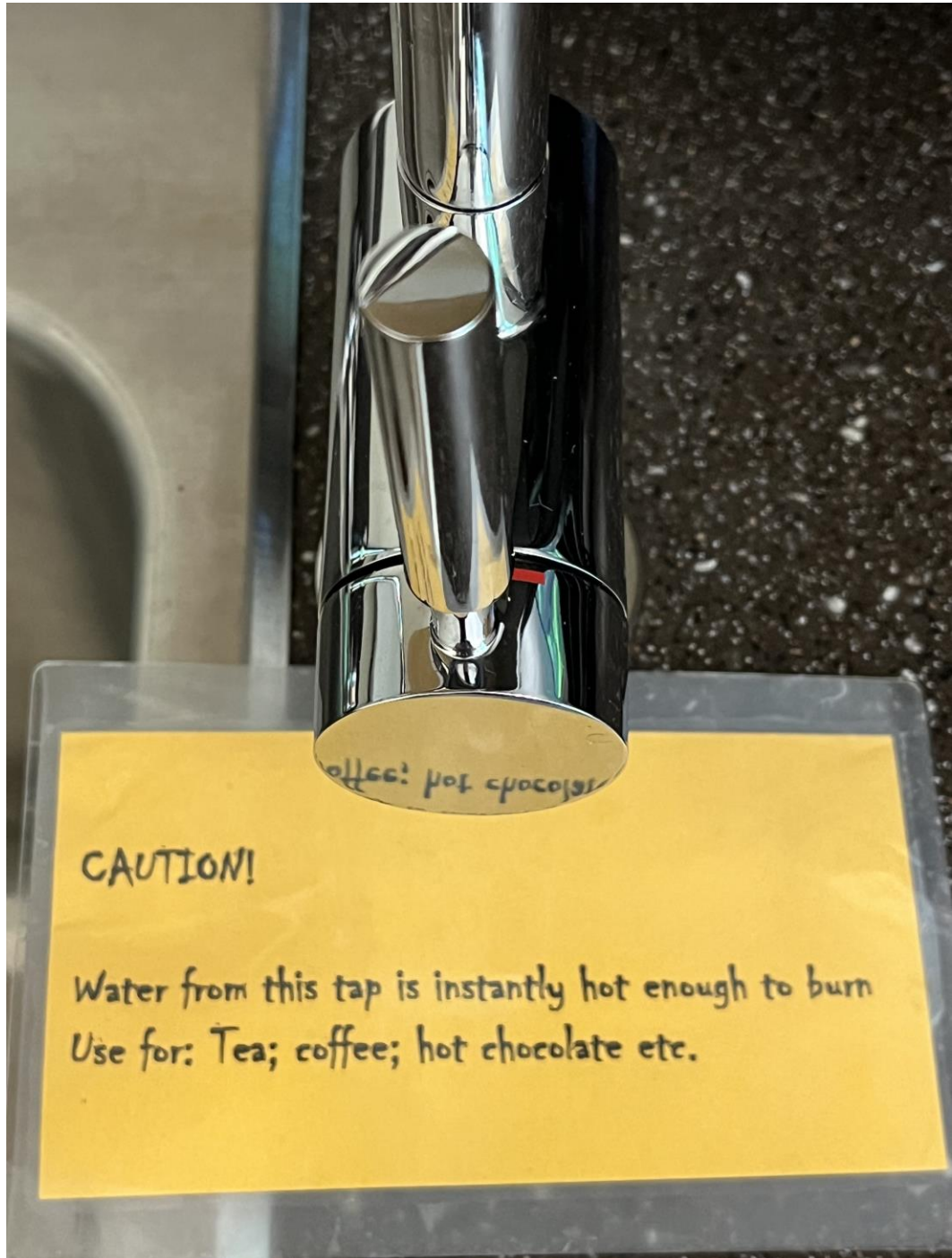
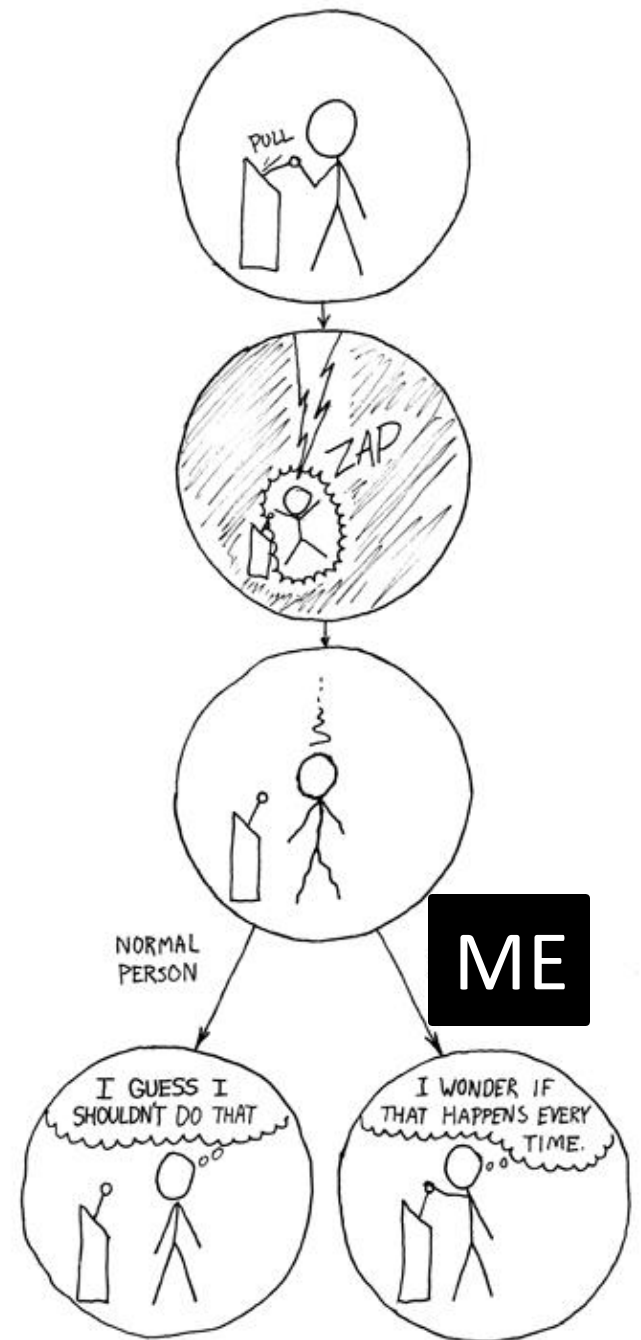


Photo: Paul Amyotte

WHY?



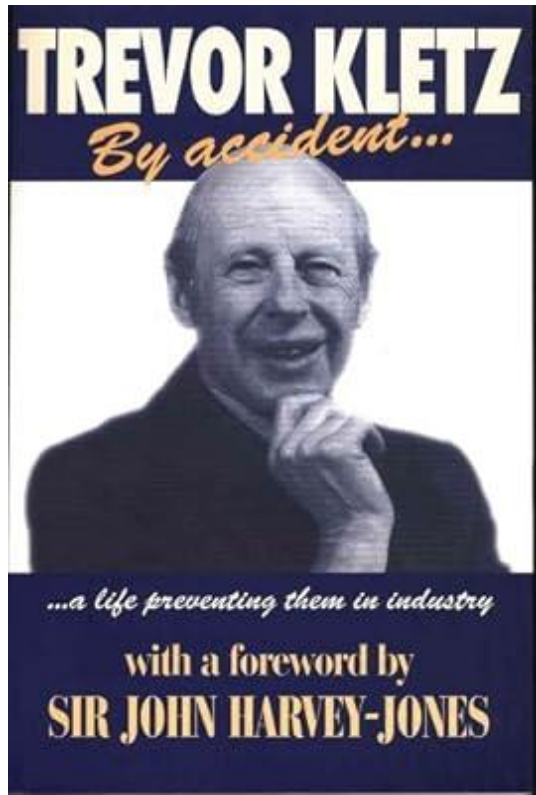
Adapted from: <https://xkcd.com/242/>

David Fung (President of Canadian Society for Chemical Engineering):
The future success of the chemical industry will depend more on social license to operate than technological advancement (Fung, 2013)



Trevor Kletz (noted safety practitioner):

If you think safety is expensive, try having an accident (Kletz, 2000)



Kletz (2000)

Peter Drucker (noted management consultant):

The first duty of business is to survive, and the guiding principle of business economics is not the maximization of profit – it is the avoidance of loss (Wilson, 1998)



Report of the Westray Mine Public Inquiry: Richard (1997)

Process Safety Management (PSM)

Application of management principles and systems to the identification, understanding and control of process hazards to prevent process-related injuries and incidents (caused primarily by fire, explosion, and toxic release)

- **Corporate Social Responsibility**

Process safety helps to display corporate responsibility through concrete actions. The principles of process safety help to plan things right and then do them right.

- **Business Flexibility**

When you openly and transparently display responsibility through implementing a rigorous process safety program, you help your company achieve greater freedom and self-determination.

- **Loss Prevention/Risk Reduction**

The core of process safety is to prevent catastrophic events. In addition, adopting a rigorous process safety program helps to reduce the likelihood of human injury, asset damage, business downtime, environmental harm, and associated costs in less severe incidents.

- **Sustained Value and Growth**

Effective implementation of process safety helps to ensure a reliable process that can produce high-quality products and services on schedule. Value creation is therefore sustained over time.

LEADERSHIP EXCELLENCE

Process Safety Management Standard; CSA Z767:17 (R2022)

- *Process safety leadership*
 - Accountability; Regulations, codes, and standards; **Process safety culture**; Conduct of operations – **senior management responsibility**
- *Understanding hazards and risks*
 - Process knowledge and documentation; Project review and design procedures; **Process risk assessment and risk reduction**; Human factors
- *Risk management*
 - Training and competency; Management of change; Process and equipment integrity; Emergency management planning
- *Review and improvement*
 - Investigation; Audit process; Enhancement of process safety knowledge; Key performance indicators

To Regulate or not to Regulate?



https://www.freepik.com/free-vector/illustration-canada-flag_2922500.htm#query=canadian%20flag&position=0&from_view=keyword&track=ais

- Europe

- Seveso III Directive
- Chemical Agents Directive (CAD)

- United Kingdom

- Health and Safety Executive (HSE)
- As Low As Reasonably Practicable (ALARP) principle

- United States

- Occupational Safety and Health Administration (OSHA) Process Safety Management (PSM) Standard (29 CFR 1910.119)
- Environmental Protection Agency (EPA) Risk Management Program (RMP) Rule

- China

- State Administration of Work Safety (SAWS)

- Canada

- Largely non-regulatory with respect to PSM – perhaps more a matter of perception than reality
- Responsible Care®
- Canadian Society for Chemical Engineering (CSChE) Process Safety Management Division (PSMD)
- Environmental Emergency Regulations, 2019
- Pre-Start Health and Safety Review (PSHSR)
- General Duty Clause in Occupational Health and Safety (OHS) legislation
- Technical Safety Regulations
- Gas Plant Facility Regulations

- Changes coming?

- Combustible Dust Regulations (British Columbia)
- *Integrating Process Safety Management into Canadian Wood Pellet Facilities that Generate Combustible Wood Dust*

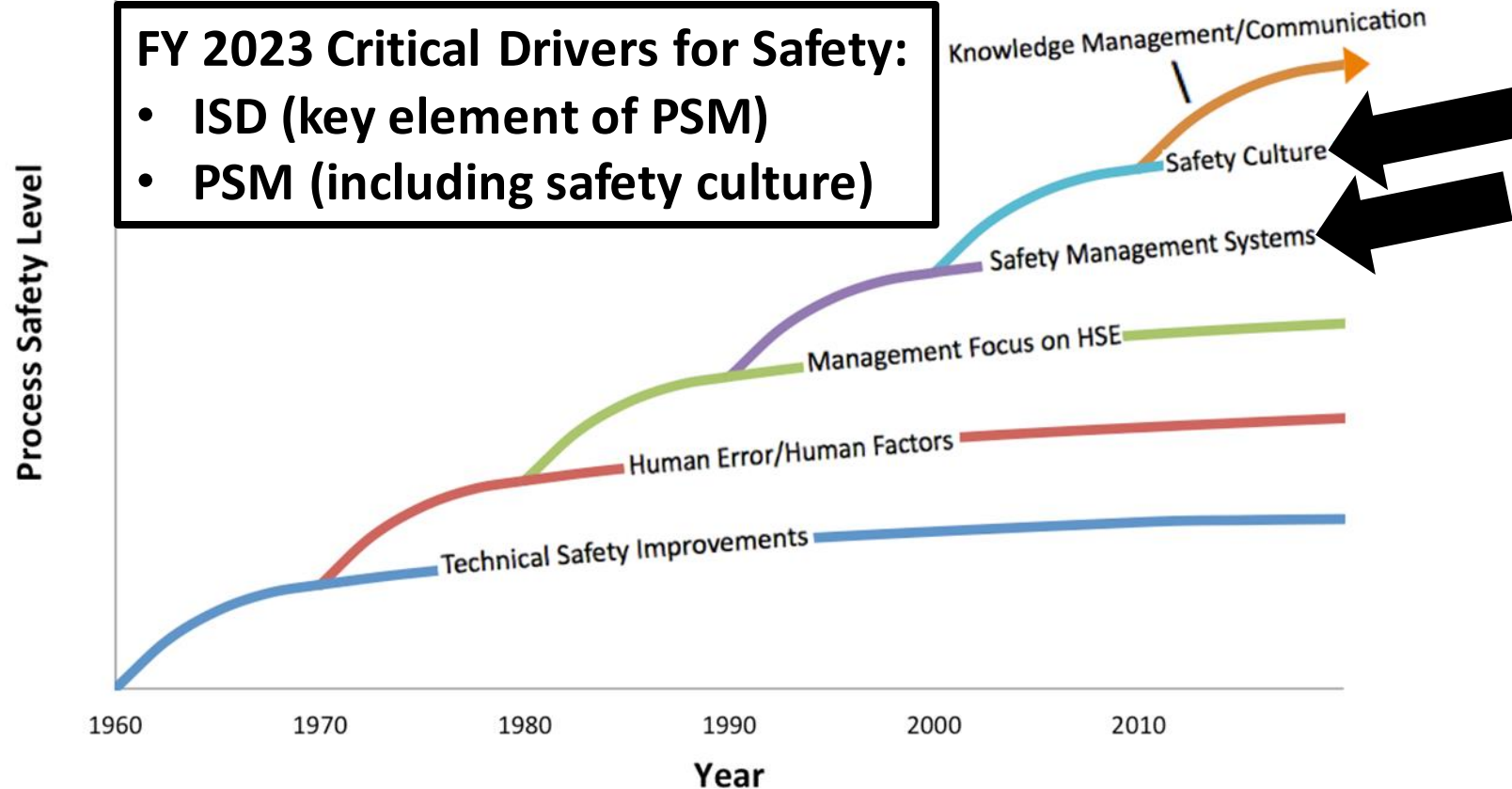
Peter Drucker (noted management consultant): *Management is doing things right; leadership is doing the right things*

(Kletz & Amyotte, 2010)



FY 2023 Critical Drivers for Safety:

- ISD (key element of PSM)
- PSM (including safety culture)



Unsplash

Flour Mill Explosion in 1785
Ignorance of the fore-mentioned circumstances, and a culpable negligence of those precautions which ought to be taken, have often caused more misfortunes and loss than the most contriving malice

Morozzo (1795)

Hierarchy of Controls

Most effective



Least effective

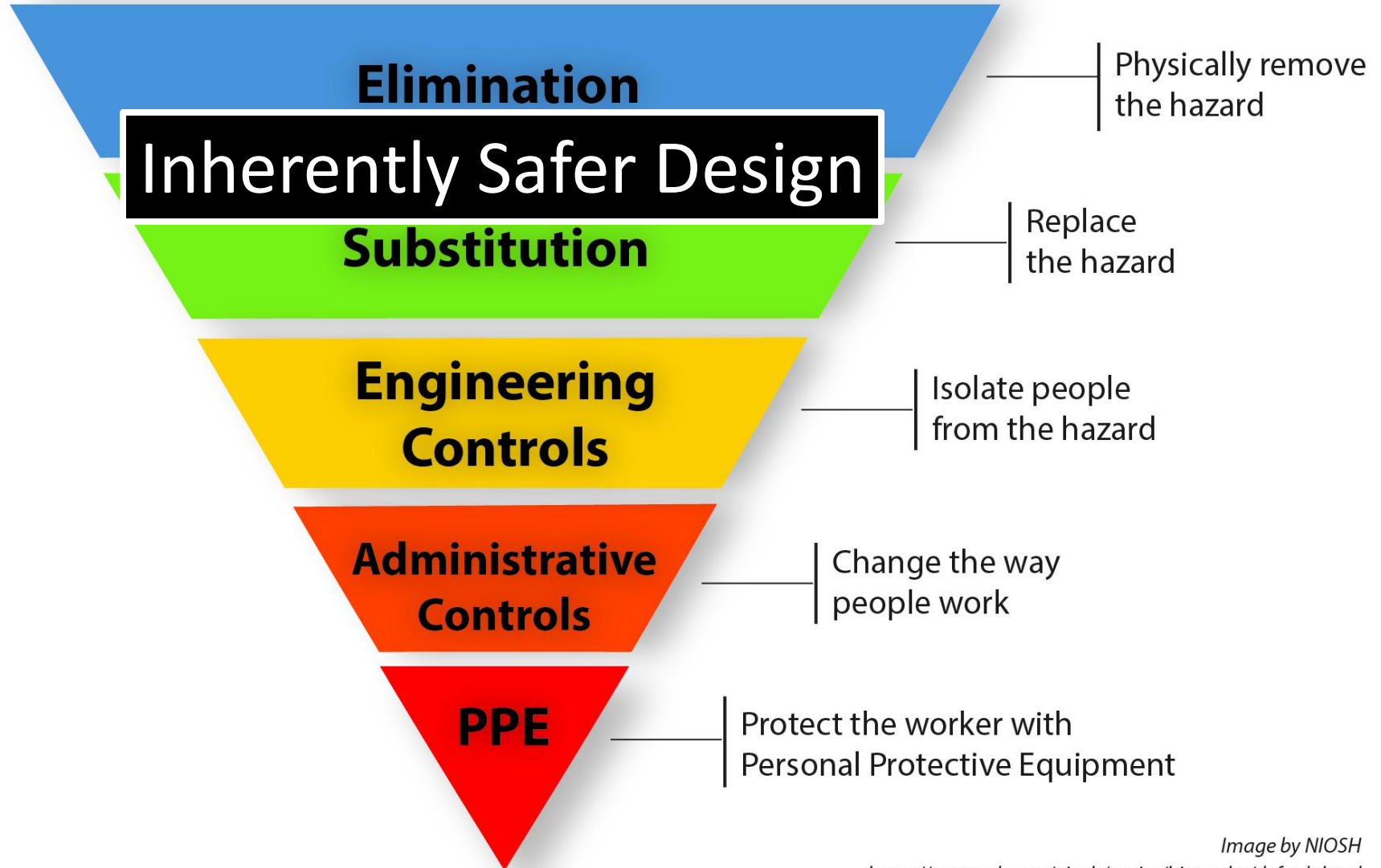


Image by NIOSH
<https://www.cdc.gov/niosh/topics/hierarchy/default.html>

What is Inherently Safer Design?



<https://www.pexels.com/photo/house-lights-turned-on-106399/>



<https://unsplash.com/photos/8ekQzUw7cT8>



<https://www.pexels.com/photo/brown-white-and-gray-houses-near-road-2816323/>



<https://www.freeimages.com/photo/tricycle-on-the-grass-1-1412217>

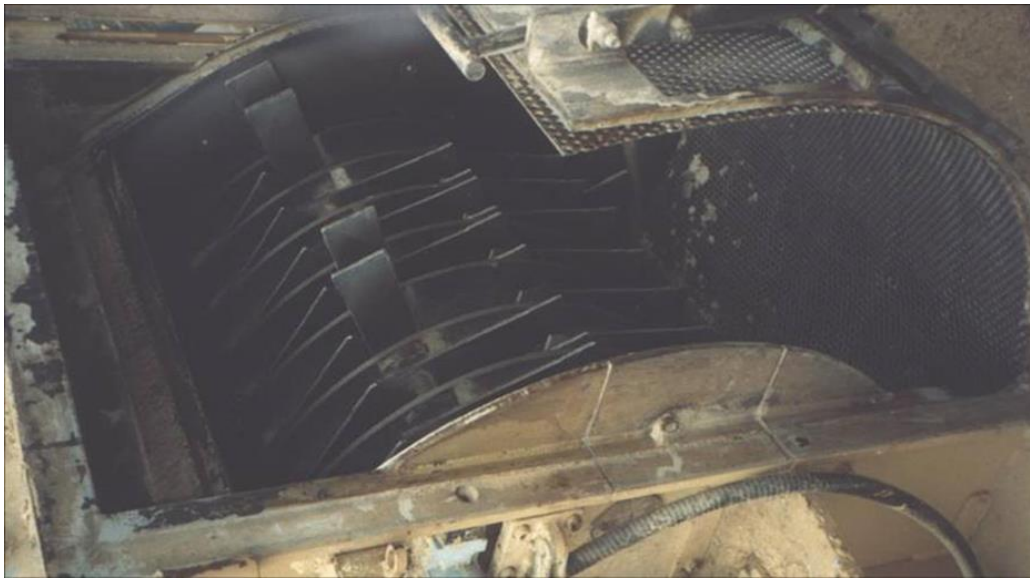
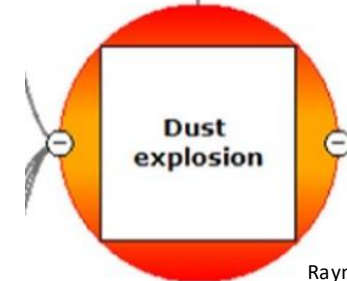
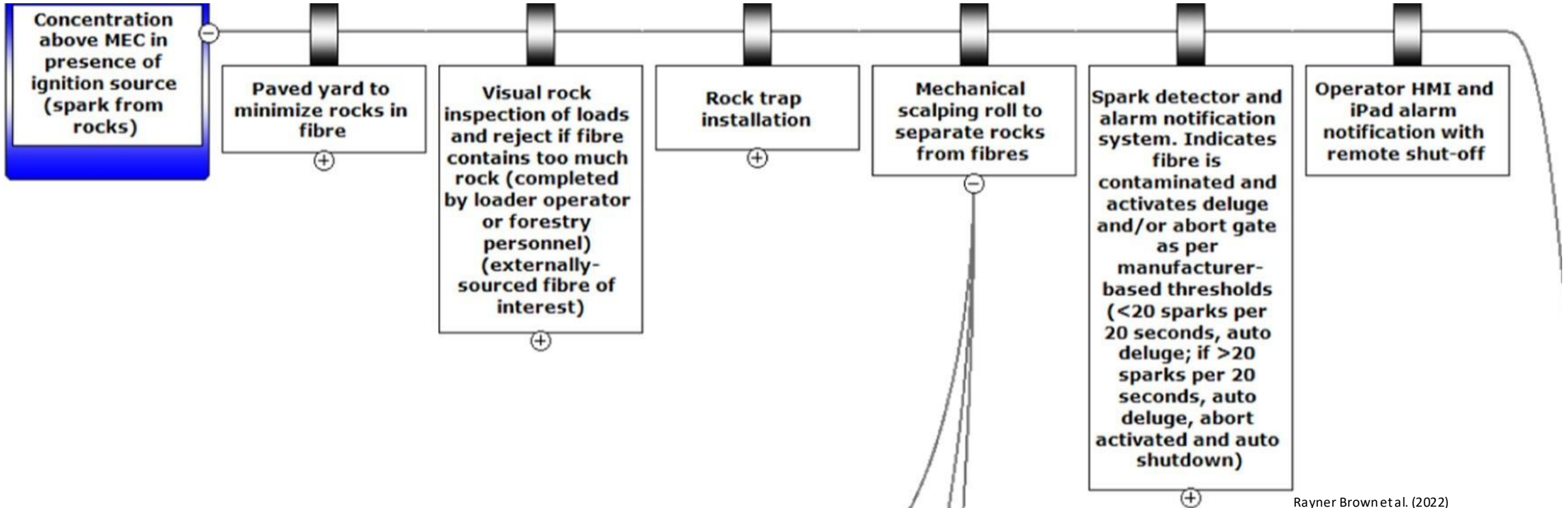


Photo: Paul Amyotte

Combustible wood dust in hammer mill

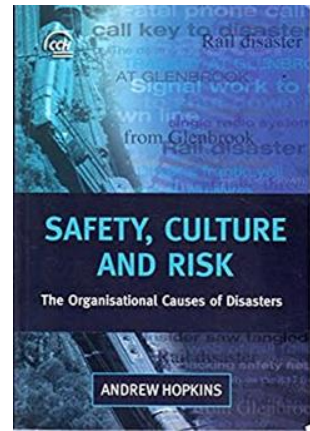


Rayner Brown et al. (2022)



Rayner Brown et al. (2022)

Safety Culture

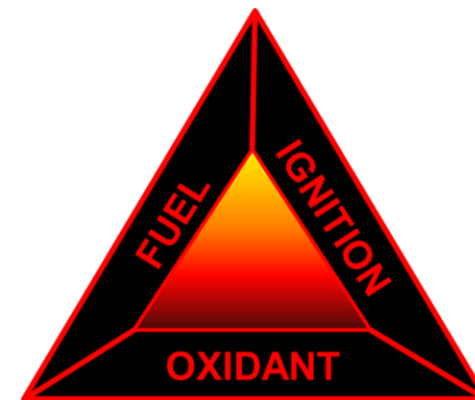


Hopkins (2005)

- Generally accepted definition: *the common set of values, behaviours and norms at all levels in a facility or in the wider organization that affect process safety*
- Provides the link between an organization's beliefs and prevention and mitigation strategies
- *In general, the problem is not that we don't know what to do, but rather that we do not always actually do what we already know how to do, and what we know we should do*

Hendershot (2015)

- Safety culture (Hopkins, 2005)
 - Reporting culture
 - Just culture
 - Learning culture
 - Flexible culture
- Risk awareness (Hopkins, 2005)
 - Avoidance of risk-denial
 - Including normalization of deviance



Credit: Paul Amyotte

Safety Culture Example

Content of safety committee poster aimed at promoting safety culture within the Department of Process Engineering and Applied Science at Dalhousie University

Reporting Culture	Just Culture	Learning Culture	Flexible Culture
We are working to foster a reporting culture ⁽¹⁾ by raising awareness surrounding incident reporting. All members of the Department should understand why to report, what to report, how to use the online reporting system, and what will happen once a report is made	We are working to foster a just culture ⁽¹⁾ by making safety responsibilities clear to all members of the Department and by responding to incident reports in an objective manner. Those reporting are thanked for bringing the incident to light and are consulted to develop a solution. Our incident investigation process is concerned with determining root causes, not finding fault with those involved.	We are working to foster a learning culture ⁽¹⁾ to ensure that all members of the Department keep educating themselves about safety best practices and learning from reported incidents. In addition to the annual Department Research Safety Day, we also arrange specialized training sessions for faculty, staff, and students. Let us know if you are looking for training in a specific area and we would be happy to point you in the right direction!	We are working to foster a flexible culture ⁽¹⁾ by encouraging all members of the Department to take ownership of safety. The combined expertise of technical staff, students, and faculty members can enhance safety-related decision-making processes.

Reporting Culture

Just Culture

Learning Culture

Flexible Culture

⁽¹⁾Andrew Hopkins, "Safety, Culture and Risk. The Organisational Causes of Disasters", CCH Australia Limited, Sydney, Australia (2005).

PROCESS SAFETY CULTURE

INTRODUCTION TO PROCESS SAFETY CULTURE

Process safety culture is the collective mindset of the organization with respect to safety and risk, including attitudes and behaviours.

Process safety culture is an element of process safety management (PSM). The CSA Z767 *Process Safety Management* framework is shown below; process safety culture is highlighted.



Process Safety Management Elements			
Process safety leadership	Understanding hazards and risks	Risk management	Review and improvement
Accountability	Process knowledge and documentation	Training and competency	Investigation
Regulations, codes, and standards	Project review and design procedures	Management of change	Audits process
Process safety culture	Process risk assessment and risk reduction	Process and equipment integrity	Enhancement of process safety knowledge
Conduct of operations — senior management responsibility	Human factors	Emergency management planning	Key performance indicators

CONSIDER PROCESS SAFETY CULTURE IN YOUR OPERATION

- Has process safety been formally identified as a core value at your facility?
- Do organizational policies include statements establishing process safety as a measure of successful operations?
- Are workers encouraged to raise (through supervisors or otherwise) concerns regarding deficiencies in the process safety system? Examples include failures in maintenance, failure of permit to work, safety system bypasses, and operating outside of safe operating limits.
- Are workers informed and encouraged that they have the responsibility and authority to initiate stoppages of unsafe work or operations?

NEXT STEPS FOR WPAC MEMBERS

Building on the research results of an Innovation at Work project (funded by WorkSafeBC), the BC Forest Council and WPAC will support operations for the implementation of PSM, which will involve activities focussed on outcomes including:

- A process safety culture survey to measure and track the effectiveness of your culture,
- A process safety culture self-assessment worksheet and action plan, and
- A process safety culture policy.

RESOURCES

[Process Safety Initiative](#) (WorkSafeBC)

[CSA Z767-17 Process Safety Management Standard](#) (CSA Group)

SELECTED PROCESS SAFETY CULTURE RESOURCES

Best Practice/Resource and Link
Transport Canada (2021). Example Safety Culture Policy Statement
Energy Institute (2023a). Hearts and Minds Safety Culture Toolkit
Energy Institute (2023b). Hearts and Minds Safety Culture: Chronic Unease Video
WorkSafe Queensland (2023): Safety Climate and Safety Culture Videos and Guides
CCHS (2011a). Safety Culture Survey Example: Baker Panel Report
Contra Costa County Health Services (CCHS) (2011b). Safety Culture Assessments Overview
Center for Chemical Process Safety (CCPS) (2021). Building Process Safety Culture Tool Kit: Tools to Enhance Process Safety Performance
HSE (2023). Organisational Culture: Guidance

The views, findings, opinions, and conclusions expressed herein do not represent the views of WorkSafeBC.

Concluding Thoughts

- One way to look at risk
 - *Take risks: if you win, you will be happy; if you lose, you will be wise* Anonymous (McCusker, 2008)
- Another way to look at risk
 - *Reduce risk to a tolerable level and responsibly manage the residual risk*
 - *Move up the hierarchy of controls as far as possible, making every attempt to rely less on procedures and devices and more on fundamental design principles*
 - *Take care of our people with personal leadership, setting clear and measurable expectations for safety performance*
 - *If we are not successful, society, our industry, and our companies will suffer to an extent that is uncertain for all parties*
 - *If we are successful, society, our industry, and our companies will prosper to an extent that is beneficial to all parties*

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