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Assessment of the Impact of Destabilizing Factors in the Main Engine Shaft of the Adaptive Speed Controller

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Abstract

In work the questions of stabilization of factors of reliability of operation of the ship equipment are considered.To solve this problem and a number of similar tasks aimed at increasing the reliability of ship's power plants (SPP), it is necessary to assess the degree of impact of various factors on the operation of the SPP.Subsequently we will use the results of this assessment to develop decision-making systems and devices to compensate for the impact of operational parameters on the parameters of the diesel engine working process.The work of the engine with loads is presented. The algorithm for parameter optimization was applied.The calculation is performed on real parameters.

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*Keywords:*resistance; shaft generators; automatic control system; algorithm; diesel;

1. Introduction

While servicing the diesel generator unit (DGU) both as the prime mover and the main ship's engine (ME), the parameters of the engine working process at the same number of revolutions stop corresponding to nominal characteristics due to the changes in external conditions, deregulation of individual units and engine components as well as their wear. Due to the wear of the components of the speed-regulating governor (rpm controller), its settings are misadjusted, the dynamic characteristics of the elements of the engine automatic control systems (ACS) are changed. This can lead to an additional increase in the amplitude and duration of the revolutions. Therefore, to

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reduce the amplitude of these deviations, it is necessary to adjust the speed-regulating governor (rpm controller) periodically. Therefore, the task of designing an adaptive governor with automatic adjustment of parameters becomes urgent.

To solve this problem and a number of similar tasks aimed at increasing the reliability of ship's power plants (SPP), it is necessary to assess the degree of impact of various factors on the operation of the SPP.

Subsequently we will use the results of this assessment to develop decision-making systems and devices to compensate for the impact of operational parameters on the parameters of the diesel engine working process.

2. Operational factors and statement of the research problem

To solve the problem of ensuring the stability of the ship's DGU and ME, it is required to take into account the operational factors directly affecting the characteristics of the marine diesel engine. The scope of such factors is large enough; therefore, we chose those whose influence is fairly significant. Such factors include the following ones [1-2]:

(a). Outlet backpressure of exhaust gases from the cylinders and inlet air resistance.
(b). Temperature of cooling water.
(c). Temperature and quality of the lubricating oil.
(d). Fuel injecting advance angle.
(e). Gas exchange and gas distribution conditions.
(f). Supercharge pressure.
(g). Deterioration of the fuel injection equipment.
(h). Uneven fuel supply to the cylinders.
(i). Wear of the engine cylinder-piston group.
(j). Fuel grade in use and its quality.
(k). Pressure, temperature and the ambient humidity in the engine operating medium.

The initial task of this study is to assess the degree of dependence of the change in the diesel engine torque on the main operational factors. Then, an integral evaluation of the destabilizing factors is made and the extent and nature of the impact of these factors on the operation of the diesel engine and DGU is studied.

The main source of electricity in the system under investigation is the diesel generator sets DGA1, DGA2, ..., consisting of synchronous generators SG1, SG2, ... driven by diesel engines D1, D2, ... (Fig. 1).

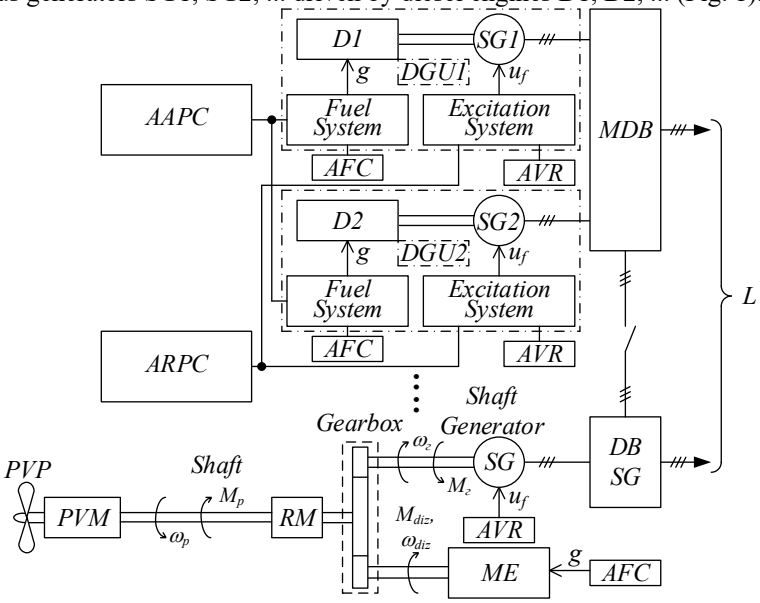

Fig. 1. Electromechanical system with power take-off from the main power plant.