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Installation of the New Pendulor for the 2nd Stage Sea Test

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ABSTRACT

The New Pendulor test was proved to perform excellent survivability during 32 months sea test (1st stage), but conversion efficiency was not high. The main cause was internal oil leakage of a vane pump developed for the Pendulor. In order to improve the efficiency, the Pendulor was studied again especially concerned with the vane pump, using the full-scale pump tested at sea besides using a model pump prepared for seal experiments. Applying the results obtained from the sea test (1st stage) and the model experiment, the New Pendulor was re-designed and manufactured again. The Pendulor was installed in Aug. '98 at the same site where the former one was tested. In Oct. '98, the 2nd stage sea test started. It was observed till end of Dec. '98 that the plant efficiency (motor output/incident wave power) was 40~60% around the rating power (output=5kW) condition. The pump efficiency was 60~80% that was 22~42% higher than the 1st stage.

KEY WORDS

Ocean wave, converter, Pendulor, revised model, installation, sea test

INTRODUCTION

The authors invented a wave power converter New Pendulor. It consists of a pendulum and a large vane pump placed on the pendulum shaft as a part of it as shown in Fig. 1. Incident waves become standing waves in the water chamber of which water flows reciprocally at the node. The pendulum is driven by the flow to be resonated with the significant water period $T_{1/3}$. Pendular motion drives a generator via the pump and two oil motors combination.

The profile of the New Pendulor has realized as a simple hardware of the system. The authors made a prototype one and tested it at sea for 32 months (Osanai et al 1996). The New Pendulor proved to have high survivability against so great storms, which have 10 times power of design rate. It also proved easy maintainability and offering a safety environment at the installation. However conversion efficiency was low, mainly caused by leak loss of the vane pump. The authors tried to improve the efficiency without any sacrifice of the merit of the Pendulor. The authors studied again the system using not only the full-scale pump but also a half-size pump prepared for the seal study. It was found that both designs: the pump cases and the oil seals must be changed to reduce the leak loss.

Applying the results obtained through these studies, a revised pump was designed and manufactured carefully. It seemed to us that the knowledge being grasped through the experience was very valuable in solving the problems of this case. All the work: design, manufacturing, indoor test, the installation and sea operation were explained in this paper from a practical viewpoint rather than an academic one.

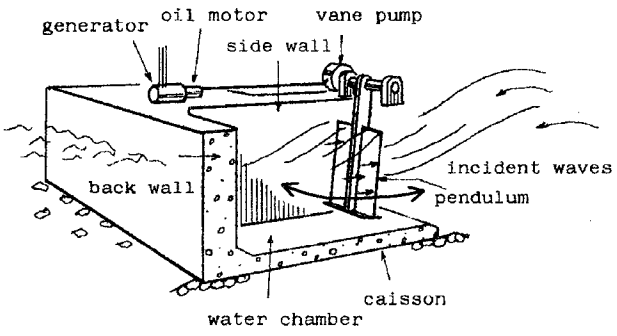

Fig. 1 New Pendulor