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Home > Volume 12, Issue 3, September 2011 > **Hantoro**

## Numerical and Experimental Investigations of Lateral Cantilever Shaft Vibration of Passive-Pitch Vertical-Axis Ocean Current

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### Abstract

*Simulation and experiment of lateral shaft vibration of passive variable-pitch vertical-axis ocean current turbine have been performed. A cantilever type of shaft has been used and modeled using finite element method, and simulated using consistent mass matrix to obtain the vibration characteristics and responses. Variations of incoming fluid velocity and the corresponding rpm were used to identify the pattern of lateral displacement responses. Analysis of displacement responses at all nodes in x and y-direction at the same time was carried out, and confirmed with the presents mode shapes. The repeated pattern of periodic displacement responses due to the functions of force acting on the foils was identified. Correlation of critical azimuth position of the foils and displacement responses was presented. Experiment was conducted as validation of the simulation results at a node of the finite element model. Periodic pattern responses resulted from simulation and experiment at the validated node shows the suitability with average error value for all variations were 11.6% in x-direction and 12.3% in y-direction.*

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