

Title of Diploma Thesis

Exploitation of Structural Integrity Measurements of a Floating Breakwater in Kavala Port, Greece

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ABSTRACT

Floating breakwaters have shown a great growth in the last decades as a measure for the protection of the coastal zones and the human activities in them. These structures are sensitive to extreme environmental conditions and are subjected to significant loads. Therefore, the monitoring of their structural health and the forecasting and repairing of possible failures are considered necessary, aiming also at the reduction of maintenance costs. The aforementioned monitoring can be achieved by installing Structural Health Monitoring (SHM) systems, which can increase the lifetime of the structure.

Within this field, this thesis aims at the exploitation of recorded data of a SHM system installed on the floating breakwater in the port of Kavala, Greece. The data are acquired from a sensors' system, which is installed at a module of the aforementioned structure. This system enables the measurement of vital parameters of the breakwater and of critical environmental factors. The whole examined problem is characterized by complexity due to the existing complicated wave field inside the port's basin, which results from the diffraction and the reflection of the waves as well as the passage of ships and boats.

Initially, the measured data corresponding to the forces of the chains, the acceleration of the module, the waves' pressure on the structure, the direction and the velocity of the wind, are being examined and assessed. The data are appropriately processed and then, they are presented in terms of time-series and boxplots, in order to derive conclusions about the functioning of the structure.

Finally, a model of the examined system (breakwater, sensors) is developed, including suitable statistical quantities that describe each one of the measured parameters. This is achieved by utilizing the Building Information Modelling (BIM) approach, which enables the inclusion of critical structural information within the model. The overall outcome of the above is the availability of information to every stakeholder in a direct and simple way.

Keywords: Floating breakwater, Structural health monitoring, Field data, Building Information Modelling.