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Hazard Identification during Simultaneous Production and Drilling at Bayan-B Platform

Nur Liyana Shafie[1,*], Roslina Mohammad[1]

[1] Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, 54100 Kuala Lumpur, Malaysia

ABSTRACT

This paper aimed to reduce the risk at the BYDP-B platform by performing risk control. The main objectives of hazard identification are (1) to identify and assess all potential hazards, including Major Accident Hazards (MAH) with the potential to affect personnel, the environment, assets, reputation, and surrounding effects on the facilities, (2) to identify causes/ threats, potential consequences and safety measures that are in place or to be implemented to reduce the risk to persons, asset or the environment arising from those hazards, (3) to identify a safeguard proposed into the design that will aid in reducing the severity of consequences in a threat, (4) to assess risk level for high, medium or low based the frequency or likelihood of the hazardous event and the consequence of the event against personnel, environment and assets and, (5) to identify any recommendations or risk reduction measures required to help reduce the risk if it is assessed that the engineering controls are insufficient relative to the severity of the threat. Latest or modern technologies in designing a complex platform will lead to the systematic method to identify the hazard. Hazard identification (HAZID) is a technique for identifying potential hazards and threats early and can be categorized as Conceptual HAZID and Detailed HAZID. The importance of HAZID is the first activity of identifying and assess all the critical hazards. Therefore, it will provide safe and cost-effective design engineering with the lowest cost of change penalty. Generally, petroleum and natural gas demand had increased progressively in the years, business of SIPROD industry is flourishing, and hence need a safety guideline to be developed. Safety operating guidelines are not new for an HSE study in the SIPROD industry since a Deepwater Horizon accident has shocked the entire world. This is important as although all HSE hazards have been notified, the injuries and near-miss accidents also still happen at the SIPROD platform.

Keywords:
Bayan Drilling Platform, Hazard Identification, Effect Management Process, Risk Assessment and Risk Control, Process Hazard Analysis, Simultaneous Operations, Simultaneous Production, Drilling

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1. Introduction

Simultaneous production and drilling activities in Malaysia's offshore involve the concurrent implementation of two or more hazardous operations such as drilling and production. This definition shows that drilling and production consist of hazards that need to be controlled. Several incidents and severe accidents have been reported few years while performing drilling activities and associated operations due to the unpredictable nature of the simultaneous operation. During simultaneous

* *Corresponding author.*
E-mail address: nurliyanashafie@yahoo.com.my

operations, risks and the probability of failure are substantially higher than in non-simultaneous activities. The reason normally increases in the number of personnel, more personnel are concentrated on the same area, jobs are carried out which require interaction and coordination with each other, the value of the assets involved may be higher, the line of command may be more complex, non-routine activity and the entire operation is exposed to the combined probability of failure of each activity.

SIPROD (Simultaneous Production and Drilling) conducts simultaneous production and drilling activities at one phase and occurs at one location, as shown in Figure 1 SIPROD overview. With the addition activities of drilling and production, this will contribute a high risk to personnel and a company's property that will discourage the SIPROD activities.

The Bayan platform is located 80km from Bintulu, Sarawak, with a water depth of 30 meters. The D18 field connects the Bayan platform at the northeast side and the D35 field at the North Westside. The field consists of platforms, as shown in Figure 1. BYDP-A, BYP-A, BYG-A, and BYR-A are interconnected via a bridge link. The three wellhead platforms of BYDP-B, BYDP-C, and BYDP-D are interconnected to the BYP-A platform via subsea pipelines.

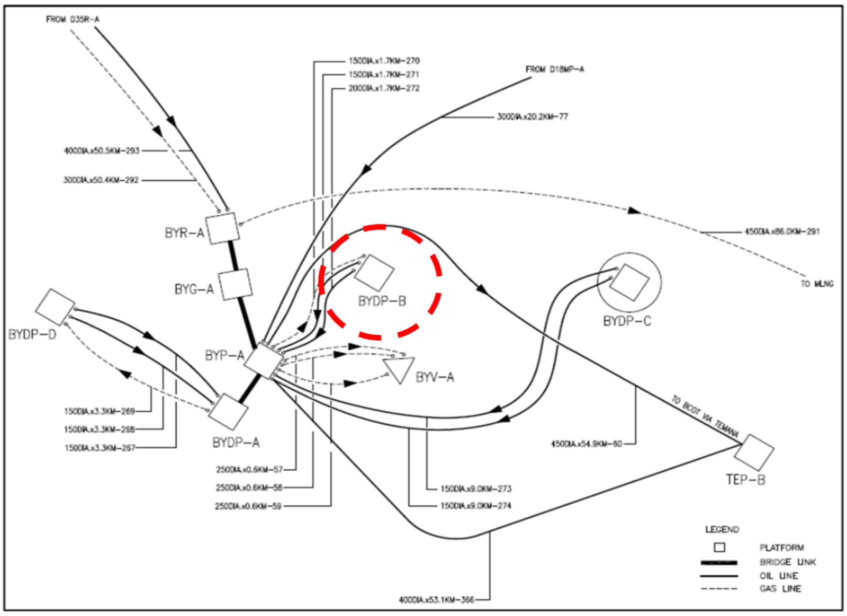

Fig. 1. Bayan Field Layout

The scope of work for this project covers the infill drilling for the BYDP-B platform to meet the SIPROD requirements for the following stages shown in Figure 2.

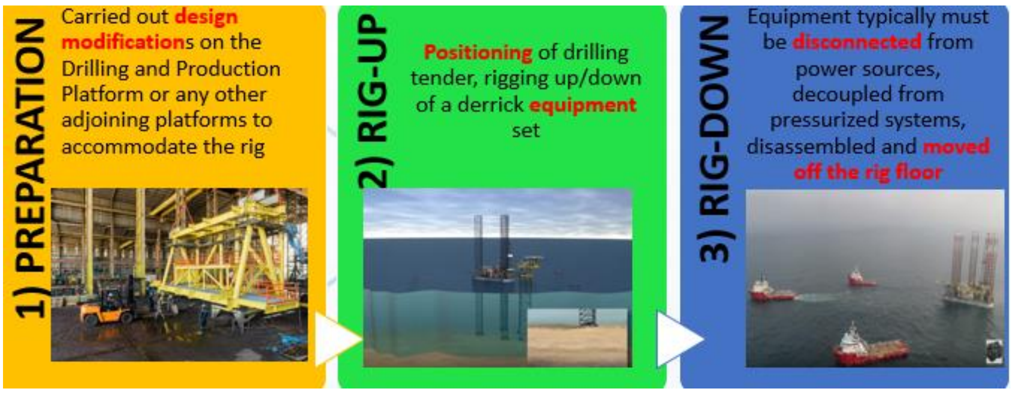

Fig. 2. Infill drilling stages in BYDP-B platform

For the drilling platform, which is bridge-linked to or integrated with the processing/production platform, the SIPROD Affected Area shall be defined based on the risks and hazards identified and evaluated as shown in Figure 3 SIPROD Affected Area at BYDP-B platform.

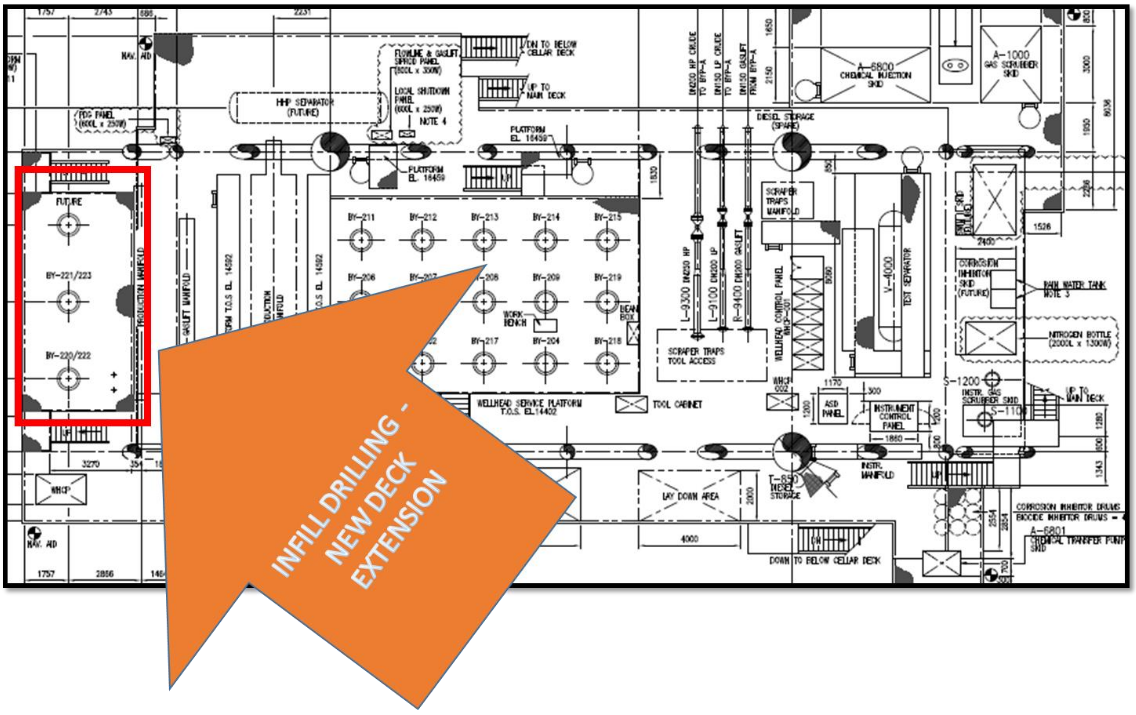

Fig. 3. SIPROD Affected Area at BYDP-B platform

2. Materials and Methods

HAZID (Hazard & Identification) is a technique for early identification of potential hazards and threats and can be categorized as Conceptual HAZID and Detailed HAZID. The HAZID workshop has been conducted by a consultant and participated by a multi-disciplinary team. The attendees have been taken part in the workshop and representing the sufficient experience and knowledge of the facilities discussed commensurate with the expectations of the HAZID Term of Reference. Figure 4 below explains the HSE Management System relations with HAZID.

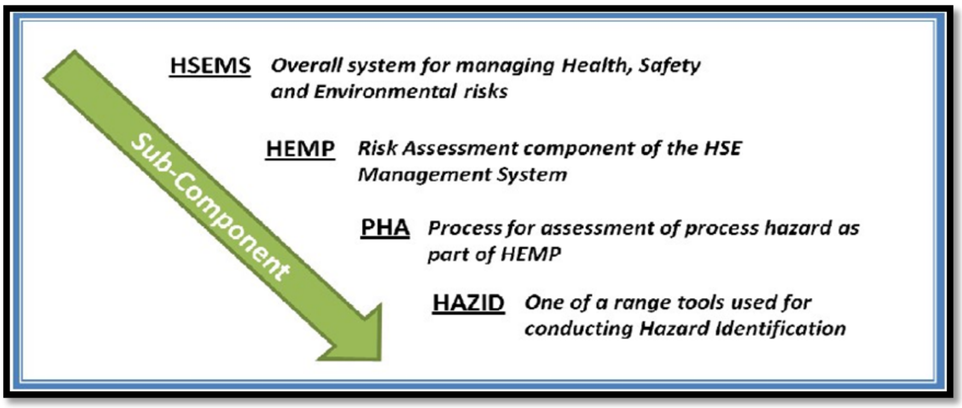

Fig. 4. HSE Management System relations with HAZID

The following sequential steps can summarize the HAZID procedure:
Step 1: Introduction briefly that consist of facilities/ project overview;
Step 2: Divide facility/ installation into suitable review areas for study; Step 3: Pick a node area, process area, utility area, which may be the whole facility or a small section, the intention of that node will be discussed and agreed upon by the team;
Step 4: Identify, assess, and record hazard "Guidewords" as per HIRARC DOSH shown in Figures 5.
Step 5: Identify all of the potential threats or causes of the release of the hazard.
Step 6: To identify the worst credible consequence related to the hazard;
Step 7: To identify safeguards in place to prevent the hazard;
Step 8: The team will analyse the appropriate controls that should be put in place to prevent or control each threat.
Step 9: Determine the risk exposed to People, Environment, Assets, and Reputation (PEAR) related to the hazard based on the HIRARC DOSH Risk of Matrix

	Severity (S)				
Likelihood(L)	1	2	3	4	5
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

High (red) Medium (yellow) Low (green)

Fig. 5. HIRARC Risk Matrix (Source: DOSH)

Step 10: To assess the current controls and safeguards whether are adequate; and
Step 11: Repeat all assessed areas until the whole facility has been studied.

3. Results and Discussion

3.1. SIPROD Hazard Identification

Observation, surveillance, information, and document review were conducted at BYDP-B to identify new potential or recurring hazards related to SIPROD operational. As a result, numerous hazards have been identified but not addressed in the current SOP for the control measures and correction action. Failure to identify the existing hazard during the activity may contribute to the workplace incident (occupational injury or illness). Therefore, a hazard analysis should be performed for all production facilities designated in SIPROD. The purpose of the analysis is to minimize the likelihood of the occurrence and the consequences of a hydrocarbon release by identifying, evaluating, and controlling the events that could lead to releases. Figure 6 show that facility hazards contribute to the highest percentage of main hazards of 71% in which contains the high-risk level of fire and explosion hazard. Meanwhile, a medium risk shows a highest risk score of 78% compare to other level of risk category as shown in Figure 7.

Fig. 6. Percentage Main Hazards for BYDP-B SIPROD Activities

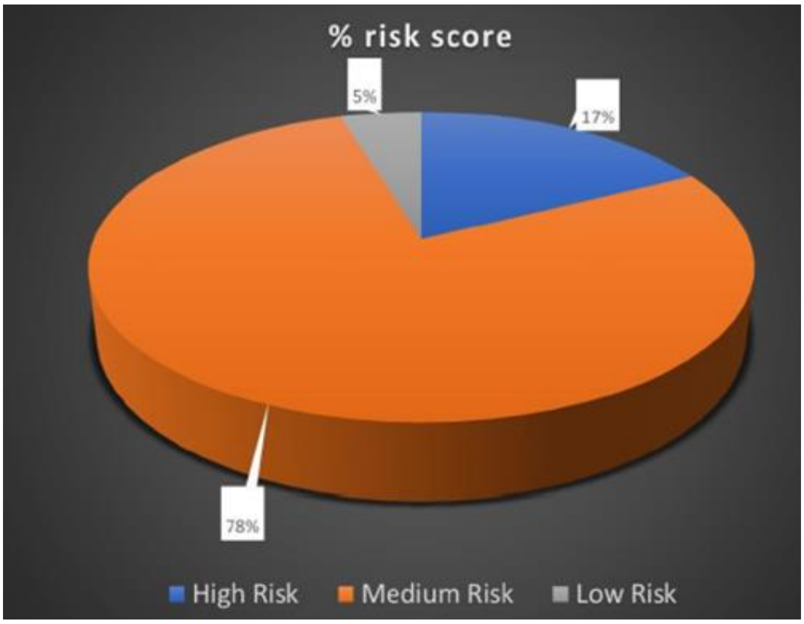

Fig. 7. Percentage Risk Scores for BYDP-B SIPROD Activities

4. Conclusion

In conclusion, HAZID is an assessment for identifying potential hazards and threats for the design project covering environmental hazards, process hazards, health hazards, and project implementation hazards. The three (3) numbers of Research Objectives (ROs) has successfully been implemented, which are (1) potential hazards for existing SOP of SIPROD operational activities at the

BYDP-B platform were identified via observation, surveillance, information, and document review, the causes, and consequences for SIPROD operational activities at the BYDP-B platform had been analysed using HIRARC analysis. As a result, fire and explosion are categorized as the high-risk level that leads to a fatality, and significant improvement of SOP associated with SIPROD operational is required to help reduce the risk at the BYDP-B platform to ensure safer working practices).

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References
[1] Muhammad Mujtaba Asada, Razali Bin Hassana et.al, Identification of Hazardous Nature of Well Drilling Operation With Associated Potential Hazards at Oil and Gas Extraction Industries: an Explanatory Approach, December 2016/4th Scientic Conference on Occupational Safety and Health: Sci- COSH 2016, vol 13, No. 2 : 85-92
[2] Diego Marucco, Simultaneous Operations Risk Assessment, 2016/Design HSE Department, Tecnimont, Via De Castilla 6A, 20124 Milano Italy.
[3] Fiona Macleod and Stephen Richardson, Piper Alpha – What have we learned? June 2018/Loss Prevention Bulletin.
[4] Jan Erik Vinnem, Analysis of hydrocarbon leaks and verification as an operational barrier, May 2014/ Journal of Risk Research, Pages 1130-1144
[5] Huacan Fang, Menglan Duan, Process safety: Remembering Piper Alpha, 2014/ Offshore Operation Facilities
[6] David M. Pritchardi Owner, Successful Energy Practices International, LLCDrilling Hazards Management – Excellence in Drilling Performance Begins with Planning (Part 1 of DHM Series), Deepwater Horizon Study Group Working Paper – January 2011
[7] Karen Maria Thaule-Pedersen, Simultaneous Activities in the Offshore Petroleum Industry, Master`s thesis in Societal Safety 2011 University of Stavanger, Norway
[8] Marta Bucelli, Nicola Paltrinie, Gabriele Landucci, 2018/ Integrated risk assessment for oil and gas installations in sensitive areas
[9] Işık, I. N., & Atasoylu, E, 2017/ Occupational safety and health in North Cyprus: Evaluation of risk assessment
[10] Gholamreza Dehdasht, Rosli Mohamad Zin et.al, 2017 / DEMATEL-ANP Risk Assessment in Oil and Gas Construction Projects
[11] Eduard Arkadievich Petrovskiy , Fedor Anatoliievich Buryukin et .a, 2015/ The FMEA-Risk Analysis of Oil and Gas Process Facilities with Hazard Assessment Based on Fuzzy Logic
[12] SreeRaj R Naira, Karel Schnebele, Hari Attal, Noma O Ogbeifun, 2019/ Achieving World Class Performance in Oil and Gas Industry Using Inherently Safer Design
[13] J. Wu, M. Lind, 2018/ Management of System Complexity in HAZOP for the Oil &Gas Industry
[14] Sundaram Haridoss, 2017 / Health and Safety Hazards Management in Oil and Gas Industry
[15] Praveen Patel and Nagendra Sohani, 2016/ System Safety Assessment Based on Past Incidents in Oil and Gas Industries: A Focused Approach in Forecasting of Minor, Severe, Critical, and Catastrophic Incidents
[16] Radzeya Zaidia et. Al, 2020/ Risk assessment of oil drilling rig welded pipe based on structural integrity and life estimation
[17] Muhammad Mujtaba Asad, Razali Bin Hassan, Fahad Sherwani and Muhammad Aamir, 2019 / Design and development of a novel knowledge- based decision support system for industrial safety management at drilling process
[18] Yuanjiang Chang, Changshuai Zhang, Xiangfei Wu et.al, 2019 / A Bayesian Network model for risk analysis of deepwater drilling riser fracture failure
[19] Muhammad Mujtaba Asad , Razali Bin Hassan, 2015/ Development of KBES with Hazard Controlling Factors and Measures for Contracting Health and Safety Risk in Oil and Gas Drilling Process: A Conceptual Action Plan
[20] Muhammad Mujtaba Asada, Razali Bin Hassana et.al, 2016 / Identification of Hazardous Nature of Well Drilling Operation With Associated Potential Hazards at Oil and Gas Extraction Industries: an Explanatory Approach