

Penilaian risiko pelepasan dan dispersi amonia dengan metode interwoven di Pabrik Pupuk = Risk assessment of ammonia release and dispersion with interwoven method in fertilizer plant / Andhica Shashica Danasa

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Abstrak

ABSTRAK

Penelitian berlokasi di Pabrik Amonia 1A, Industri Pupuk Urea, PT XYZ. Fasilitas ini telah mengimplementasikan beberapa penilaian kinerja, seperti Jam Kerja Selamat dan Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan (PROPER). Akan tetapi, penilaian kinerja tersebut belum dapat dijadikan indikator bahwa kedepannya perusahaan tidak akan mengalami Major Accident. Dalam rangka pencegahan dan penanggulangan potensi Major Accident di lingkungan industri, Presiden Republik Indonesia melalui Menteri Lingkungan Hidup dan Kehutanan mengeluarkan regulasi dengan Nomor 74 Tahun 2019 tentang Program Kedaruratan Pengelolaan Bahan Berbahaya dan Beracun dan/atau Limbah Bahan Berbahaya dan Beracun. Tujuan penelitian ini adalah untuk melakukan penilaian risiko pelepasan dan dispersi amonia dengan skenario Tank Rupture pada tangki penyimpanan amonia dengan kapasitas terbesar. Pengumpulan data dilakukan dengan berbagai instrumen, meliputi Process Safety Management Checklist, Universal Assessment Instrument, Safety Culture Assessment Checklist, dan Emergency Response Procedure Checklist. Metode yang digunakan adalah metode pembobotan berdasarkan Key Risk Indicator (KRI) dan analisis kepatuhan (prosedur, dokumentasi, dan implementasi), pemodelan konsekuensi (perangkat lunak ALOHA), analisis spasial (perangkat lunak QGIS), dan matriks risiko. Hasil penelitian menunjukkan bahwa likelihood yang direpresentasikan oleh Effectiveness of Control (EOC) berada pada tingkat Effective. Sementara, konsekuensi terbesar terjadi pada skenario lubang kebocoran 30 cm di dasar tangki ketika rilis terjadi pada malam hari. Skenario tersebut menghasilkan Zona AEGL-3 (Red Zone) seluas 41,2 km² serta melingkupi 14 desa. Dalam rangka mengendalikan faktor risiko tersebut, diperlukan pencapaian EOC yang maksimal (High Effective), yaitu dengan upaya mitigasi pada elemen-elemen Process Safety Management (PSM), meliputi Pre-startup Safety Review (PSSR) dan Management of Change (MoC). Tindakan mitigasi tersebut dapat menurunkan tingkat risiko dari Medium to High Risk menjadi Medium Risk, sehingga Residual Risk berada pada Zona ALARP (As Low as Reasonably Practicable).

ABSTRACT

This research is located at Ammonia Plant 1A, Urea Fertilizer Industry, PT XYZ. The facility implements performance measurement programs include, Safety Man Hours and Program Penilaian Peringkat Kinerja Perusahaan dalam Pengelolaan Lingkungan (PROPER). Nevertheless, those programs do not guarantee that the facility is free of Major Accident. Considering that the increasing activities of development in various sector particularly industry, the use of hazardous and toxic substances tends to increase the potential of Major Accident. The President of Republic Indonesia decided to stipulate a regulation on hazardous and toxic substances management namely The Ministry of Environment and Forestry Regulation No. 74-2019.

Hence, this study aims to conduct a risk assessment due to ammonia release and dispersion by simulating a worse-case Tank Rupture scenario at the largest capacity storage tank. Data collecting were done by utilizing several instrumentations comprise of Process Safety Management Checklist, Universal Assessment Instrument, Safety Culture Assessment Checklist, and Emergency Response Procedure Checklist. Key Risk Indicator (KRI) and compliance analysis (procedure, documentation, and implementation) are weighted to calculate the likelihood while consequence is simulated by using several tools include, ALOHA and QGIS Software. Risk is determined by using risk matrix. The study shows that the likelihood which represented as an Effectiveness of Control (EOC) is calculated at a level of Effective. Whilst, the worst consequence is forecasted at a 30 cm leakage diameter scenario located at the bottom of the tank with time release is night. The scenario exposes about 41,2 km² AEGL-3 Zone (Red Zone) and suffering 14 villages. In order to mitigate risk, EOC should be improved by upgrading the quality of Process Safety Management (PSM) elements covering Pre-startup Safety Review (PSSR) and Management of Change (MoC). It is expected by conducting these actions that the calculated risk (Medium to High Risk) can be reduced to be a Medium Risk which is an As Low as Reasonably Practicable (ALARP) Zone.