



Half day seminar on HAZOP and Sustainable Design with Process Integration

by Ir. Assoc. Prof. Dr Chong Chien Hwa & Ir. Prof. Dr Dominic Foo

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A half day seminar on HAZOP and Sustainable Design with Process Integration was organised by Chemical Engineering Technical Division (CETD) on 21 Jan 2018. The seminar was delivered by Ir. Razmahwata Mohamad Razalli and Prof Ir Dr Dominic Foo. Ir. Razmahwata is the Director of Synergy Oil & Gas Engineering Sdn. Bhd. He have 17 years of experience in oil & gas industry, TÜV certified functional safety engineer and PHA-HAZOP leader. Ir. Professor Dr. Dominic Foo is the Professor of Process Design and Integration at the University of Nottingham Malaysia Campus. Ir Prof Dr Foo is the Chief Editor for Process Integration and Optimisation for Sustainability (Springer Nature), and Subject Editor for Process Safety & Environmental Protection (Elsevier). He is the winners of the 2009 IChemE Innovator of the Year Award, 2010 IEM Young Engineer Award, Outstanding Young Malaysian Award 2012, 2013 Society of Chemical Engineers Japan (SCEJ) Award for Outstanding Asian Researcher and Engineer, and Top Research Scientist Malaysia 2016.

The HAZOP seminar started at 9 am. Ir Wata covered the topic related to concept of risk, implementing safety into design, PHA process and implementing safety into operations. In the introduction of risk, the speaker discussed about the safety consequences and target mitigated event likelihood (TMEL) magnitude. In addition, he showed the participants risk matrix tools used to depict risk and assist in the decision making process. In safety design, inherent and engineered approaches were discussed. The, he start to talk about HAZOP, which is part of the Process Hazard Identification (PHA). The speaker claimed that most problem (HAZARDS) are missed because of the facility (system) is complex rather than the lack of knowledge of the design team and participants must use P&ID as the base documents for HAZOP. Table 1 shows the selection of guideword, parameter, deviation, cause, consequence and safeguard example for a downstream PSV sized for blowby case is discussed. Further to this, example related to Proposed Olefins Dimerization Unit were discussed in detail. The speaker ended the seminar around 11am by recommending useful references to the participants.

Table 1: Example of a HAZOP methodology

Guide Word	Parameter	Deviation	Cause	Consequence	Safeguard
Less	Level	Lower Level	LCV failure	Loss of NPSHA Gas Blow-by Inadequate Separation	Low pump suction pressure trip Low level trip

Prof Ir Dr Dominic Foo started his talk on “Sustainable Design with Process Integration” at 11.15 am. He firstly introduced the concept of sustainability, as one of the main agenda for 21st century engineers. Next, he introduced a widely accepted design technique known as *process integration* to the participants. Back in the 1970s, process integration was developed for systematic design of heat recovery system for process plants. It was then extended into mass exchange network for waste reduction in late 1980s, and further into various material recovery networks in the 1990s. The established branches of process integration techniques for waste reduction include water minimisation, hydrogen network and property integration. The speaker then introduce the *material recovery pinch diagram* (MRPD) which can be used to set performance targets in designing a waste recycling systems. For a water minimisation problem, MRPD allows the designer to know how much waste material (e.g. wastewater, hydrogen, etc.) can recovered for use in the process, thus identifying the minimum fresh resources (water or hydrogen gases) to be purchased external. This reduces both fresh resources and waste generation for a process, as well as reduced operating cost. The speaker then introduce a technique where the material recovery system can be designed to match the fresh resource targets. The section ended at 1.15 pm.



Participants during the session