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Procedia Engineering 174 (2017) 711 – 716

Procedia Engineering

www.elsevier.com/locate/procedia

13th Global Congress on Manufacturing and Management, GCMM 2016

Prediction Model of Spare Parts Consumption Based on Engineering Analysis Method

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Abstract

The consumption of spare parts is closely related to all aspects of support activities which include financing, storage and supply of equipment spare parts, and support activities are based on the law of spare parts consumption. In this paper, the factors influencing the consumption of equipment spare parts are considered, the consumption characteristics of equipment spare parts are analyzed, and the consumption prediction of spare parts under small sample conditions is solved by engineering analysis method. Application examples show that the engineering analysis method has good prediction accuracy.

Peer-review under responsibility of the organizing committee of the 13th Global Congress on Manufacturing and Management

Keywords: engineering analysis method; small sample; spare parts consumption

1. Introduction

Equipment spare parts support is an important part of equipment maintenance support, and practice has proved the spare parts closely inseparable with spare parts consumption support activities. Equipment spare parts support activities, which consist of the financing, storage, supply and other aspects of the management work, must be based on the consumption of spare parts. The target of equipment spare parts support is to ensure the number of appropriate spare parts, good quality, timely and reliable equipment to meet the maintenance needs. Only by mastering the law of spare parts consumption, can we achieve the precise protection of spare parts, and then improve the combat effectiveness of equipment.

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Peer-review under responsibility of the organizing committee of the 13th Global Congress on Manufacturing and Management
doi:10.1016/j.proeng.2017.01.210

2. Engineering Analysis

2.1. Ideas of Analysis

Engineering analysis mainly uses qualitative and quantitative methods to calculate the equipment unit failure rate, maintenance event frequency and other parameters, and then predicts the number of spare parts consumed in the period of minor repair, medium repair and overhaul on the basis of analyzing the replacement rate at the time of minor repair, medium repair and overhaul. It is shown in Fig.1 that the basic idea of forecasting spare parts consumption is inferred through engineering analysis.

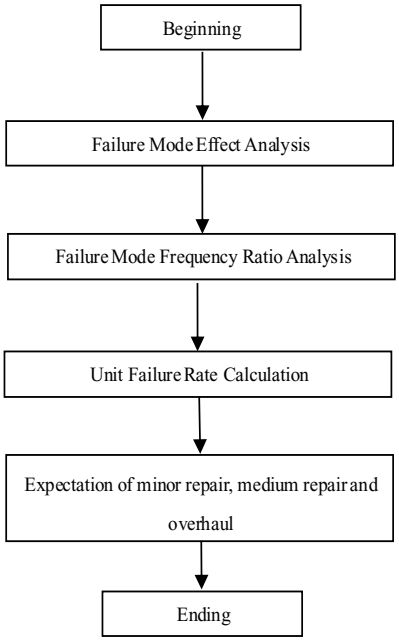

Fig. 1. The basic idea of estimating spare parts consumption by the engineering analysis

2.2. Failure Mode Effect Analysis

When the failure rate of each unit is known, we only need to analyze maintenance work on the basis of FMEA, and then analyze the unit failure mode repair methods, levels and the corresponding proportion. Thus we can calculate the probability of occurrence of maintenance events, which provides help for calculating spare parts consumption. However, in the equipment development stage, it is hard to know all units failure rate, spare parts demand rate and other basic data, which demands to analyze the failure of all levels of the unit model. There are certain relations between different levels of failure modes and failure effects. In other words, the influence of the low-level unit failure mode on the next-level unit is the failure mode adjacent to the upper-level unit, and the lower-level failure mode is the cause of the fault immediately next level, so we can get the iteration relation among the different hierarchical units from this deduction. As shown in Fig. 2, if the failure rate of current system or all subsystems is known, the frequency ratio of the unit failure mode can be analyzed layer by layer to determine the failure rate of other hierarchical units.