Performance of exhaust gas recovery units for marine engines

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1. Introduction

If the size of the tanks was more or less the same for 25 years, after World War II, they increased significantly, initially at a slow pace. A typical tank from the T2 range from the time of the Second World War was 162 m long and had a capacity of 16,500 dwt.

A modern ultra-large crude carrier (ULCC) can be 400 m long and has a capacity of 500,000 dwt. Several factors have encouraged this massive increase. Hostilities in the Middle East that have disrupted traffic through the Suez Canal have contributed, as has the nationalization of oil refineries in the Middle East. Intense competition between shipowners also played a significant role. Apart from all these considerations, it all comes down to a simple economic advantage: the larger an oil tanker, the cheaper the transportation of crude oil and the more it can contribute to meeting the demands of increasing quantities of oil [1].

The application of RSM to design optimization is aimed at reducing the cost of expensive analysis methods (e.g. finite element method or CFD-Computer Fluid Dynamics analysis) and their associated numerical noise. The problem can be approximated with smooth functions that improve the convergence of the optimization process because they reduce the effects of noise and they allow for the use of derivative-based algorithms.

2. Experimental research method

Based on the data presented above, it is possible to proceed to establish the optimal essential parameters of the main engine:

- Engine power (at 90% MCR): 20,650 kW;
- Propeller speed: 106 rpm;
- Cruise speed: 14 knots

The ME-C engine concept consists of a mechanical-hydraulic system for fuel injection activation. The actuator is electronically controlled by a series of control units that form the complete engine control system. The fuel pressure booster consists of a simple plunger powered by a hydraulic piston activated by the fuel pressure. The fuel pressure is controlled by a proportional valve, which in turn is electronically controlled. The exhaust valve is activated by a light camshaft, actuated by the actuator located at the aft end of the engine. The closing time of the exhaust valve is electronically controlled for low fuel consumption at low load

Fuel system for the MAN B&W 6G70ME-C9.5 main engine which is arranged aboard the MT Green Attitude so that it takes up as little space as possible and provides optimized operation for both solid fuel and marine diesel fuel. From the service tank, the fuel is directed to an electrically operated feed pump with which a pressure of approximately 4 bar can be maintained in the low-pressure part of the fuel circulation system, thus avoiding gasification of the fuel in the exhaust valve box at intervals. temperature applied. The vent valve box is connected to the service tank by an automatic vent valve, which will release any gases present in the fuel path, and which will retain only the liquids. From the low-pressure side of the fuel system, it is driven by an electrically operated circulating pump, which pumps the fuel through a heater and a complete filter located immediately before entering the engine. The primary source of residual energy from a main engine is the exhaust, dissipated gas, which holds over 50% of the share of residual heat, from about 25% of total fuel consumption. Increasing interest in reducing emissions, reducing ship operating costs and the new IMO rules on EEDI call for measures to ensure the optimal use of fuel for the main engines on board ships.

3. Experimental Results and Discussions

The quality of products and services is the basic indicator of an industry or economy. As reliability, along with other indicators, is a component of quality, it must be in the attention of all the factors that determine the good of society. Although the notion is very old - it appeared with the technique - it is feasible that the theory was formed in the last decades and is in a continuous development.

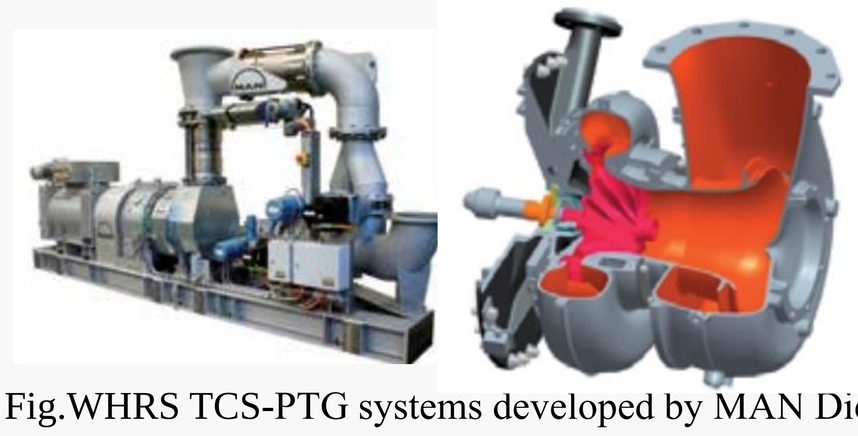

Fig.WHRS TCS-PTG systems developed by MAN Diesel & Turbo

The concept of age and new discipline, the theory of reliability is an interdisciplinary science that refers to a wide range of problems in all aspects of the existence of products (projectors, fittings).
The reliability of a product is determined by its design (projectors) when its structure is established and its dimensions are measured. Its reliability is ensured in the manufacturing process by the correct choice of technological processes and equipment, by respecting the manufacturing regimes and conditions of the factory and by strict quality control.
Feasibility is maintained through the use of adequate methods of preservation, transport, commissioning and operation. Qualitative analysis of reliability provides relevant information to the analysis in which it is reflected, in the functioning of the analytical entity, the different ways of the other components.
Quantitative Approach - Feasibility is the probability that the system will perform its functions for which it has been conceived and realized, with a certain and unambiguous performance, without delay. The quantitative approach to reliability is that it is objectively quantified, in the form of numerical indicators, of the level of reliability of the entities established for:
-comparison of two or more solutions from the point of view of the desired performance;
-demonstration of the classification of the values of the feasibility indicators within certain imposed limits, in the points of interface with other entities (installations, electric lines);
-detection of weak links within the analyzed entities;
-elimination of some indicators of guarantees included in the offers and contracts.

4. Conclusions

In recent years, there has been a large amount of residual heat released into the environment, such as exhaust fumes from turbines and internal combustion engines, residual heat from industrial installations, which lead to environmental pollution. In addition, there are also abundant resources of solar and geothermal energy. These heat sources are classified as low temperature thermal energy. Therefore, more and more attention has been paid to the use of waste heat for its potential in reducing fossil fuel consumption and mitigating environmental problems.

The recovery of waste energy is a growing concern for building developers, especially at European level, and in this field researchers have intensively studied the development potential of tube heat recuperators. As in the naval field, increasing energy efficiency and the use of renewable energy sources in the building sector is a priority.

Energy consumption for buildings today accounts for around 42% of final energy consumption in the European Union with a high potential for energy recovery of around 22% in the short term. Today, 35% of EU buildings are over 50 years old. By improving the energy efficiency of buildings, the EU's total energy consumption could be reduced by up to 56% and CO2 emissions by around 5%.

References

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