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Offshore Structure Stabilization under the Surface Wave Effet

Stabilisation des plates-formes marines sous l'action des vagues

Stabilisierung maritimer Plattformen unter Welleneinwirkung

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The surface waves are one of the major factors of the external influence on the supporting structures of the type of the offshore fixed structures. In this case offshore fixed structures undegro intensive dynamic effect. As a result the supporting structures suffer the considerable dynamic loads decreasing their supporting power.

The offshore fixed structure stabilization under the surface wave effect can be realized by means of the surface wave destruction and the absorption of the part of the energy. On this purpos the obstacle can be settled on their way-before their interaction with the offshore fixed structures. This obstacle presents a peculiar type of constructions that may be called breakwaters. The effectiveness of such breakwaters is determined by the part of the surface wave absorbed energy.

An elastic circular plate-that may be closed or sectional-is presented in the given paper as a specimen of a breakwater. This plate is freely floating on the water surface and is flexibly fastened to the framework of the offshore fixed structure. The width of the elastic plate on the wave beam, i.e.its chord and its thickness depend on the calculated parameters of the surface wave.

The flexible connection of the plate with the supporting structure is sufflied with the additional source of the system oscillation energy absorption to increase the effectiveness of breakwater. The circular pontoon, partly submerged by means of filling it with the water ballast, can be used to increase the flexing rigidity of the plate on its surface. The material consumption is minimal here.

In course of theoretical analisis of the interaction of the flexible elastic plate with the travelling surfase wave due to Stoker-Phillips theory three cases are investigated: a freely floating plate, a rigidly fastened plate and suppoting structure interaction values ave investigated,where the plate may be regarded either as rigidly fastened or as freely floating, from the point of view of wave suppressing effect.

The optimum values of the plate parameters under which the effectiveness of the surface wave energy absorption reaches 20-80 % are also indicated.

The original structure of a wave suppressing device is presented in this paper. The device can be mounted in the boundary area of wate-wetting of sea latticed supprting structure elements.The considerable part of surface wave energy is reflected and absorbed by the device itself because of its constructive peculiarities. The remained energy is transfered directly to the joints of the space latticed structure. Besides the above mentioned,another extremely effective device is presented here, that performs the functions of the hydrodinamic damper of the floating structure oscillations.

The new ideas and structures on the offshore fixed structure stabilization under the surface wave effect presented in the paper make it possible to prolong the service eife and to increase the flexibility of the offshore fixed structures. At the same time they don't disturb the comfort of the personnel and don't break the environment including the surronding fauna and flora.