Process Safety Incidents Across 14 Industries
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Introduction
It is commonly misunderstood that process safety incidents only revolve around loss of containment events in the oil & gas, chemicals, and refining industries. However, the typical process safety incident definition is “an event that is potentially catastrophic, that is, an event involving the release/loss of containment of hazardous materials that can result in large-scale health and environmental consequences.”

Moreover, the identification and analysis of a wide range of incidents proves that such incidents are prevalent across a spectrum of industries. Through research, the contributing factors for process safety incidents were found to be similar across different industries.

Spectrum of Industries
1. Refining
2. Chemical
3. Oil & gas
4. Storage facility
5. Pipelines
6. Fertilizers
7. Agriculture
8. Pharmaceuticals
9. Fireworks
10. Manufacturing
11. Power plant
12. Mining
13. Food
14. Other

Methodology
Databases and resources:
- Chemical Safety Board (CSB) incident investigation reports
- BBC news articles
- CAEN articles
- Reuters reports

Research factors:
- Identify incidents based on the corresponding industry
- Time of incident
- Location of incident (Domestic and international)
- Number of fatalities and injuries
- Direct cause(s) of incident
- Factors of shortcomings leading to the incident
- Monetary damages (When available)
- Environmental damages (When available)

Through the thorough analysis of the research factors listed above, common shortcomings can be further recognized and addressed towards their corresponding industries. These specific “root causes”, also known as the underlying causes that ultimately led to the incidents are often shared between incidents of a multitude of industries.

Case in point, a total of 81 incidents across the 14 industries were reviewed, followed by a written summary of each incident based on the research factors listed above. This was paramount because there was seldom a high level of detail encapsulated within the reports by the media.

Therefore, through further study of the written summaries for each incident, a list of primary “contributing factors” was constructed to illustrate the most common root causes of process safety incidents.

Contributing factors:
1. Safety culture
2. Process hazard analysis (PHA)
3. Mechanical integrity
4. Emergency preparedness
5. Personnel training
6. Operating procedures
7. Preventative maintenance
8. Management of change
9. Work permit system
10. Regulations and regulatory oversight
11. Design factors
12. Human factors
13. Hazard awareness and identification
14. Facility siting

Analysis:
Number of Incidents per Region
- Asia, 27%
- North America, 56%
- Europe, 9%
- Africa, 3%
- Other, 5%

Occurrences during Incident Incursion
- Normal Operations, 69%
- Maintenance, 10%
- Shutdown, 3%
- Other, 14%
- Startup, 4%

Departments of Incident Incursion
- Storage, 22%
- Production, 47%
- Auxiliary systems, 14%
- Other, 17%

Results:
- Safety culture
- Emergency preparedness
- Preventative maintenance
- Management of change
- Design factors
- Hazard awareness and identification
- Facility siting

Conclusion:
- These findings indicate that catastrophic process safety incidents occur across a wide spectrum of industries.
- Common contributing factors that need to be addressed and improved are safety culture, emergency preparedness, and mechanical integrity.

References: