A shallow-water flow in gutter, found everywhere in urban- and country-sides, is one of extra-hydropower. In order to extract the power effectively, a turbine system of dam Darrieus-type is proposed in the present paper. A simple structure of the Darrieus turbine with a vertical rotating axis gives its advantages of cost effectiveness and ease of maintenance. And by adopting a handy type of turbine system a flood due to heavy rain or blockage of garbage flowing is avoided. The meaning of “dam type”, here, is that a whole of water flows through the turbine to contribute the power generation increasing. Therefore, the upstream water level of the turbine becomes higher than that of the downstream one. The head difference contributes the power generation further increasing in comparison with no dam-type, in which velocity head of shallow-water flow only contributes the power generation. Then the downstream water level of the turbine is equal to the lever before the turbine installing, which will be estimated by an empirical formula of Fanning and the continuity equation. In addition, in the case of installing the turbine in inclined gutter, the cascade arrangement of multi-turbines is available.

In the case of a shallow-water flow, as the upstream water level is higher than the span-length of Darrieus runner with the vertical axis, a whole of water enters over the full of span length in upstream path of blade rotating while water passes over a part of it in downstream path. Therefore, the attitude of Darrieus blade on the rotating pitch circle becomes more important with considering the working principle of Darrieus turbine.

In order to clarify the guiding line of the higher performance design of Darrieus turbine in the case of a shallow-water flow in gutter, a dam type of Darrieus turbine was designed and examined experimentally. As the result, the relation between the turbine performance and the inclination of gutter is cleared and the effect of downstream water level against the blade span length on the performance is also obvious. Then, the future work to be settled is discussed.

Keywords: Hydropower, Shallow-water flow, Darrieus turbine, Gutter