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Research on Element Importance of Shafting Installation Based on QFD and FMEA

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Abstract

Development in today's shipbuilding economy is transforming from the quantitative growth to the quality growth. Quality function deployment (QFD) and failure mode and effects analysis (FMEA) adopt different ways of thinking, they remedy their respective limitations for each other, that can effectively guide the quality control. This paper is combined of HuDong ZhongHua Shipbuilding (group) co. LTD.'s shafting installation process, starting from the QFD customer requirements for finding the importance of production process elements and correction by FMEA, ultimately acquire the comprehensive importance of shafting installation process elements.

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Keywords: Quality Function Deployment; Failure Mode and Effects Analysis; Marine Shafting; Comprehensive Importance

1. Introduction

Since entering the 21st century, the state attaches great importance to the Marine resources development research, vigorously develop high-tech Marine science and technology, makes the ocean shipping is more and more large-scale, high performance-based, so the ability of high value-added ships construction has become a shipbuilding enterprises to actively construct their own core competitiveness. Development in today's world economy is experiencing the transition from quantitative growth to the quality-type growth, market competition mainly get

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priority from price competition to quality and service competition, so the quality problem has risen to the height of the relationship to the enterprise survival [1].

Ship shafting is the core component of Marine power system, due to the complexity of technological process, high accuracy, the construction process has certain irreversibility, the completion quality assurance has been a major project risk for the turbine technology of each ship companies. QFD and FMEA as a commonly used methods for quality engineering technology has a certain similar features, both in terms of its purpose is in order to achieve the quality factor importance sorting and control, receive better product quality and customer satisfaction. Quality Function Deployment (QFD) is a process of positive thinking [2], starting from the user requirements according to the logical order gradually thorough and design the process satisfy to the customer requirements, quality control table is its concrete results in the end. Due to problems' unpredictability in the process of implementation, experience proves that there will be unexpected failure, Failure Mode and Effect Analysis (FMEA) is an effective way to solve this problem, is a kind of method used to determine potential failure modes and effects analysis [3].

2. Set up technology elements of quality house based on QFD

2.1. Determine the importance of customers' requirements by FAHP

Make quantitative processing of the importance of customers' requirements through Fuzzy Analytical Hierarchy Process [4-6]. In the evaluation of every two contrast to the various needs of customers on the basis of their relative importance to determine the absolute weight of the various needs of customers. In the process, the establishment of shafting installation quality house considering the needs of customers play the important role in the study of QFD, that is suitable for using fuzzy analytic hierarchy process (FAHP) [7,8] to compute the importance of customer requirements. Determine the weighing values for customer demand on shafting installation by FAHP, the process is as follows:

(1) Construct the hierarchical structure model

Analysis of shafting installation content of customer demand, classified and summarized involved requirements and establish customer needs hierarchy diagram of shafting installation for quality house, as Fig. 1.

(2) Construct the fuzzy complementary matrix

Assuming that matrix $R=\left(r_{ij}\right)_{n\times n}$, if it match as $0\le r_{ij}\le 1,(i,j=1,2,\ldots,n)$,we call this matrix is fuzzy matrix.

If the fuzzy matrix $R=\left(r_{ij}\right)_{n\times n}$, match as: $r_{ij}+r_{ji}=1,(i,j=1,2,\ldots,n)$,we call the fuzzy matrix is fuzzy complementary matrix.

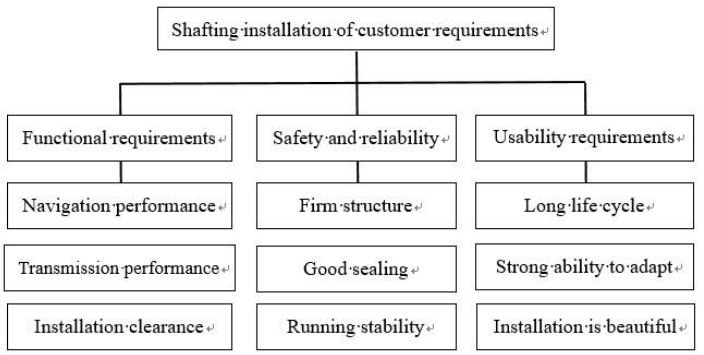

Fig.1. Hierarchy structure of customer demands.