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1. MARINE ENGINEERING

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Research paper
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ANALYSIS OF USAGE OF ALTERNATIVE PROPULSIONS ON CONTAINER SHIPS

The paper analyzes the economic justification for the development of alternative powering systems for container ships. It gives an economy and reliability study of the currently most acceptable diesel-engine propulsion as compared to alternative powering systems, the gas turbine mechanical drive and the gas turbine electrical drive. The purpose of the paper is to assess the economic justification for the development of alternative powering on container ships, that is to say, will these drives bring about an improvement in the profitability of this type of ships. The analysis of the powering system is carried out in accordance with the following parameters: weight of power plant in kg/kW, fuel consumption in kg/kWh, supply costs in \$/kW, and the costs of fuel in \$/kW.

Key words: analysis, economy, container ship, powering systems, costs

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MAINTENANCE OF SHIP'S SYSTEMS

The paper outlines implementation of different approaches in maintenance of shipboard systems. Maintenance costs represent an outstanding economic factor in the shipping business. On the one hand a good maintenance policy increases the ship's profitability, and on the other hand the price of conducting the maintenance business grows. Shippers endeavor to find a solution for maintenance that achieves a most favorable relationship of maintenance costs. With the introduction of information technologies, the ship implements computer-based maintenance methods. Efforts are made to fulfill the objectives of ship maintenance through analysis of the performance of the ship's systems when a fault occurs (so-called cause and effect breakdowns). On the grounds of such analyses based on a database of faults, the approach to the type of maintenance to be applied is determined. The analysis shows the reaction of a system, or a certain part of the system, to the emergence of a breakdown. The parameters most often taken as indicators of such reactions are reliability or availability. The paper outlines the RCM method based on reliability (Reliability Centered Maintenance). Since risk consequences of a breakdown are not included in the best possible way, a derivative RCM method based on risk (Risk Centered Maintenance) is also described.

Key words: maintenance, access to maintenance, Reliability Centered Maintenance

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TECHNICAL CODE OF NO_x EMISSION FROM MARINE DIESEL ENGINES IN ACCORDANCE WITH SUPPLEMENT VI MARPOL 73/78 CONVENTION

It is necessary to explore every interactive possibility to achieve a synergistic performance in connection with reducing emission of exhaust gases, implementing the methods and procedures that can under the given circumstances render optimum results. It is currently, but also in the future, an imperative to explore new methods to reduce air pollution. Regulations regarding air pollution from ships should be supplemented in proportion with the needs of practice. Legislative initiative with the purpose of decreasing emissions of exhaust gases from marine engines in the global and local sense must incite even more intense research in the development of methods and ways of preventing air pollution from ships, as well as to adhere to the Technical Code in accord with the Supplement of the VI MARPOL 73/78 Convention. The aim of the Code is to establish a valid procedure of testing, surveying and issuing marine diesel engine certificates, which will enable the manufacturers, shipowners and administrations to adhere to the diesel engine limitations of NO_x emission.

Key words: Technical Code, NO_x emission

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INTELLIGENT SYSTEMS OF CONTROL AND FAULT DIAGNOSIS BASED ON ARTIFICIAL NEURAL NETWORKS

The development and application of new computer technologies based on algorithms of artificial intelligence could to a great extent improve the quality and performance of monitoring operative systems and fault diagnosis of marine propulsion engines. The paper is structurally divided into three almost independent parts. The first part represents a brief introduction to the artificial neural net so as to thematically familiarize students and engineers of marine traffic with the subject since they have practically barely encountered it during their training. The second part presents an analysis of existing, mainly highest grade, systems for monitoring and fault diagnosis that the world's leading engine manufacturers use. The third part deals with the possibilities of enhancing the existing systems through implementation of new technologies such as artificial neural networks, fuzzy logic and its combinations, and all

this for the purpose of increasing the safety and reliability of marine propulsion engine operation.

Key words: artificial neural networks, fuzzy logic, expert (high grade) systems, fault diagnosis, operating

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VISUALIZATION OF PERFORMANCE PARAMETERS ON STEAM TURBINE ENGINES BY MEANS OF ARTIFICIAL NEURAL NETWORKS

Observing the operation of complex systems by means of artificial neural networks enables acquirement of high-quality information about the characteristics of the system as well as about the influence of their interrelationships. The paper describes Kohonen's self-organizing neural network by means of which clusterization, visualization and value assessment of operative parameters of the industrial triple-phase steam turbine of 210 MW nominal power was effected. MATLAB 6.5 and SOM Toolbox 2.0 program packages were used. The acquired results represent the classification of certain parameters into corresponding clusters, as well as their interrelationships, for the purpose of enhancement of quality monitoring of the performance of the steam turbine engine. Special emphasis is placed on graphic visualization of the parameters dealt with, so as to facilitate analyzing of the acquired results.

Key words: artificial neural networks, clusterization, SOM, U-matrices, steam turbines

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COMMON RAIL SYSTEM

This paper outlines the operative principle of the Common Rail System and WECS (Wartsila Electronic Control System) that controls the engine performance of the common rail system. In comparison to classical engines the system has many advantages, such as: decreased fuel consumption, reduced engine weight, smoother running during low rpm, lesser maintenance costs, and most important is that the system provides considerable reduction of detrimental gas emission below the level prescribed by the MARPOL 73/78 Convention, from which it may be concluded that this system will to a steadily increasing extent be used on ships in the future. The electronic control system that regulates the quantity of injected fuel and the intervals of injection along with electronic regulation of the opening and closing of the

exhaust valves have in the highest degree contributed to the reduction of detrimental gas emission.

Key words: common rail system, WECS-9500

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FAILURE ANALYSIS OF SHIP'S REDUNDANCY SYSTEMS

Reliability improvement of a ship's propulsion system is achieved by reducing the failure rate of the ship's redundancy system. The propulsion system has the highest failure rate in the ship's redundant system. The propulsion system has the highest failure rate in the ship's machinery. The exhaust valve and injection pump are the most endangered items with the highest failure rates. Reliability enhancement can be achieved by adjustment of the existing concept of maintenance by means of an analysis of the operational data of the ship's propulsion system. In order to make the ship propulsion system more resistant to failures, in light of the faults in the conventional propulsion system (one propulsion engine – one propeller shaft), it is necessary to install redundant propulsion engines and steering wheels with necessary auxiliary service support for each engine, with a multiple system of shafts and provide multiple spaces for fire or flood risks.

Key words: reliability, redundant systems, failures, maintenance

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SIMULATION OF BEHAVIORAL DYNAMICS OF THE MARINE DIESEL ENGINE UNDER LOAD

Simulation Modelling, together with System Dynamics and intensive usage of modern digital computers, which means application on a massive scale, nowadays very cheap, and at the same time a very powerful personal computer (PC-a), is one of the most suitable and effective scientific ways for investigation of the behavioral dynamics of non-linear and very complex natural, technical and organisation systems. The aim of this paper is to show the efficiency of System Dynamics Simulation Modelling during the study of the dynamics behavior of the complex marine diesel generator system. The marine diesel generator is presented by a set of non-linear differential equations i.e. a continuous simulation model of higher order, in other words by so-called level equations and will at the same time be a discrete simulation model since it strictly satisfies the selected value of the basic discrete time period DT, which value is

determined in total accordance with “Sampling Theorem” (Shannon – Kotelnikov – Nyquist – Sampling theorem). Furthermore, the paper presents the mathematical model of the whole system, i.e. the marine diesel engine model and marine synchronous generator model, based on which System Dynamics qualitative models (mental-verbal, structural and diagram models) and quantitative models (mathematical and computer simulation models) are made.

Key words: simulation, systemic dynamics, modelling, diesel engine, synchronous generator, heuristic optimization.

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TECHNICAL TOLERANCE OF FAULTS IN THE SYSTEM OF DIAGNOSIS

During the designing of diagnostic systems for the ship's electric power propulsion the coordination of different objectives is necessary. In addition to the realization of the anticipated functions, the system must have a corresponding reliability, security, availability, economy, quantification, etc. This paper presents a survey of possible solutions by which the ship's electric power processes can be managed with a considerably more satisfactory failure-free operation. In this connection consideration is given to achieving and securing the availability of the system as one of the crucial components of the overall technical and user efficiencies. The techniques for detection, diagnosis, limitation, hiding, compensation and repair of faults are presented. The described procedures are illustrated on the example of a system with a fault in an active unit in a redundant pair. These techniques can be used for designing a diagnostic system that tolerates faults. As regards which techniques should be used, does not depend only on the given application, but likewise on the ideas and philosophy of the designer.

Key words: failure diagnoses, control system

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DETERMINING OF THE SHIP'S HULL TOTAL DEFORMATIONS IN REAL SAILING AND SERVICE CONDITIONS

The paper describes the method and procedures in determining the ship's hull bending deformations in the longitudinal horizontal plane in the real sailing and service conditions. The ship's hull bending is determined on the basis of the reading of digital inclinometers inclination data, obtained from the ship's hull measurement network. The method of absolute and relative measurement point shifts calculations is described, as well as the determining of the defined neutral line. The impact of ship's hull bending in longitudinal vertical plane and of

torsion ship's hull deformation on the bending in longitudinal horizontal line is included in deformations calculations method.

Key words: hull, control, sailing, inclination, deformation

2. MARITIME TRANSPORT TECHNOLOGY

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Review

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LOGISTICS – PREREQUISITE FOR THE SUCCESS OF MODERN ORGANIZATION

The paper aims to present significance and importance of the logistics activities in the organization, as a basic prerequisite of permanent organization growth and development on global market. The first step of implementation the logistics activities in the organization is defining logistics strategy. The second step is designing the logistics structure that needs to be alignment with defined logistics strategy, strategic organization orientation and organizations structure. Properly defined logistics strategy and structure contribute in achieving the basic organization goals: customer satisfaction and profitability as primary generator of the organization growth and development.

Key words: logistics, logistics activities, logistics strategy, logistics structure

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COMPARATIVE ANALYSIS OF RO-RO/CONTAINER SHIP FEEDER SERVICE OF LOŠINJSKA PLOVIDBA

The Feeder Service of Lošinjska Plovidba – Rijeka transports containers from transshipment terminals in the central Mediterranean to Adriatic ports. The trend of a worldwide increase in container traffic leads to congestion of the transshipment terminals of Gioia Tauro, Taranto and Marsaxlokk, where domicile ships have priority at berth and in transshipment thus causing

feeder ships to wait for berth up to 48 hours. Ro-Ro ships, on the other hand, have a ready access to transshipment ramps. It is up to the shipowner to decide which type of ships to use in order to achieve better and more successful service. This paper makes a comparative analysis of the ships that take part in the Feeder Service of Lošinj'ska Plovidba.

Key words: feeder service, container ship, ro-ro ship

3. NAUTICAL SCIENCES

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STRUCTURAL ANALYSIS OF TECHNOLOGICAL PROCESSES IN MARITIME SURFACE NAVIGATION

This paper aims at presenting technological processes that occur during maritime voyages on the cargo vessel. Processes during maritime voyages consist of operations that arise during maritime voyages between ports of departure and ports of arrival. Specific conditions of a voyage throughout the course of different parts of the voyage are the cause of the differentiation of these processes. Thus, it is possible to separately study the processes on departure, the processes during open sea voyage and the final processes on arrival at the port of destination. Besides such a classification, processes can be divided into processes directly related to the voyage as well as ones related to the vessel and those related to the transport object and each of these processes can be applied to any maritime voyage regardless of the type of transport means, place and time of voyage as well as of the transport object. Technological processes during the maritime voyage provide safe and efficient navigation and fast and economical transport of the cargo.

Key words: technological processes, maritime voyage, vessel.

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CHARACTERISTICS OF THE SEA WAVES OF THE ADRIATIC SEA RELATIVE TO THE SAFETY AND COMFORT OF SEA TRAFFIC

Sea traffic plays an important role in the tourist trade of coastal countries because it can prevalently be considered a tourist service as opposed to land or air traffic, which are mainly

in the function of bringing the tourists to their destinations. This is particularly true in reference to the portion of sea traffic that is fulfilled on pleasure craft.

The interaction between waves and craft can be observed in two different ways. The smaller waves or ripples is when one entity of rolling or pitching causes a pleasurable sensation, but the bigger waves are experienced as unpleasant and even frightening; people become seasick, especially taking into account wave impact on pleasure craft.

From this aspect wind waves should be taken into consideration, and their elements are mainly defined by the velocity of the wind, the local maritime zone and the duration the wind blowing. The sensation of pleasant or unpleasant sailing primarily depends on the relationship between the waves and the size of the craft.

The mareographic (oceanographic) buoys can very accurately measure the height and the period of waves, where their length and speed are assessed or calculated by means of empiric formulas.

This paper proposes parameters and respectively interdependent elements between the waves in the Adriatic Sea and the seafaring craft that could prove to be useful in selecting the craft that would make navigating pleasurable.

Key words: Characteristics of sea waves, safety of navigation, pleasant voyage

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APPOINTMENT OF A SHIP SECURITY OFFICER

The International Ship and Port Facility Security Code requires that Shipping Companies appoint a Ship Security Officer (SSO), but the Code does not regulate which officer is to be selected for this position. The choice is left to the Shipping Companies. This work deals with the problem of selection of the SSO among present ships' officers. By observing the officers on merchant ships and comparing their existing functions and tasks with the SSO tasks this work endeavors to indicate that the Chief Officer is closest to the appointment and the most probable choice of the shipping companies. In addition to this, the work looks into the main problems of selection of the Chief Officer as SSO with suggestions how to solve them.

Key words: International Ship and Port Facility Security Code, Ship Security Officer, Chief Officer

4. SOCIAL-HUMANISTIC SCIENCES

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LEGAL ASPECTS OF ALIGNING MARITIME LEGISLATION OF THE REPUBLIC OF CROATIA TO EUROPEAN MARITIME SAFETY AGENCY REGULATIONS

The paper deals with the legal starting points of a European approach to maritime safety as a regional source of legislation for member states and acceding countries to the European Union (EU). It analyzes the challenges of implementing the European maritime regulations, with an emphasis on the role of the European Maritime Safety Agency (EMSA) as a special control body of the EU whose basic task is to monitor the efficiency of implementation of regulations in the field of maritime safety. The coordination of legislation of the Republic of Croatia with maritime policy of the European Union as well as the interrelationship between the International Maritime Organization (IMO) and EMSA are considered. The authors analyze the position of Croatia and propose that on occasion of aligning the legislation in the domain of maritime law the Croatian legislator must focus attention not only on the activities of IMO as a specialized organization of the United Nations, but also to bear in mind the need to accept the legal acquisitions (*acquis communautaire*) of the EU, which are in the sphere of maritime safety reflected in the activities of EMSA.

Key words: maritime safety, ship and port facility safety, coordination of maritime legislation, *acquis communautaire*.

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TECHNOLOGY AND ORGANIZATIONAL CULTURE

The author analyzes the theoretical precepts of technology and organizational culture and by means of differentiation and association of their phases, types, layers and dimensions he endeavors to grasp the whole of the relationship between these human phenomena and the tendency of their future development based on theory.

In the technology itself he makes a distinction between its positive and negative aspect, as well as its historical, sociological and organizational level. On the level of organizational theory he deliberates on the classification of technology (Woodward, Perow, Thompson) and their determinations. Finally, the author emphasizes two appearances of organizational culture and one form of the related types of organizational culture with the types of technology. Thereupon, he presents Schein's model of organizational culture as a starting point in quest of

a reply as to whether organizational culture can be introduced and changed through the will of the management? The author gives a negative answer in the sense that although such action might have some results, in essence it distorts the humanistic perception of culture.

Key words: aspects and types of technology, the essence and types of organizational culture, links between types

5. MARITIME ENGLISH

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SEMANTIC RELATIONSHIPS BETWEEN MARITIME TERMS

The study of semantics has long been the domain of different scientists, such as psychologists, philosophers and anthropologists. Only lately, in the 20th century, have linguists taken a serious interest in it, so that gradually we came to know about *linguistic semantics*. But this deals only with one aspect of meaning, i.e., how meaning is affected by the interrelation of words. This is probably one of the reasons why the linguistic approach has been safely confined only to theoretical aspects of general English, leaving aside language for specific purposes. That is to say, technical terms must consider concepts and referents to a greater extent. Our paper attempts to fill this gap by providing a semantic structure of maritime English.

Key words: semantic field, lexeme, semantic relationship, metaphor and metonymy.

6. PAPERS COVERING DIFFERENT FIELDS

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WEB PORTAL DEVELOPMENT IN LAMP ENVIRONMENT

Dynamic and individualized Web portal development projects have become the centerpiece of IT development strategy for many institutions in order to create a strategic advantage, to provide services for increasingly demanding users and expand market opportunities.

Open Source LAMP development environment is used to create complex, dynamic and secure Web applications.

Open Source technologies will improve reliability, reduce costs and provide new revenue streams.

Key words: Web portals, LAMP, portal development, Web applications, Open Source