Monitoring of the Processes of Accumulation of Defects of Steel Structures Over Time of Ships Operation

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ABSTRACT

The forecast of processes development of ship’s steel structures’ defects accumulation over the operating time is one of the most difficult problems of reliability assessment of marine engineering. Particular difficulties related to the investigation of structural defects in the special gain, directly perceiving ice loads. The study examines the problems of monitoring of corrosion wear and residual deflections. Defects such as cracks and gaps are not within the scope of this study.

KEY WORDS: Vessel structure, defect of the vessel structure, accumulation of defects, corrosion of vessel, vessel inspection, defect prediction of hull; Register.

INTRODUCTION

Existing methods of diagnostics of technical state of structures of ships and marine equipment and accumulation of defects are based on the principle of periodical inspections by classification societies, in particular the Russian Maritime Register of Shipping (Register).

Thickness measurements and deflection of the strengthening structures of ice loads are being done in the inspections of the ship with an interval of 2 to 3 years in the dock. For offshore structures, such as drilling rigs, there may be a problem to lift the rig in the dock for examination. The interval between surveys of marine structures, in particular, the drilling platform can be up to 10 years or more.

The probability and risks of ship damage or offshore engineering structures increases with the length of intervals between the surveys. The main objectives of the inspection of ship in the dock are mainly associated with the evaluation of corrosive wear.

Most of the applied techniques used to determine deterioration of structures are based on the simple concept of linear in time arising of deterioration. The accumulation of residual deflections of hull structure with the corrosive wear of the ship almost unheeded.

In the present study is examined the developed software for the nonlinear prediction and analysis of shared corrosive wear and residual deflection structures. Are provides practical examples of survey and monitoring of defect of the ships’ structures.

Monitoring of the technical state of ice–strake structures

Damage of marine engineering and vessels, associated with the threat of disturbance to the environment, can cause negative publicity. Condition monitoring of structures of marine engineering and merchant ships are among the most important and technologically complex operations during maintenance. The ultimate aim of the monitoring is prevention of serious damage of structures, which would require costly repairs or termination of operation.

Theoretical and technological difficulties may arise in implementing of the monitoring of structures of marine engineering and merchant ships upon exposure to extreme loads random – hydrodynamic, ice, mechanical loads at sea mooring in case of a collision with an obstacle or the ground.

The objectives of monitoring the technical condition of marine engineering structures and merchant ships include the following: measurement of various data of defects of structures; forecasting of defect accumulation; evaluation criteria of physical failures, – failure of structures; standardization of limits of defects.

Defects of structures of marine engineering and merchant ships may be the result of design deficiencies, technological shortcomings and mistakes of operation. In Russian practice of the monitoring of structures condition to progressive operational defects are referred: corrosive wear, residual strain and fatigue cracks. The sizes of these defects are measured during of operation marine engineering and merchant ships at regular intervals, more often it is 5 years, and the maximum allowable size of defects subject to standardization.

The standardization concepts of maximum permissible sizes of defects are grounded on the fact that preserved the strength margin of structure necessary to prevent excess defect before the next inspection.

The creation of approaches to measure and assess defects and their limiting constraints is among the tasks of maritime classification...