INVESTIGATION OF SEAWATER EXCHANGE RATE FOR COASTAL PROTECTION STRUCTURES

JeongCheol Park, Catholic Kwandong University, jeongcheol.park@up.net.au
Jun-Hyuck Sohn, Water Front and Coastal Research Center, sohn4329@nate.com
Kyu-Han Kim, Catholic Kwandong University, khkim@cku.ac.kr

INTRODUCTION

Various types of coastal structures have been used as a measure to effectively block the incident high waves to control the damage behind the coast. In order to achieve the needs and specific purposes of residents, it is often constructed in a structure with strong closure, and in this case, water quality and low quality pollution may occur due to the inflow of contaminated water and congestion of seawater. In order to solve this problem, this study reviewed various kinds of countermeasures that induce seawater exchange inside and outside the facility using natural energy such as waves and tidal changes.

FIELD SITE

The target area of this study is Wolcheon coast located on the East Coast of Korea where severe erosion has occurred as a result of the construction of a large-scale coastal facility on the northern part of the beach. Various construction methods and layout plans were suggested during this process, but due to continued requests by the local community, plans to install a strong covering was selected to control the waves and current, while efforts were made to restore the beach through beach nourishment(Fig.1).

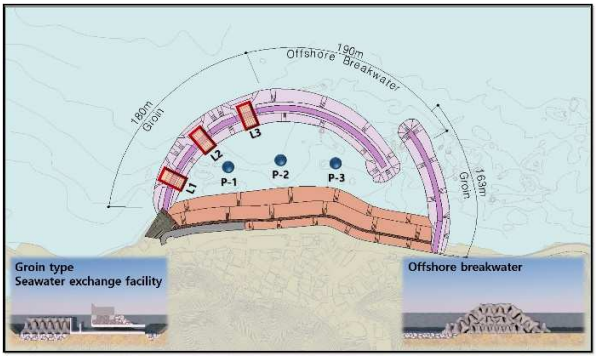

Figure 1 - 3D Layout Plan for Seawater Exchange Structure

SEAWATER EXCHANGE RATE IN THE FACILITY

The erosion prevention facilities selected at the request of local residents are tightly covered, and therefore, problems with water pollution due to inflow of contamination sources or a decrease in seawater circulation can be expected. Thus, the seawater exchange effect was reviewed by taking a look at changes in concentrations of pollution and seawater exchange rate per point within the facilities based on numerical simulations (Fig.2).

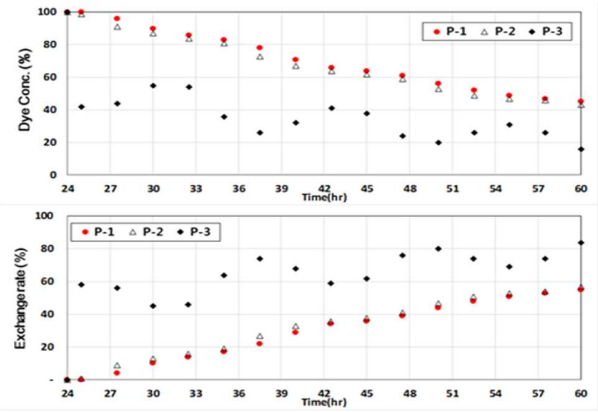

Figure 2 - Concentration Change (up), Seawater Exchange rate (down)

HYDRAULIC CHARACTERISTIC INVESTIGATION

It is difficult to consider the wave overtopping and flow that penetrates the structure, the physical phenomenon was to be reviewed through a 3D model test. Hydraulic test results showed that for conditions in facilities with a groin installed, seawater exchange effects were low regardless of whether or not a seawater circulation structure were installed during abnormal wave approach (Fig.3). This was the same in conditions where both a groin and offshore breakwater were installed, and it was found that the main reason for this is because of the low discharge rate of particles from the high waves flowing into the gap.

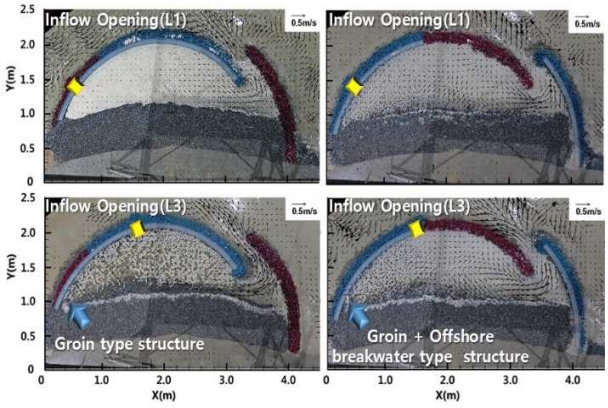

Figure 3 - Results of Particle Tracking Analysis

REFERENCES

Loncar, G., Bartolic, I,. Bujak, D.,(2018). Contribution of Wind and Waves in Exchange of Seawater through Flushing Culverts in Marinas, 25(6):1587-1594.