

# Half-day HAZOP Training for Team Members – A Practical Approach



by Engr. Dr Chong Chien Hwa

CHEMICAL ENGINEERING TECHNICAL DIVISION

**IR.** Razmahwata bin Mohamad Razalli recently conducted a Hazard and Operability Analysis (HAZOP) workshop at Wisma IEM, Petaling Jaya. He holds a Master of Engineering degree from University of Cambridge, and had previously worked at Exxon Mobil, IGL and Pöyry. Currently, he is the Director of Synergy Oil and Gas Engineering Sdn. Bhd.

During this event, Ir. Razmahwata shared his 17 years of experience in the oil and gas industry with the participants with the focus on issues related to HAZOP. He is a TÜV Certified Functional Safety Engineer, TÜV Certified PHA-HAZOP leader, HAZOP, HAZID and SIL Facilitator.

The objectives of this workshop include familiarisation with the concept of risk, theory behind HAZOP, HAZOP workshop process, defining expectations as to what HAZOP will (or will not) provide, understanding the expected HAZOP deliverables, providing participants the opportunity to participate in a HAZOP exercise in a safe environment and the sharing of HAZOP experiences amongst them.



Attendees participating in the HAZOP workshop



The HAZOP role playing game was facilitated by Ir. Razmahwata and Mr. Mohd. Kamal Izham

The workshop started punctually at 9.00 a.m. with an introduction to the process of hazard analysis. The speaker started the event by defining risk as a product of the probability or likelihood of a hazard resulting in an adverse event ( $p$ ), times the severity or the consequence of the event ( $c$ ), where  $R=f(p,c)$ . He claimed that it can be dividedly assessed, either qualitatively or quantitatively.

Under the qualitative method, participants were taught to identify risk by referring to the risk matrix which is useful for decision making or for planning of budget, as a low risk scenario may involve a very severe outcome such as multiple fatalities and significant environmental impacts. In terms of quantitative assessment, values and tolerable or non-tolerable risks are measured based on the frequency and target mitigated event likelihood (TMEL), respectively.

Then, he introduced process hazard analysis (PHA), which is a set of organised and systematic assessments of potential hazards associated with an industrial process. PHA typically addresses the hazard of the process, identification of incidents with the likely potential for catastrophic consequences, engineering and administrative controls applicable to the

hazards and their interrelationships, consequences of failure of engineering and administrative controls, especially those affecting employees, facility siting and human factors and the requirement to promptly resolve PHA findings and recommendations. PHA can be assessed through quantified risk assessment (QRA) and qualitatively where specific numerical values are associated with risks. This assessment is important before the startup of the plant.

Hazard and Operability Analysis (HAZOP) is one of the qualitative assessments of PHA. The speakers spent one hour explaining the principles followed by examples to all the participants regarding the HAZOP methodology related to selection of guide word, application of guide word to its parameter, identifying causes and consequences of deviation, providing and deciding whether or not the existing engineering and safety systems could cope with the consequences of the deviations, and some recommendations.

After the tea break, the speaker spent about 30 minutes to share his experience related to HAZOP session management. Participants were informed by the speaker to use Piping and Instrumentation Diagram (P&ID) to identify and mark the HAZOP node. He explained that an experienced HAZOP facilitator would be elected to be the person in-charge of identifying study nodes before leading team members to perform HAZOP analysis. Some questions were raised by participants regarding the use of the process flow diagram (PFD) instead of P&ID.

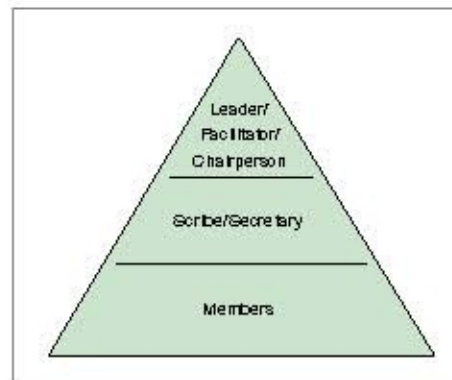


Figure 1: HAZOP Team Structure

In addition, Ir. Razmahwata explained that PFD is not a correct source of references as it lacks information such as design pressure and temperature, isolation, minor process or utility lines and control loops. Further to this, he showed all the participants regarding the team structure in which HAZOP review should be performed. Figure 1 shows a typical HAZOP team structure.



A group photo of the speaker with all the participants

This workshop ended with a HAZOP role playing game facilitated by Ir. Razmahwata bin Mohamad Razalli with the assistance of Mr. Mohd. Kamal Izham of Berwanger. ■

Engr. Dr Chong Chien Hwa is currently the co-opted member of IEM Chemical Engineering Technical Division (CETD). He is the Programme Director of Chemical Engineering at Taylor's University.