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Transportation Engineering Technology – A review

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Abstract: This article reviews the results of the studies, which are presented in the selected papers of the special issue "Transportation Engineering Technology" of the International Journal of Mechanical Engineering and Applications (IJMEA). The results of the studies, introduced here by the authors, have helped to determine which research problems related to the Transportation Engineering Technology are interested in Vietnam.

Keywords: Transportation Engineering; Research cooperation; Review

1. Introduction

In September 2014 an invitation was send from the Science Publishing Group concerning the possibility of adding papers on transportation engineering to the scope of the International Journal on Mechanical Engineering and Applications (IJMEA). The outcome was a proposal for a special issue, to include papers from academics, researchers and practitioners with a strong interest in the fields of transportation engineering and technology. In response, a number of interesting and very varied manuscripts were submitted, from which this issue has been selected [1].

2. A Review of current research interests

The first paper in this issue by Ngoc-Hien Do et al. (pp. 1-8) is devoted to the congestion, a serious traffic problem in many countries in the world. In this study, based on simulation analysis, the impacts and effects of traffic controls including traffic circle, traffic light system and coordination alternative were consider on two common intersections. They are studied under the mixed traffic conditions. The study shows that the coordination alternative should be used to control traffic flows at intersections. Therefore, a specific traffic simulation program is used. Suitable simulation models are constructed to describe as well as compare or evaluate considered alternatives including traffic light systems, traffic circle and coordination between them at the intersections. Besides, the logic of simulation models is outlined.

Relating to the engine innovation, Tran Anh Tuan and Ly Vinh Dat (pp. 9-17) focus on replacing the VE mechanical fuel system with the VE-EDC (Electronic Diesel Control) computerized fuel controlling system on the diesel engine. The implementation of VE-EDC has brought many advantages in improving the productivity performance, the fuel consumption and the exhaust level on the Diesel engine. This paper will analyze the installation and the conversion of the VE conventional fuel system to the VE - EDC in the Hyundai H100 diesel engine 1T25.

The next two papers consider the ship's hull strength and stability analyzing. To predict the ultimate longitudinal strength of intact ship, Huynh Van-Vu (pp. 18-23) has chosen the Finite Element Method (FEM) with ABAQUS software. In this research, by using the nonlinear FEM analysis through the modified RISK method in ABAQUS software, the ultimate longitudinal strength of intact ship under vertical bending moment was generated. This method was taken into account for two Nishihara models, 1/3- scale frigate model and double hull VLCC. The result obtained by FEM analysis had good agreement with experimental results. The difference between the results of two methods is about 2%.

Nguyen Anh Tuan and Tat-Hien Le (pp. 24-28) have proposed a research task focusing on study of the effects of roll motion on a transverse stability of a small boat. As presented in this paper, the roll frequency will be calculated and analyzed for reducing motion sickness based on stability solution of the ship roll motion.

Drawing on long experience in the welding technique, Dang Thien Ngon and Phan Van Toan (pp. 29-34) identify the problems of the research and proposal on welding technique for longitudinal crack defect welding. In this

research, authors propose a new approach to create welding crack with residual stress using cast iron electrodes. The process to create the welding cracks based on this technology using the SMAW combining with GTAW allows to create the welding with cracks similar to those in nature. Cracks are created with lateral deviation well response to the phased array ultrasonic testing technique and have similar shape to natural shape of the crack defect.

The next two papers in this special issue are the reports of the R&D Projects both funded by the Ho Chi Minh city University of Technology (HCMUT) in 2013 and 2014 FY. First, Thi Tuyet Nhung Le et al. (pp 35-40), in the paper entitled "Design of Aero-elasticity Bench Test for NACA0012 Wing Model in the Low Speed Wind Tunnel: Influence of Wing's Parameters on Flutter Speed", present the aero-elasticity bench test design process and optimize this design. Based on strip theory and V – g method. Authors design the geometric parameters of the wing fitted with the wind tunnel in the HCMUT. This model has been manufactured to research about aero-elasticity phenomenon. Thus, if the PU plastic wings have wing chord length c = 0.1 m and length of wing span L=0.4 m, the divergence could be observed at 30.34 m/s. Dimensionless parameter of wing were analyzed to design the wings parameters for flutter phenomenon.

The second paper by Phan Quoc Thien et al. (pp. 41-46) presents the estimation of hydrodynamic forces of the floating airboat by numerical simulation. The flow around the airboat and the forces acting on it are quite different from those for a ship in normal act. By solving the unsteady Reynolds - Averaged Navier-Stokes (RANS) equations, the transient flow field around an airboat undergoing unsteady motion is simulated and the varying hydrodynamic force in effect of the different currents acting on the hull is evaluated in this article. OpenFoam 2.1.0 and extended toolbox were used to do simulation. The numerical results obtained with K-omega shear stress transport turbulence models and the volume of fluid method as the suitable turbulence model were analyzed and compared with experimental results.

The next two papers return back to the fields of structural analysis. The first, Hung-Chien Do and Vo Trong Cang (pp. 47-53) report an assessment of ship structural analysis and design using MSC solutions. This study discusses the buckling and ultimate strength of un-stiffened plates, stiffened panel, and fatigue of a FPSO crane by using such solutions as MSC NASTRAN and MARC. Following is the paper by Hung Anh Ly and Thinh Thai-Quang (pp. 54-62), which is also a report of another research project funded by HCMUT. Crash-dynamics research has contributed significantly to the safety, survivability of passengers in transportation accidents, especially in automotive industry. Among thin-walled structures, the application of thin-walled tubes with square and circular cross-sections has gained currency thanks to convenience of manufacture and capability of energy absorption. In this paper, a thorough review has been illustrated, the comments and specific guidance have been introduced in theoretical calculation and numerical simulation as well.

Again, back to the engine related fields, the paper by Phan Van Quan et al. (pp. 63-68) reviews the methods for improving the transient operation of the diesel engine of transportation vehicles. Each method has its own advantages and disadvantages responding to the structure of the engine as well as the use of the engine. It needs to ensure that the engine working in the transient condition has the stable operation mode with the high efficiency and reduced fuel consumption.

At last, the maintenance system should be built taking into account the specific exploiting conditions, that is, to take into account not only the running distance between repairs, but the volume of the planned maintenance was made (both preventive and corrective) and their intervals. In his paper, Vo Trong Cang (pp.69-75) presents the principles and algorithms to optimize the meantime to repairs for the components of vehicles at a given level of reliability parameters. This algorithm can be applied to the worn parts of vehicles through the attrition survey in the specific exploiting conditions and calculating the reliability indexes respectively. The programs, which used for calculating the relationships between the failure flow parameter and the number of the total converted units repairs with the working time, will also be useful tools for the determination of the optimal repairing cycle of the parts or components of the transportation means with regard the unexpected failures and the correlation between the costs of planned and unplanned repairs respectively.

3. Discussion on the future

Although it is only an incomplete collection of articles, but the results of the studies, introduced here by the authors, have helped to determine which research problems related to the Transportation Engineering Technology are interested in Vietnam (see table 1).

In addition, table 2 shows not only which topics are being interested but also where they are being implemented. Believe that there will be new partnerships between the affiliations to expand not only the application but also the implementation of our cooperative researches in the future.

Acknowledgement

Table 1. *Relationships of research fields and methods*

nn	Research Fields / Topics	Paper No (*)											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Traffic Problems, on-land Transport	✔											
2	Engine Innovation / Development		✔								✔		
3	Naval Architecture – Ship design			✔	✔			✔					
4	Ship Stability and Motion				✔			✔					
5	Hydro dynamics						✔	✔					
6	Structural Analysis			✔		✔			✔	✔			
7	Ship Strength			✔					✔				
8	Material and Testing					✔				✔			
9	Manufacturing and Technology Mgt					✔				✔			✔
10	Reliability, Maintenance, NDT					✔						✔	
11	Optimization				✔							✔	
12	CAD & 3D Modeling			✔			✔		✔				
13	Simulation, Experiment	✔	✔		✔	✔	✔	✔		✔			
14	Literature Review								✔		✔		✔

(*) Paper numbers are referred to the endnote "List of Papers"

Table 2. *Authors' Affiliations*

nn	Affiliations	Paper No (*)											
		1	2	3	4	5	6	7	8	9	10	11	12
1	Ho Chi Minh city University of Technology, - Faculty of Transportation Engineering				●		●	●	○	●	○	●	●
2	Ho Chi Minh city University of Technology, - Faculty of Mechanical Engineering	●											
3	Ho Chi Minh city University of Transport, - Faculty of Naval Architecture & Ocean Engineering								●		●		
4	Tran Dai Nghia University		●								○		
5	Ho Chi Minh city University of Technology & Education		○			●							
6	Nha Trang University			●									
7	Industrial University of Ho Chi Minh city					○							
8	Korea Maritime & Ocean University, - Department of Logistics Engineering, *Korea*	○											
9	Others …							○			○		

(*) Paper numbers are referred to the endnote "List of Papers". ●/○- Authors corresponding / secondary

References

[1] Vo Trong Cang et al. Transportation Engineering Technology - Special Issue. *International Journal of Mechanical Engineering and Applications*. 3: 1-3, 2015 < www.sciencepublishinggroup.com/specialissue/220006>

[2] Vo Trong Cang et al. Transportation Engineering Technology – Part II. Special Issue. *International Journal of Mechanical Engineering and Applications*. 3: 3-1, 2015 < www.sciencepublishinggroup.com/specialissue/220014>

Appendix

Special Issue: Transportation Engineering Technology

List of Papers

Biography

Vo Trong CANG (1961, Saigon). PhD (2009) in Logistics and Operations Managements. Senior lecturer of the Faculty of Transportation Engineering at the Ho Chi Minh city University of Technology (HCMUT), Vietnam National University of Ho Chi Minh city (VNU-HCM).

Work experience: shipbuilding, CG, R&D, educator. Former Head of the Naval Architecture and Marine Engineering Department of HCMUT. He has 20 publications in scientific papers and 10 presentations on international conferences. He has published 5 books and instructions in ship design and construction. He is an associate researcher at the Digital Control and Systems Engineering Key-Lab (DCSE-Lab) under the VNU-HCM.