

## INTISARI

Gas bumi sebagai energi primer ketiga di Indonesia merupakan salah satu sumber energi efisien sehingga peminatnya semakin tinggi di berbagai sektor. PT XYZ merupakan perusahaan yang bergerak di bidang transmisi dan distribusi gas bumi. PT XYZ meningkatkan proyek infrastruktur pipa gas bumi untuk memenuhi permintaan dan meningkatkan optimalisasi pemanfaatan gas bumi berkelanjutan. Salah satu proyek yang dikelola oleh PT XYZ di awal tahun 2020 adalah proyek relokasi pipa gas 24 inci di kawasan Taman BMW, Jakarta Utara. Proyek ini dilatarbelakangi oleh adanya pembangunan Stadion Internasional Jakarta yang berdiri tepat di atas lokasi pipa gas 24 inci milik PT XYZ. Proyek relokasi pipa gas ini dilaksanakan pada area yang memiliki kondisi tanah yang labil. Proyek ini juga tidak dapat terlepas dari kondisi penggunaan alat-alat berat dan peralatan lainnya yang berpotensi melukai atau mencederai pekerja proyek. Oleh karena itu, identifikasi dan analisis risiko perlu dilakukan sebelum dan saat aktivitas pekerjaan untuk meminimalkan atau mencegah kecelakaan kerja.

Dalam menjalankan penelitian ini, metode yang digunakan adalah *Fuzzy Failure Mode and Effect Analysis*. Proses pengambilan data dilakukan melalui observasi, diskusi dan wawancara, serta peninjauan terhadap dokumen identifikasi dan pengendalian risiko milik PT XYZ. Proses penilaian risiko dilakukan berdasarkan komponen *severity*, *occurrence*, dan *detection*. Perancangan fungsi keanggotaan dan aturan *fuzzy* juga dilakukan. Setelah melalui proses validasi, proses inferensi *fuzzy* melalui perhitungan manual dan *software* MATLAB untuk memperoleh nilai *Fuzzy Risk Priority Number* (FRPN).

Berdasarkan hasil analisis, diperoleh sebelas potensi risiko yang menjadi prioritas tertinggi. Potensi risiko tanah galian runtuh pada aktivitas *trenching* dan *welding tie-in* dengan nilai FRPN 883,333 menjadi prioritas tertinggi. Di bawah kedua potensi risiko tersebut, terdapat 9 potensi risiko dengan nilai FRPN 880,289. Pada aktivitas *test pit* dan *trenching*, terdapat potensi risiko kegagalan mengidentifikasi utilitas *existing*, tersengat listrik, dan alat berat/pekerja terjatuh ke lubang galian. Pada aktivitas *nitrogen purging*, terdapat potensi risiko keracunan N<sub>2</sub>. Pada aktivitas pemasangan proteksi galian, terdapat potensi risiko kegagalan mengidentifikasi utilitas *existing*. Pada aktivitas *holiday detector test*, terdapat potensi risiko tersengat listrik. Rekomendasi tindakan pengendalian yang dapat diberikan, antara lain koordinasi dengan pemilik utilitas *existing* jika ditemukan utilitas *existing* yang tidak terdata, peningkatan komunikasi antar pekerja, pemeriksaan kesehatan, pengoptimalan *housekeeping* atau budaya 5R, penggunaan *checklist form*, pemasangan *safety net*, pemasangan balok pengganjal, inspeksi rutin, pembuatan prosedur tanggap darurat, pemberhentian aktivitas kerja jika kondisi cuaca buruk, uji kompetensi pekerja, dan *reward and punishment*.

Kata Kunci: Kecelakaan Kerja, Relokasi Pipa Gas Bumi, Identifikasi Risiko, Analisis Risiko, *Fuzzy Failure Mode and Effect Analysis*, *Fuzzy Risk Priority Number* (FRPN)

## ABSTRACT

Natural gas as the third primary energy in Indonesia has more abundant reserves than petroleum reserves. Natural gas is also one of the most efficient sources of energy so that demand is getting higher in various sectors. PT XYZ is a company engaged in the transmission and distribution of natural gas. PT XYZ encourages the natural gas pipeline infrastructure project to meet the demand, increase the optimization of sustainable natural gas utilization and reach all customers. One of the projects managed by PT XYZ in early 2020 was the 24-inch gas pipeline relocation project in the BMW Park area, Tanjung Priok, North Jakarta. The gas pipeline relocation project must be held due to the planned construction of the Jakarta international stadium which was built directly above the location of the 24-inch gas pipeline owned by PT XYZ. The gas pipeline relocation project held in an area that has unstable soil conditions. The project also can not be separated from the use of heavy equipment and other equipment that have the potential to injure project workers. Therefore, the risk analysis needs to be done before and during work activities to minimize or prevent work accidents.

In this research process, the method used is Fuzzy Failure Mode and Effect Analysis. Risk identification data is obtained through observation, discussion and interviews, as well as a review of PT XYZ's risk identification and control documents. The risk assessment process is based on the severity, occurrence, and detection components. The design of membership functions and fuzzy rules are made to obtain membership degree and control input-output interaction. After validation process, the fuzzy inference process is carried out to obtain the value of Fuzzy Risk Priority Number (FRPN).

The results of the risk analysis using this method find 11 potential risks as the highest priority. Potential risk of collapse of excavations in trenching and welding tie-in activities with FRPN 883,333 is the highest priority. Under these two potential risks, there are 9 other potential risks with a value of 880,289. In pit test and trenching activity, there are potential risks of failure to identify existing utilities, electric shock, and heavy equipment / workers falling into excavation holes. In nitrogen purging activity, there is a potential risk of N<sub>2</sub> poisoning. In the installation of excavation protection activity, there is the potential risk of failure to identify existing utilities. In the holiday detector test activity, there is a potential risk of electric shock. Recommendations of risk responses planning are coordinating unrecorded utilities with existing utility owners, improving communication among workers, housekeeping optimization, usage of the checklist form, installation of safety net, installation of block beams, routine inspection, establishing emergency response procedure, discontinuing working activities if bad weather present, worker competency test, and applying reward & punishment system.

**Keywords:** Work Accident, Gas Pipeline Relocation Project, Risk Identifying, Risk Analysis, Fuzzy Failure Mode and Effect Analysis, Fuzzy Risk Priority Number (FRPN)