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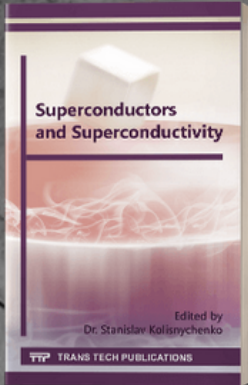
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## Application of Waste Elimination Theory in Production Processes at Balikpapan Shipyard

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### Abstract:

The shipbuilding industry also supports the economic sector in Balikpapan. Shipbuilding industry business generally consists of new building and ship repair. There is a shipyard in Balikpapan that already has experience in making landing craft tanks, tugboats and barges. But according to the head of production, this shipyard often experiences delays in the production process. Based on temporary assumptions, this happens due to correction and re-works waste. This study aims to find the initial causes of waste that occur, and try to prevent it. Prevention from the initial cause, is a meaningful innovation. This study uses the fault tree analysis (FTA) method as a modeling of the root causes; and waste management theory is used as the basis for the science of innovation application. The research objective is to increase shipyard productivity. Based on research there are five top events that cause delays in the production process at Balikpapan shipyard, they are work not done; incorrect raw material specifications; incorrect product specifications; changes by surveyor owner; and not yet approved by the class.

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*Applied Mechanics and Materials*  
ISSN: 1662-7482, Vol. 902, pp 1-12  
doi:10.4028/www.scientific.net/AMM.902.1  
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Submitted: 2020-01-03  
Revised: 2020-06-07  
Accepted: 2020-06-07  
Online: 2020-09-15

**Automatic Predicting Torsional Vibrations on Main Propulsion Plants, Installed Two-Stroke Diesel Engines: Algorithms and Software**

LUU Do Duc<sup>1,a</sup>, HANH Cao Duc<sup>2,b</sup>, NHO Luong Cong<sup>1,c</sup>

<sup>1</sup>Maritime Research Institute at Vietnam Maritime University, Hai Phong, Viet Nam  
<sup>2</sup>IT Faculty of Vietnam Maritime University, Hai Phong, Viet Nam  
<sup>a</sup>luudd@vimaru.edu.vn, <sup>b</sup>hanhcd@vimaru.edu.vn, <sup>c</sup>luongcongno@vimaru.edu.vn

**Keywords:** Torsional vibration calculation; software for automatic calculating torsional vibrations (SATVC); predicting torsional vibrations; software for automatic predicting torsional vibrations (SATVP).

**Abstract.** The main propulsion plant (MPP) on marine sea-going ships consisting of a diesel engine as the main engine and driving the ship propeller is with the torsional vibrations to be calculated in accordance with the Rules for the Classification and Construction of Sea-Going Ships. The Rules are given by one of maritime registers in the world that are the members of IACS, such as Russian Maritime Register of Shipping (RMR), DNV, ABS, at el. The TV calculation (TVC) on the MPP usually is certainly a monumental calculation task and is conducted with special software for TVC. Nowadays, in accordance with the Rules, almost modern software products for TVC have the abilities to calculate the TVs at normal working regimes and at misfire regimes (called by Normal or Misfire regimes relatively) with only one of cylinders of marine diesel engine (MDE) while engine speed range covers from the minimum to maximum values of the operation speeds. The paper presents improved algorithms and software for automatic calculating the TVs (SATVC) at the Normal and the Misfire regimes, in which the misfiring processes appear not only in one cylinder, but also in two of the MDE cylinders together. The SATVC was based on the made mathematical models, algorithms and coded in LabView by authors. The SATVC consists of modules for automatic calculation of freedom TVs (FTVs), excited torsional moments (ETM), excited TVs (ETVs), permitted torsional pressures (PTP), and common management (CTVC), TVC at every working regime of MDE was automatically conducted in the following procedure: Configuration of the MPP for TVC; Calculation of FTVs; Calculation of ETM; Calculation of ETVs; Calculation of ETVs, and solution of the TVC in considered working regime. The working regime of MDE was modeled by a vector of firing coefficients (VFC) of every MDE cylinder.

**Introduction**

TVC of the MPP on the sea-going ships is very important to the safety of the plant when operating without over-permitted torsional pressures of the MPP's shaft-line in accordance with working speed regime (WSR) of and working condition regime (WCR) of the MDE. The WSR is formed in the range  $\lambda = [\lambda_{min}, \lambda_{max}]$ ;  $\lambda = n$  nodes; when  $n$  and  $n_{max}$  calculated and maximum continuous rate of MDE speed, as a relative speed vector:  $\lambda = [\lambda_1, \lambda_2, \dots, \lambda_n]$  [5], [8]. The WCR is Normal while firing process in every combustion cylinder chamber is normal, and is Misfired while in only one of cylinders is missed firing process, but the compression is normal. The WCR is modeled by a vector of firing coefficients of cylinders (VFC):  $C_F = [C_{F1}, C_{F2}, \dots, C_{Fz}]$ ;  $z$  – number of cylinders. The TVs are calculated for all of the different variant configurations of the MPP in according to its functional operation. The TVC are necessary to carried out for MPP of the new built marine motor vessel or for the modified MPP of an exist ship. The above-mentioned keys for TVC are given in the Rules [2], [9], and are basis for TVC in practice, such as [1], [3], [6].

TVC of MPP with the simplest configuration considers TVC of the MPP: MDE drives directly a propeller. The MDE is usually multi-cylinder, for example, the engine has  $z = 6$  cylinders, then WCR is 7. If the WSR with a related speed range  $[0.4 \dots 1.2]$ , vector  $\lambda = [0.4, 0.5 \dots 1.2]$  has 90 related speed regimes (step iteration 0.01). The total regime for TVC is 630.

**Info:**

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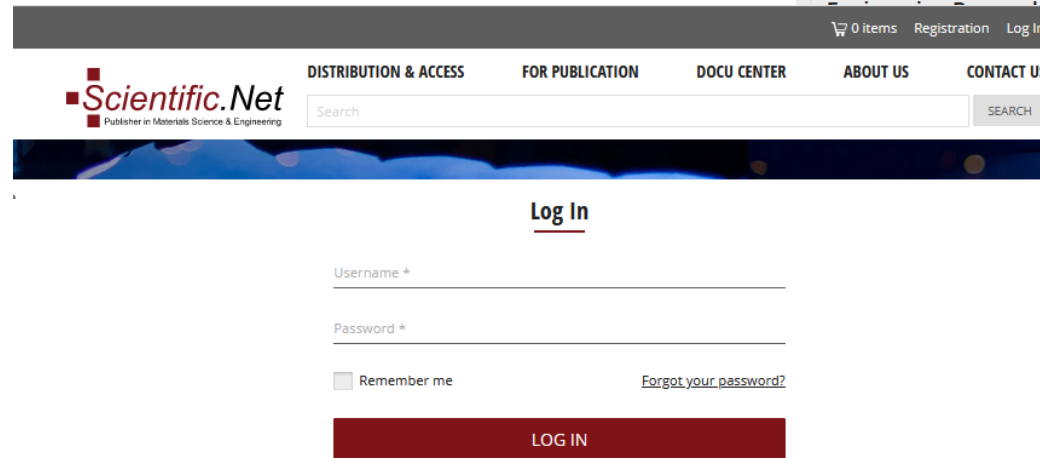
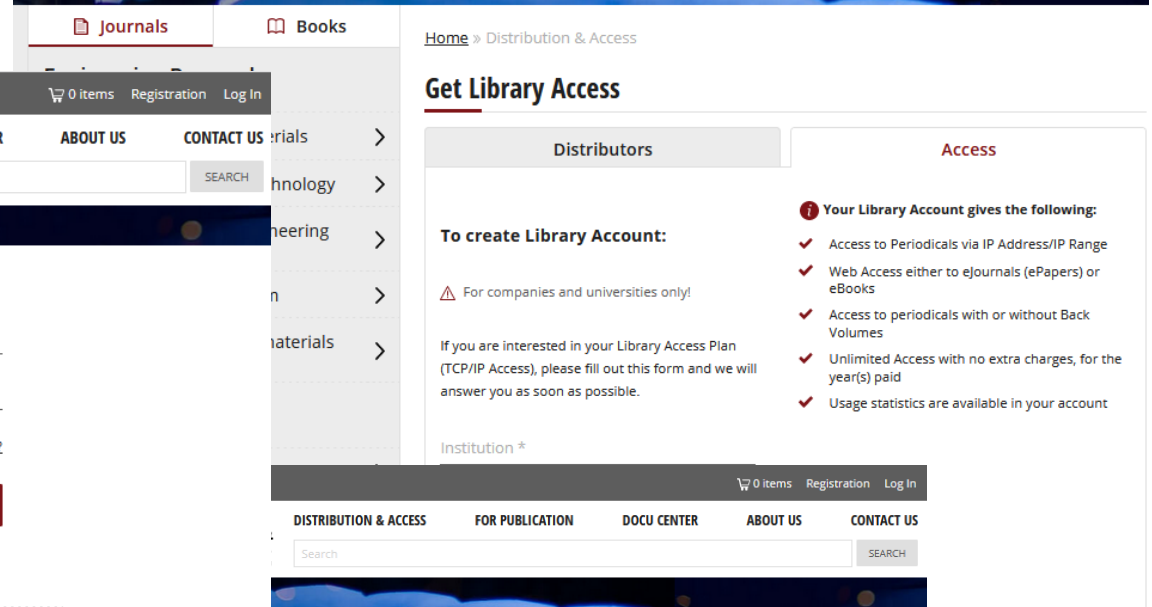
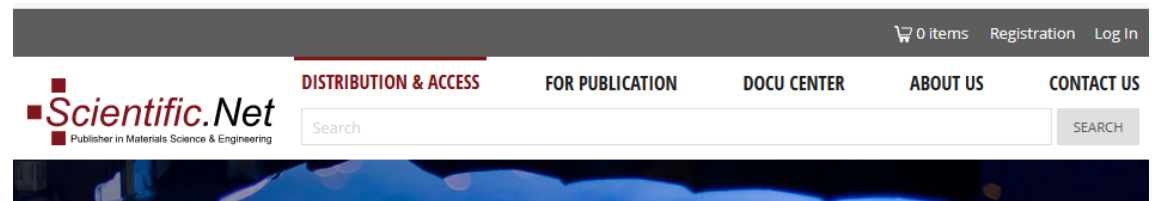
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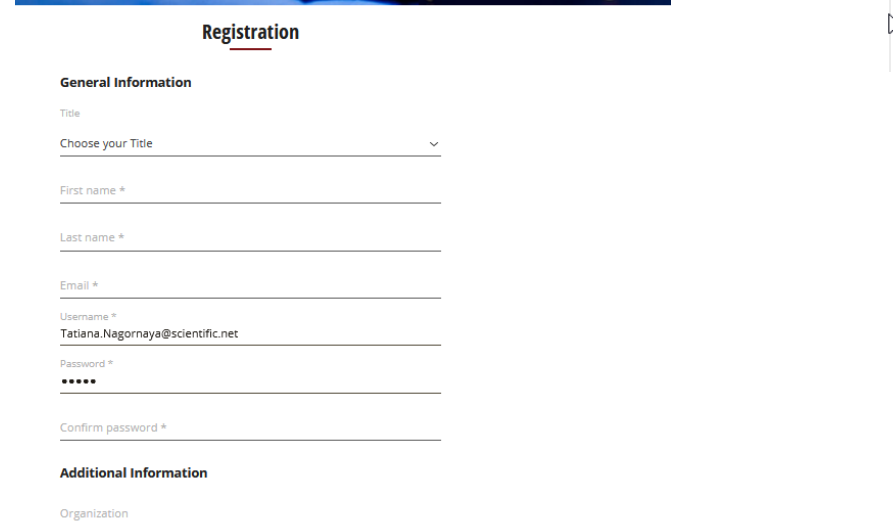
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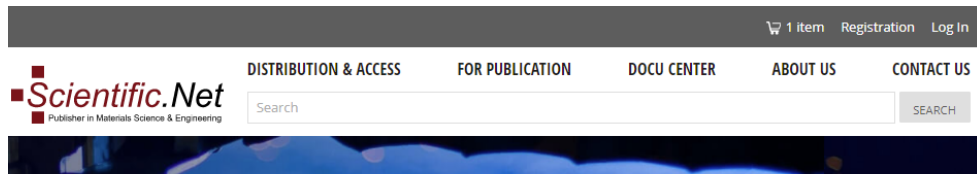
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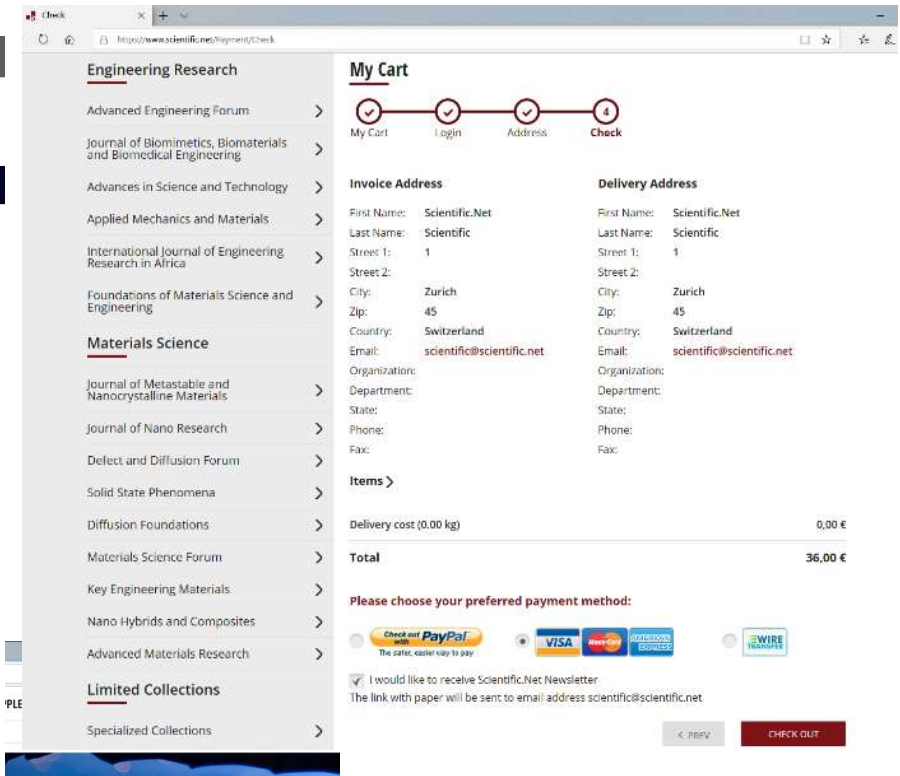
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