

## **Application of Floating Tidal Current Power System in Cooling Water Channel**

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### **ABSTRACT**

Being surrounded by ocean except the north where bothering with the North Korea, the South Korea has many suitable sites for ocean energy retraction. Having a high tidal range of up to 9.7m on the west coast of Korea, the tidal current and the tidal barrage powers are practical applications. However due to the great environmental impact to the costal and estuary by construction of tremendous dam structure to preserve water that can paralyze the circulation of water, the tidal barrage should be carefully considered since the purpose of developing renewable energies is to minimize the environmental impact and to maximize the utilization of clean energy. Also due to the uneven sea floor and narrow channels between islands on the south coast, there are many locations with high current speed. Therefore tidal current power would be the most applicable and practical energy source in Korea. Using the tidal current power technologies, the application in the cooling water channel has been considered since there are many power stations circulating and draining seawater. Some of cooling water weir has more than 3.3m/s of discharging water that attracts the recycle of water. Not like the ocean current, the discharging water has little variation in speed and orientation. To investigate the application of tidal current power technology in the cooling water weir, series of experiments have been carried out in the CWC (Circulating Water Channel) and the findings in the rotor design, floating body stability, power delivery, device maintenance, etc. are introduced in the paper.

### **INTRODUCTION**

Many researches have been introduced in the application of current stream power systems. Garbuglia et al.(1993), Young(1966) and Bernshtain(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 Darrius 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. Jo et al.(2007) have investigates the interference effects of rotors placed on a multi-module.

Not like ocean environments, the cooling water weir has many advantages for the application of tidal current power technology. The generation efficiency is very much independent on the direction of incoming flow. The consistent flow direction provides ideal condition for the power generation. Also the velocity does not vary as much as in

the ocean, the components including step up gear, generator, convertor, etc. are relatively simpler than ocean current. The electricity produced also very much consistent with little variation. Obviously the flow flux changes as per season due to the seasonal demand variation. To study the application of tidal current power system to the cooling water weir, series of experiments have been conducted. The results and findings are summarized in the paper.

### **EXPERIMENT**

#### **Rotors**

Two rotors have designed to investigate the power and rpm generated under same flow speeds. The rotors have tow blades with  $d/D$  ratios. Figure 1 shows the designed graphics of two rotors. The section of two rotors was aerofoil since the flow attacks from one direction only being different form ocean tide.

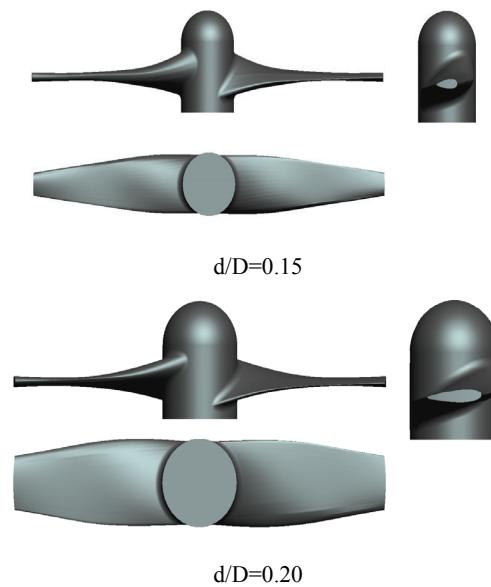


Figure 1 Designed rotors