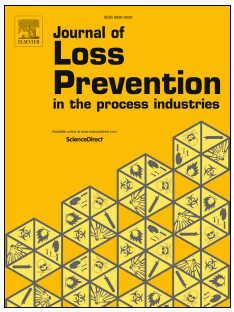
Accepted Manuscript



How can we improve process hazard identification? What can accident investigation methods contribute and what other recent developments? A brief historical survey and a sketch of how to advance

Hans J. Pasman, William J. Rogers, M. Sam Mannan

PII: S0950-4230(18)30032-9

DOI: 10.1016/j.jlp.2018.05.018

Reference: JLPP 3710

To appear in: *Journal of Loss Prevention in the Process Industries*

Received Date: 8 January 2018

Revised Date: 15 April 2018

Accepted Date: 29 May 2018

Please cite this article as: Pasman, H.J., Rogers, W.J., Mannan, M.S., How can we improve process hazard identification? What can accident investigation methods contribute and what other recent developments? A brief historical survey and a sketch of how to advance, *Journal of Loss Prevention in the Process Industries* (2018), doi: 10.1016/j.jlp.2018.05.018.

How can we improve process hazard identification? What can accident investigation methods contribute and what other recent developments?

A brief historical survey and a sketch of how to advance.

Hans J. Pasman*, William J. Rogers, and M. Sam Mannan
Mary Kay O'Connor Process Safety Center, Texas A&M University, College Station, TX 77843

ABSTRACT

Risk assessment is essential for various purposes such as facility siting, safeguarding, and licensing. Hazard identification (HAZID), which suffers greatly from incompleteness, is still the weakest link in risk assessment. Of course, this recognition is not new and many efforts have been spent to improve the situation, of which some have been rather successful. To find out what can go wrong, creative divergent thinking is required. Hazard identification should result in scenario definition. In that respect, applying the present tools as HAZOP and FMEA there is still a great emphasis on the material and equipment aspects. In contrast, underlying management and leadership failure in its many forms reflecting in organizational and human failure, due to complexity, attracts much less attention.

Unlike in HAZID, in accident investigation the occurrence of an event with nasty consequences is no doubt a fact, so there must be one or more causes and the traces will lead to them. Over the years, methods for accident and incident investigation have gone through a significant evolution. From the early-on simplistic domino stone model and the human operator always at fault, via models of latent failure due to failing management involvement and via extensive root cause analysis (RCA) to a system approach. Hence, in accident investigation, management failure appearing in the many possible forms of human and organizational factors, obtained already 30 years ago with the RCA technique much attention, while it nowadays culminates in the socio-technical system approach.

So, the question arises whether for improved HAZID we can learn from the accident investigation experience. In addition, safer design and advances from static risk assessment towards more accurate predictive operational dynamic risk assessment and management, will also be enabled by possibilities offered by big data and analytics. Digitization, automation and simulation, hence computerization, will be of great help in improving the identification of hazards and tracing the corresponding scenarios.

The paper reviews the developmental history of both accident investigation and hazard identification methodology; incidentally it will identify commonality and differences. On the basis of the comparison and of recent advances in computerization, the paper will investigate to what extent beneficial modifications and additions can be made to obtain a higher degree of completeness in HAZID.

Keywords: Accident-incident investigation; hazard identification; causation; system approach

* Corresponding author.
E-mail address: hjpasman@gmail.com (H.J. Pasman)