Interaction of Multi Arrayed Current Power Generations

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ABSTRACT

The tidal current power generation can be very suitable and predictable renewable energy source in Korean western and southern coastal regions as characterized with very high current speed. Being different from tidal power generation requiring tremendous dam structure to preserve water, the current power generation utilizes the ocean current flow without damaging on the estuary area and its environment. There are still many areas to understand the characteristics of current power generation for the actual field application and installation. One of feasible economic applications would be a module unit having several rotors. However, the interference between rotors will occur that would affect the efficiency and performance of the system. In this study, the interference caused by gaps in axial and transverse directions in a module is studied.

INTRODUCTION

Current power generation is different from tidal power generation which can produce the electricity with dams to store water during low tide. The basic study and application of current stream power have been conducted by Garbuglia et al.(1993), Young(1966) and Bernshtein(1995). Paish et al.(1995) have introduced a new concept of current stream power system and also carried out experiments in the sea. In Japan Darrious type has been studied (Shiono et al., 1999). Walsum (1999) has introduced the current power system in Fundy. Jo et al. (1999) have compared the performance of three different types of rotors by experiment. In this study, the experiments to observe the interference of rotors placed on a multi-module have been conducted.

EXPERIMENT METHOD

Rotor Arrangement

The rotors have placed at determined locations with certain gaps (1D/2, 1D, 3D/2, 2D, 3D) in axial, transverse and diagonal directions in order to observe the interference with various current speeds from 0.2m/s to 0.8m/s with 0.2m/s interval. Fig. 1 shows the rotor used in the

experiment and Table 1 the specification of rotor.

Fig. 1 Rotor used in the study

<table>
<thead>
<tr>
<th>Description</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Aluminum</td>
</tr>
<tr>
<td>No. of rotor</td>
<td>3</td>
</tr>
<tr>
<td>Diameter</td>
<td>8.5 inch (21.6cm)</td>
</tr>
<tr>
<td>Pitch</td>
<td>8.0 inch (20.3cm)</td>
</tr>
</tbody>
</table>

Circulating Water Channel

The dimension of circulating water channel is shown in Table 2 with the maximum current velocity of 1.2m/s.

Table 2 Main particular of circulating water channel

<table>
<thead>
<tr>
<th>Main Particular</th>
<th>Description</th>
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<tbody>
<tr>
<td>Length</td>
<td>6.0m</td>
</tr>
<tr>
<td>Breadth</td>
<td>1.0m</td>
</tr>
<tr>
<td>Height</td>
<td>3.0m</td>
</tr>
<tr>
<td>Max. Velocity</td>
<td>1.2m/s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measuring Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>2.3m</td>
</tr>
<tr>
<td>Breadth</td>
<td>1.0m</td>
</tr>
<tr>
<td>Height</td>
<td>0.9m</td>
</tr>
</tbody>
</table>