

INTRODUCTION TO SESSION ON HAZOP: PUTTING HAZOP IN CONTEXT

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There are four papers on Hazop in this session. In his paper David Limb summarises the history of Hazop. It is over 60 years since it was developed in ICI and it is now widely accepted. Many people, including our authors, have developed and described ways of reducing the time and effort involved. They have described these in their papers and there is much to be learned from them. They have also noted that in some companies Hazops have deteriorated into formalities, as the teams lack the necessary knowledge and experience to carry them out. Our authors also point out that some companies save time by looking only for safety problems and ignoring inefficiencies. Yet from the start Hazops have usually found more operating problems than safety ones, quite enough to pay for the cost of a Hazop.

Taken as a whole the four papers agree that Hazop is a valuable technique and that its cost in time and money is repaid in the long run. In this Introduction I will try to put Hazop in context, that is, show it fits in with other studies.

Two of the four papers mention the six process hazard reviews that ICI Mond Division used to carry out on each project. They were:

1. A review of the obvious major hazards such as flammability and toxicity.
2. A review of other hazards that come to light as the process design develops, carried out before the process design is passed to the mechanical engineering team for preparation of the line diagram.
3. Hazop: carried out when the line diagrams are complete, it finds the hazards and operating problems that have not been foreseen so far as they can be found only by systematic and detailed study of possible deviations.
4. Construction.
5. Pre commissioning.
6. Start-up.

Later two, more reviews were added;

0. What product should we make, what process should we use and where should we put the plant.
7. Demolition. (No thought was given to this when the early nuclear reactors and processing plants were designed and as a result the costs of demolition are enormous.)

There is an importance difference between Reviews 0–2 and the Hazop. In a Hazop we ask if deviations from the design conditions are possible and harmful and, if so, how can we prevent them or guard against the

consequences. In the earlier studies we consider whether alternatives are possible and desirable. For example, in a Hazop we ask if more pressure is possible, if the effects on safety and efficiency could be harmful and, if so, how can we prevent more pressure or mitigate the consequences? In reviews 0–2 (perhaps reviews 1 and 2 can be combined) we ask if more pressure might be a better design.

While Hazops are widespread only a few companies carry out the earlier reviews. Few carry out reviews 1 and/or 2 and fewer still carry out review 0. The thought of more reviews horrifies many engineers but the earlier studies are far less time-consuming as there is less detail to look at. And the pre-Hazop reviews can result in a better design and a shorter Hazop. The earlier reviews, especially number 0, are essential if we want inherently safer designs, that is, to avoid hazards rather than keep them under control. By the time we get to the Hazop, we can install inherently safer items of equipment, such as a heat exchanger with smaller hold-up, but it is too late for fundamental changes. A great nuisance in a Hazop is someone who keeps saying that we are making the wrong product in the wrong way at the wrong site. He says it then because he had no opportunity to say it earlier.

In reviews 1 and 2 many of the usual Hazop questions can be asked but in review 0 different questions are necessary. There are some suggestions in (Kletz, 1998).

Reviews 1 and 2 are sometimes called the Hazid studies. However, Hazid is also the name of a computer program that identifies the significant deviations that the team will have to study. This program can speed up Hazops. To avoid confusion I suggest that we do not use the abbreviation HAZID but spell “Hazard Identification” in full (or find another abbreviation).

Hazop was developed in the early 1960s at a time when many changes in process safety, and also in “hard hat safety”, were being made (Kletz, 2009). Many minor improvements have been made since then. I would like to recommend a major change, not to Hazop itself but to its context. In many design organisations responsibility for a project is passed on from one group of people to another. The research chemists develop a process and then pass it on to the process design group who blame the chemists for their ignorance of what is practicable. The project parcel is then passed to the mechanical engineering company or department who develop the detailed design while the electrical, instrument and other specialized groups add their contributions. The parcel then passes to the construction team and finally to the team who will

start up and operate the plant. These different teams may be in different buildings or places and may rarely or never speak to each other.

Many accidents and operating problems have arisen as a result of such “pass the parcel” organisation (Kletz, 2007). To avoid these problems representatives of all the various groups should meet regularly as the project progresses. Each group is then able to suggest changes that will make the design easier for them and can comment on features which will increase their costs. Everyone will gain some knowledge of other groups’ problems.

REFERENCES

- Kletz, T.A., 1998, *Process Plants: A Handbook for Inherently Safer Design*, Taylor and Francis, Philadelphia, PA., Section 10.2.
- Kletz, T.A., 2007, Don’t pass the parcel: accidents that would not have occurred if those involved had talked to each other, *Proceedings of the Mary Kay O’Connor Process Safety Center Annual Symposium*, College Station, TX, 23–24, October.
- Kletz, T.A., 2009, ICI’s contribution to process safety, this Symposium, Session 1.