Is Risk Analysis a Useful Tool for Improving Process Safety?

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Abstract

Many will answer the question whether risk analysis contributes to safety is that the methodology may be useful to satisfy authority or regulator but as a tool it is impractical. The results are not reliable and are not helping to make a plant or a transportation activity with hazardous materials any safer. It also requires a non-negligible amount of resources. So, can we skip as a tool and rely fully on methods such as HAZOP and LOPA?

Answer to the above question is that we cannot, since these methods though very useful, do not provide a full and complete picture of all hazards and certainly do not provide information on the intensity of the consequences of a mishap depending on distance to the risk source. Such overview is essential for optimizing facility siting and plant lay-out. Moreover the demand for making a risk inventory on activities involving hazardous materials is growing as space gets more scarce, population density is on the increase, certainly near industrial and harbor areas, while risk aversion grows at the same time too. Traffic intensity increases as well as the amounts of materials produced and shipped; on top of that operations get more complex due to more severe requirements. Hence we shall need risk analysis methodology and we have to improve existing tools. The paper will analyze what sources of uncertainty are obscuring the clarity of outcomes and summarize various aspects where considerable improvement can be made. It will thereby focus on:

- Making hazard identification methods more complete and reproducible, i.e. less dependent on the persons doing it
- Improvement of consequence analysis accuracy and providing confidence limits on results of calculations
- Delimiting uncertainty in failure rates and taking into account the effects of time

This will be performed partly by reviewing literature, for a (small) part by developing new thoughts, and by making future projection. More particularly it will examine relatively new models for hazard identification, deficiencies but also progress in modeling source terms, physical effects as dispersion and damage, as well as the important role of reliability engineering in a chemical environment. The latter will take uncertainty and dynamics by e.g. wear and corrosion into account, quality of maintenance in which human factor and management effectiveness are reflected.

Risk analysis can be also a powerful tool in the hands of business management when we succeed to value risk realistically and ethically justified enabling cost-benefit analysis to aid decision making.

Where there is a risk, a situation lacks safety. Thinking risk will therefore result in thinking safety, although everything has its limits.