Numerical Simulation for Floating Fish Cage Systems

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ABSTRACT

A numerical code is developed to predict the performance of floating fish cage systems. The numerical scheme is based on lumped mass method and the acceleration technique for particle method. It can treat interaction among fish cages and complicated mooring system consisted from synthetic cable material and rigid buoys in current and waves.

KEY WORDS: Cage, Net, Floating body, Lumped mass, Culturing.

INTRODUCTION

In order to develop an improved fish cage system and confirm the reliability of empirical design of traditional ones, a numerical tool was developed for prediction of the performance. If loads acting on frames and mooring systems were clearly computed, we could obtain new suggestion of the system design.

The floating fish cage consists of flexible net cages, pipe frames, floats, buoys and mooring lines. Numerical simulations of motions of the complicated system require treatment of interaction among them.

In this paper, firstly the numerical implementation of flexible material is presented. The numerical scheme based on a simple lumped mass method for flexible fish net structures. This type lumped mass method was introduced (Takagi, Shimazu, Suzuki, Hiraishi, Matsushita, Watanabe(2003)) and presented the reliability(Takagi, Shimazu, Suzuki, Hiraishi, Yamamoto(2004))(Shimazu, Takagi, Hiraishi and Yamamoto(2007)).

Secondly, a simplified method to treat many rigid bodies with 6 degrees of freedom is presented. Buoys and cage frames are treated as rigid bodies.

Lastly, numerical results of some complicated arrangements of linked floating cages and mooring system are presented.

Fig.1 Floating fish cage system.