ABB discuss the importance of Scenario Development and Consequence Likelihood Ranking (CLR) as part of COMAH Report development.

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Confused about COMAH?

Representative set of MAH – the starting point

In a previous post my colleague Sarah Bickerstaffe discussed how to define a representative set of Major Accident Hazard scenarios for the purposes of a COMAH Safety Report submission. The Representative Set of Major Accident Hazards (MAH) Scenarios is a list of hazardous events with the potential to cause harm. This list can provide the foundation from which an Upper Tier COMAH Safety report is constructed.
This list, referred to as the “Rep Set”, should be a representative summary of the entire site and therefore include a variety of MAHs which reflect “what could go wrong” for all sorts of processes and equipment across the site – see Figure 1.

**Figure 1: Producing a Representative Set of MAH Scenarios from historical site hazard identification data**

So taking that a little further, now you have established a list of MAH scenarios that reflect all of the operations across your site, what do you need to do with it in order to satisfy your regulatory goals but also importantly and often missed, how can this be used to produce something that is useful in your ongoing operations.

**Scenario development**

The basics are straightforward enough in that you carry out appropriate consequence modelling using recognized tools to give hazard ranges for fire, explosion and toxic gas hazards in order to establish the potential level of harm due to the unmitigated event. You then carry out some form of frequency assessment using historical records, LOPA (Layers of Protection Analysis) or fault tree analysis to give you a mitigated event frequency. Put these together and you have your risk ranking that can be plotted on a suitable risk matrix.

In a COMAH submission you are expected to include the ‘worst case’ event on your facility. This often takes the form of a catastrophic vessel rupture due to, for example a runaway reaction, BLEVE (Boiling Liquid Expanding Vapor Explosion) or cold catastrophic failure. By their nature these are generally very low frequency events, so even though the potential severity of the consequence is high, when coupled
with a very low event frequency this means the overall risk is generally very low. It is important to understand these events in terms of a COMAH submission. Ask yourself the question “Does it provide you with useful information for your day to day operations?” If you have established that you have all of the necessary controls in place to meet relevant good practice then the answer is probably no. This is where scenario development comes in.

Taking the catastrophic event and working back, what other scenarios are relevant? Perhaps a leak from the vessel, or an overpressure that causes a relief device to lift or place a demand on a protective system. By looking at potentially lower consequence events then you start to encounter events that could reasonably be expected to occur within the lifetime of a plant. Their consequence potential is lower but their frequency is higher so quite possibly their overall level of risk when plotted on a risk matrix may be higher.

**Consequence Likelihood Ranking (CLR)**

The following risk matrix (Figure 2) is taken from a typical site and it shows a range of events from small leaks resulting in category 1 or 2 consequence events (minor injury), through to major leak category 4 (single fatality) and catastrophic vessel failure category 5 (multiple fatality). Focusing on the category 5 multiple fatality events means you are spending time on a small population of events and possibly missing the bigger picture of what could go wrong.

![Risk Matrix](image)

*Figure 2 Risk Matrix*
Benefits of CLR

So why look at these lower consequence/higher frequency events? It's because the underlying causes and weaknesses in control and prevention systems are likely to be very similar to those associated with the catastrophic events. In addition, there is a much larger population of scenarios through which trends and learning points can be drawn including clear identification of the Basis of Safety (BoS). Understanding and rectifying these weaknesses is likely to bring benefits to the majority of scenarios across the board.

Furthermore, training of personnel and understanding the process hazards on a site becomes more realistic. Rather than attempting to focus on a catastrophic Major Accident Hazard event, that too many seasoned operating personnel would seem 'non-credible', focusing on a smaller but 'more credible' event would bring a greater degree of realism to the assessment so provide more chance to embed learning.

In summary

We spend a lot of time, effort and money on COMAH Safety Reports. It would be a shame if all that effort is seen as an intellectual exercise that is then left on a shelf for the next 5 years gathering dust. The COMAH Safety Report must be made to work and repay the cost it took to write it in the first place. By developing a range of scenarios from worse case events through to smaller and more likely events, this allows useful learning to be extracted and communicated to both technical and operations personnel at all levels in an organization.

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For further information see ABB COMAH support