

ANALISIS RISIKO SKENARIO MAJOR ACCIDENT HAZARD (MAH) PADA FASILITAS PLATFORM OPERASI PRODUKSI OFFSHORE DI PERUSAHAAN PT X HULU MINYAK DAN GAS BUMI

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INTISARI

Industri hulu minyak dan gas bumi merupakan salah satu sektor dengan tingkat risiko kecelakaan kerja tertinggi di dunia, terutama pada kegiatan operasi di wilayah offshore yang melibatkan sistem bertekanan tinggi, bahan mudah terbakar, serta lingkungan kerja ekstrem. Data Direktorat Jenderal Minyak dan Gas Bumi (2023) menunjukkan bahwa sepanjang tahun 2016–2023, kecelakaan kerja di sektor ini masih menunjukkan fluktuasi dengan tren peningkatan kasus fatal, sehingga menegaskan urgensi penguatan sistem manajemen risiko dan keselamatan kerja. Selain itu, laporan SKK Migas (2023) memperkirakan rata-rata kerugian akibat insiden di fasilitas offshore mencapai Rp 25–40 miliar per kejadian, dengan dampak kehilangan produksi mencapai 15.000 barel per hari. Kondisi tersebut menuntut penerapan strategi pengelolaan risiko yang lebih sistematis, terutama terhadap Major Accident Hazard (MAH) seperti kebakaran, ledakan, tumpahan minyak, dan *well control failure*.

Penelitian ini bertujuan untuk menganalisis potensi Major Accident Hazard (MAH) pada fasilitas platform proses produksi offshore di Perusahaan X Hulu Minyak dan Gas Bumi, dengan menggunakan pendekatan analisis risiko berbasis skenario yang dikombinasikan dengan metode Risk Register dan Bow-Tie Analysis. Analisis dilakukan untuk mengidentifikasi sumber bahaya dominan, mengevaluasi skenario kecelakaan besar yang paling relevan, serta menentukan tingkat risiko dan rekomendasi mitigasi sesuai prinsip ALARP (*As Low As Reasonably Practicable*).

Hasil penelitian diharapkan dapat memberikan pemahaman menyeluruh mengenai faktor penyebab utama kecelakaan kerja di lingkungan offshore, serta menghasilkan strategi pengendalian risiko yang efektif dan adaptif. Selain itu, penelitian ini juga mendukung penerapan Process Safety Management (PSM) serta kesesuaian terhadap standar ISO 45001, ISO 31000:2018, dan API RP 75, guna memperkuat budaya keselamatan dan keberlanjutan operasional di industri hulu minyak dan gas bumi Indonesia.

Kata kunci: Major Accident Hazard (MAH), offshore, analisis risiko, Risk Register, Bow-Tie Analysis, Process Safety Management

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**RISK ANALYSIS OF MAJOR ACCIDENT HAZARD (MAH)
SCENARIOS ON OFFSHORE PRODUCTION PLATFORM FACILITIES
AT PT X UPSTREAM OIL AND GAS OPERATIONS**

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ABSTRACT

The upstream oil and gas industry is recognized as one of the sectors with the highest occupational risk worldwide, particularly in offshore operations involving high-pressure systems, flammable substances, and extreme environmental conditions. According to data from the Directorate General of Oil and Gas (2023), the number of occupational accidents in this sector from 2016 to 2023 shows a fluctuating yet increasing trend in fatal cases, highlighting the urgent need to strengthen risk management and safety systems. Furthermore, the Special Task Force for Upstream Oil and Gas Business Activities (SKK Migas, 2023) reported that the average financial loss due to offshore incidents reaches IDR 25–40 billion per event, with production losses of up to 15,000 barrels per day. These conditions demand a systematic risk management approach, particularly toward Major Accident Hazards (MAH) such as fires, explosions, oil spills, and well control failures.

This research aims to analyze the potential Major Accident Hazards (MAH) at the offshore production process platform of Company X Upstream Oil and Gas, using a scenario-based risk analysis approach combined with Risk Register and Bow-Tie Analysis methods. The analysis identifies dominant hazard sources, evaluates the most credible major accident scenarios, and determines risk levels and mitigation recommendations following the ALARP (As Low As Reasonably Practicable) principle.

The study's results are expected to provide a comprehensive understanding of the main contributing factors to occupational accidents in offshore environments and to produce effective and adaptive risk control strategies. Additionally, this research supports the implementation of Process Safety Management (PSM) principles and alignment with international standards such as ISO 45001, ISO 31000:2018, and API RP 75, thereby strengthening safety culture and operational sustainability within Indonesia's upstream oil and gas industry.

Keywords: Major Accident Hazard (MAH), offshore, risk analysis, Risk Register, Bow-Tie Analysis, Process Safety Management

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