

## INTISARI

Ketersediaan material *Maintenance, Repair, and Operations or Overhaul* (MRO) berperan penting untuk memastikan kelancaran produksi pada perusahaan dengan tipe produksi kontinu seperti pengolahan gas alam. Hal tersebut dikarenakan *downtime* tidak terencana dapat meningkatkan biaya penanganan dan persediaan berlebih dapat menghadapi risiko keusangan. Namun, pengendalian persediaan material MRO menghadapi beberapa tantangan diantaranya pola permintaan material yang bersifat sporadis dimana kuantitas permintaan dan interval antar permintaan bervariasi dengan permintaan beberapa periode bernilai nol. Selain itu, penanganan material MRO yang berjumlah ribuan dengan kondisi bisnis berupa *fuzzy environment* menyebabkan informasi terkait karakteristik persediaan tidak dapat didefinisikan dengan jelas. Maka dari itu, penelitian ini dilakukan untuk menentukan pengendalian persediaan material MRO yang tepat dengan mempertimbangkan karakteristik permintaan yang *intermittent* serta lingkungan bisnis yang dinamis. Keseimbangan persediaan MRO dapat mendukung kelancaran produksi dan mencegah terjadinya *downtime* tidak terencana dengan mempertimbangkan biaya persediaan dan tingkat layanan.

Penelitian ini dilakukan pada 2451 material MRO pendukung produksi pengolahan gas alam dengan beberapa tahapan pengendalian persediaan yang meliputi klasifikasi menggunakan metode *Tomada de Decisão Interativa e Multicritério* (TODIM) atau *Interactive and Multicriteria Decision Making* pada data *Pythagorean Fuzzy Set* (PFS) untuk menangani informasi karakteristik material pada lingkungan bisnis yang dinamis, peramalan dengan metode *intermittent* berupa *Croston*, SBA, TSB, mSBA, mTSB, dan *bootstrapping*, hingga analisis sistem pengendalian persediaan dengan mempertimbangkan biaya persediaan dan tingkat layanan.

Hasil klasifikasi menggunakan metode TODIM PFS menunjukkan pengelompokan material berdasarkan tingkat dominansi material MRO berdasarkan kriteria-kriteria. Perbandingan metode peramalan juga menunjukkan perbedaan pada metode peramalan terpilih pada kategori material yang berbeda. Penerapan hasil peramalan terpilih dan sistem pengendalian persediaan *periodic review* menunjukkan penurunan total biaya persediaan hingga 10,84% dengan *service level* 97,32%. Dengan demikian, klasifikasi, peramalan, dan sistem pengendalian persediaan yang tepat dapat meningkatkan kualitas pengendalian persediaan MRO tanpa peningkatan biaya dan penurunan *service level*.

**Kata kunci:** *Maintenance, Repair, and Operations or Overhaul* (MRO), *intermittent*, *fuzzy*, klasifikasi, peramalan, pengendalian persediaan.

## ABSTRACT

The availability of Maintenance, Repair, and Operations or Overhaul (MRO) materials has an important role to ensuring smooth production in companies with continuous production types such as natural gas processing. This is because unplanned downtime can increase handling cost and excess inventory can increase the risk of obsolescence. However, MRO material inventory control faces several challenges, including sporadic material demand patterns where the quantity of demand and interval between requests vary with some periods of demand being zero value. In addition, the handling of MRO materials amounting to thousands with business conditions in the form of fuzzy environments causes information related to inventory characteristics cannot be definitively defined. Therefore, this study was conducted to determine the appropriate control of MRO materials inventory by considering the characteristics of intermittent demand and dynamic business environment. MRO inventory balance can support smooth production and prevent unplanned downtime by considering inventory costs and service levels.

This study was conducted on 2451 MRO materials supporting natural gas processing production with several stages of inventory control including classification using the Tomada de Decisão Interativa e Multicritério (TODIM) method or Interactive and Multicriteria Decision Making on Pythagorean Fuzzy Set (PFS) data to handle material characteristic information in a dynamic business environment, forecasting with intermittent methods in the form of Croston, SBA, TSB, mSBA, mTSB, and Bootstrapping, and inventory control system analysis by considering inventory costs and service levels.

The results of the classification using TODIM PFS method showed the grouping of materials based on the level of dominance of MRO materials based on criteria. The comparison of forecasting methods also found differences in selected forecasting methods in different material categories. The application of selected forecasting results and periodic review inventory control system showed a decrease in total inventory costs up to 10,84% with a service level of 97,32%. Thus, the right classification, forecasting, and inventory control system can improve the quality of MRO inventory management without increasing costs and decreasing service levels.

**Keywords:** Maintenance, Repair, and Operations or Overhaul (MRO), intermittent, fuzzy, classification, forecasting, inventory management.