**Operational Risk Assessment and Management in Process Facilities**

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**Abstract**

Chemical processes involve handling of hazardous chemicals which on release may potentially cause catastrophic consequences. In spite of using numerous end-of-the-pipe safety systems, tragic accidents such as Texas City refinery, Richmond refinery still continue to occur. One of the main reasons of such rare but catastrophic events occurrence is lack of effective monitoring and modeling approaches that provide early warnings and help to prevent, control or at least mitigate.

There are many methods to assess the risk of accident scenarios in the process industries. Each method consists of different steps and follows a specific procedure. Accident probability estimation is a common and central step to all these methods. Probability of low frequency high consequence accidents is not well supported by conventional statistical methods due to data scarcity. Thus, accident precursor analysis has been proposed as effective method to deal with such accidents. Here, a major accident is modeled as a sequence of failures and near misses, the probabilities of which can be obtained from a variety of sources. These probabilities are then integrated via risk assessment methods to obtain the risk profile. The estimated risk profile is updated continuously as new operational information made available. This approach is termed as operational risk assessment. It is a novel approach as it integrates failure-updating mechanism as plant operates with the potential consequence if such failure occurs. The implementation of this methodology to the Texas City incident proves that the approach has the ability to learn from near misses, incident and past accidents and predict event occurrence likelihood in the next time interval. This likelihood transformed into risk factor, which may be used for effective decision-making.

This presentation discusses details of operational risk assessment using early warnings often termed as accident precursors. Operational accident scenarios are modeled using Bow-tie approach. Real time operation data is used to update the failure probabilities of key elements is operation. Updated probabilities are integrated with potential consequents to assess real time operation risk. The usefulness of risk assessment methodology is demonstrated using case study. The case study highlights the applicability and advantages of the proposed method in process operation risk management.

**Bio-brief**

Dr. Faisal Khan is Professor and *Vale* Research Chair of Safety and Risk Management. He is also Chair of Process Engineering Discipline and Oil & Gas Engineering Board of Studies at Faculty of Engineering & Applied Science, Memorial University, Canada. His areas of research interest include: safety and risk engineering, inherent safety, risk management, and risk-based integrity assessment and management. He is actively involved with multinational oil and gas industries on the issue of safety and asset integrity. In 2006, he served as risk and integrity expert with Lloyd’s Register a risk management organization. He also served as Safety and Risk Advisor to Government of Newfoundland, Canada, Llyod’s Register EMEA, SBM, ABS, Qatargas and others. From 2008-10, he visited Qatar University and Qatargas LNG Company as Process Safety and Risk Management Chair. In 2013-14 he served as Associate Dean (globalization) at AMC, University of Tasmania, Australia. Where he lead development of offshore and risk engineering group and initiative of global engagement related to research, teaching and learning. He has authored over 300 research articles in peer reviewed journals and conferences on safety, risk and reliability engineering. He has authored five books on the subject area. He is Editor to Journal of Process Safety and Environmental Protection, and Journal of Process Engineering. He regularly offers training program/workshop on safety and risk engineering in different places including St John’s, Chennai, Dubai, Beijing, Aberdeen, Doha and Kuala Lumpur.