

# Pitfalls observed following 20 Years of Layers of Protection Analysis use

Layers of Protection Analysis (LOPA) has become the default methodology for Safety Integrity Level (SIL) determination since the publication of the guidance from the AICHE CCPS in 2001.

The completion of LOPAs over many years have revealed some interesting results. The common pitfalls observed can be categorised into two main areas:

- 1) Preparation
- 2) Technical issues

## Preparation

The old saying is very valid in running LOPA studies 'Fail to prepare, prepare to fail.'

1. The timing of LOPAs is crucial, if you have not completed a review of the process hazards using something like HAZOP then when the LOPA session is completed there can be opportunity to downplay / exaggerate the consequences. The result is that you end up with many actions to work out the consequence, reworking assessments once the outcomes are known or leaving the assessment incorrect and not meeting tolerability for the system.
2. Risk Targets – these are set at the corporate level so asking a support organisation such as 'RPS' what should our targets be is an open-ended question. Of course, we can work with customers to develop the targets in line with current guidance. This cannot be done at the beginning of the LOPA session. The targets being incorrect can lead to issues with regulatory authorities. In addition, insufficient protection maybe provided leading to incidents occurring causing harm to people and the environment more often
3. People – Trying to run the session with the incorrect composition of experience within the team for the system in question also means you may end up with the incorrect assessment. Make sure you schedule a multi-discipline team which sufficient experience to attend the sessions (preferably away from the work front so fewer distractions can occur).

## Technical Issues

The correct preparation allows the continuance of the study. The next concern is the correct application of the LOPA methodology. Traceability and justification are key to a robust LOPA session and findings.

4. Initiating Events – using a standard cookbook of figures is commonplace. However, you need to confirm the history of the equipment in use on the area under review. The default might be a 1 in 10-year event but if you see problems every 3 months you are going to demand the protections to work more often than assumed and may end up with a hazardous situation more often. Therefore, having the correct confirmation in the session means that the validity of the assessment would be confirmed.
5. Independence – The publication of IEC 61511 in the second edition clarified the requirements of basic process control (BPCS) protections, that they need to be independent in the entirety including the CPU. Allowing two protections in BPCS has been in the standard since its inception in 2004. Pressure relief systems can often be mis-allocated too, if the relief valves are 50% capacity each then the two should be one protection considering that either of them can fail, a common cause could render both inoperable therefore not providing the quoted risk reduction. Commonly in this case people have taken a credit for each one without considering the capacity and any common cause effects. The check needs to be conducted for all protections with the Initiating Events and the proposed safety function. Not completing this check results in the achieved mitigated event frequency to be reduced and potential that the system is not tolerable. Make sure you include your reasons for the claims to support these checks.
6. Condition Modifiers – These are generally non-engineered measures such as 'chance someone is present' commonly called occupancy. The use of these needs to consider real life data. If you claim 10% of the time someone could be present to be harmed, then make sure you understand why people would attend the area and how long for. It has been observed where incorrect modifiers have been used, for example, chance someone is present for environmental hazards.... the environment is always there. Once again make sure you justify the reasons for selection of data.

Hopefully this brief article has provided some areas to consider when conducting / reviewing your LOPA assessments.

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