

Smart Approaches to Process Safety risk Management in Tank Terminal Operations

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We well understand the nature and scale of risk associated with large scale and concentrated storage of bulk hazardous substances. Incidents such as Buncefield in the UK in 2005 and Carribbean Petroleum Refining explosion in 2009 illustrate the catastrophic consequences of a loss of containment. Terminal storage located in estuaries and coastal sites pose a special risk to protected marine environments. So the combined pressure of protecting people and the environment comes with the territory of managing any large scale terminal facilities. Fortunately, few operators have ever experienced a catastrophic accident but one thing I have learnt is that the past is not a good predictor of the future when it comes to risk management.

The challenge is that against this background of complexity and potential catastrophic harm if operations are not managed well the hazardous properties of materials, substances and energy never take any time off to allow us to figure out how to contain and manage the associated risks. So the hazard has no regard for the complexity we apply to risk management.

So what are the big lessons to learn about risks from terminal storage operations over the last 20-30 years?

The most important point is that we know how to effectively manage such catastrophic risks by implementing a process safety management system. But major catastrophic accidents keep occurring, so what are the factors that we all should pay attention to?

The second big lesson is that it's not the technology that lets us down. There have been major improvements in plant design, integrity and asset management in the last 20-30 years. This includes secondary and tertiary containment to keep large spills confined and recoverable in the event of a major tank failure. Safety instrumented systems that are the guardian of safe operations and level control have seen a significant reduction in the risk of tank overfilling – which was at the core of what went wrong at Buncefield.

The complexity and the sheer scope of safety issues can be the enemy of effective risk management in modern process plant and installations. But not all safety systems contribute equally to risk reduction or safety performance and people are now the critical and vulnerable factor. Few terminal operating companies have the luxury of high manning levels, spare human resources and a workforce with many years of experience. Lean operations and contracting out support and maintenance is common place. So operational and maintenance errors based on inexperience or lack of a fundamental understanding of process safety risks is likely to form the trigger for the next big incident.

Sitting alongside this front line weakness in process safety management is a lack of thorough understanding of the principles of process safety management by senior managers and executives. Organisations soon become over reliant on a few safety specialists who hold the key knowledge and

information about process safety and how all the safety system components fit together to deliver safe outcomes. Without the appropriate degree of competence in process safety management effective decision making at senior management level can become blinded to the potential impacts that critical decisions and actions can have on process safety integrity. A classic example of this was at BP Texas City Refinery where a blanket maintenance cost reduction exercise led to neglect of critical process safety control measures. Similar circumstance occurred at Buncefield but this time it was organisational complexity and lack of clear responsibility that led to such neglect.

The reason why incidents keep occurring in my view lies in an inability within organisations to identify key ongoing operational and maintenance tasks that contribute the greatest to sustainable safe operation and to then to rigorously focus on ensuring that these are undertaken the way they were intended. The converse is also true – neglect the most vulnerable parts of risk management and a disaster is bound to occur at some point. The old adage that you are only as good as the weakest point holds true for catastrophic risk management. And the weakest part is now obviously the human input to risk management, not the hardware or safety instrumented systems. So many incidents I have investigated have been as a result of a single critical mistake made by an individual responsible for a key part of safe operations or maintenance or from a critical error made during risk assessment or say authorisation of a plant change or issuing a permit to work. Yet when senior managers discover such failings there is disbelief because a safety management system existed on paper and had been implemented at some time in the past within the business. Unfortunately, such failures arise because so little attention is given to see that the systems continue to deliver the intended outcome long after they are first designed and put in place.

Delivering the right safety and environmental protection outcomes involves people at all levels within an organisation from senior executives, managers and operational staff. Safety cannot just be the responsibility of a small dedicated professional team, we all have to 'Get on the Same Page' and get involved in the same way because the hazards are always on the same page and always present, no matter how inconvenient this is for us. Confusion, misunderstanding and misaligned priorities can all lead to catastrophic consequences. The hazards and the safety risks will all still be present whether or not those involved in controlling these risks all have the same focus.

Given this backdrop of criticality and vulnerability in key operational and maintenance tasks there are now developing good techniques and methodologies using bow tie analysis to undertake risk profiling and to identify those aspects of process safety risk management which contribute the greatest to the prevention of a major incident but which are also those most vulnerable to failure. These techniques have been applied successfully within the bulk storage terminal sector with surprising results. Such clarity of focus has helped business to focus on what really matters and to scale back activities which are less liable to fail. This saves costs and also provides an ability to respond quickly to early signs of failure within complex systems.

I am convinced that this clarity of focus holds the key to a much smarter approach to process safety risk management.

Ian Travers, January, 2016