A distributed energy equipment with highly efficient heat dissipation

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Abstract. Distributed energy technology is an important development direction of the world energy technology in the future [1]. It has the characteristics of high energy utilization efficiency, small negative impact on the environment, improving the reliability of energy supply and good economic benefits. At present, China's distributed energy technology is not mature enough. Aiming at the heat dissipation problem of distributed energy technology, we propose a method of using natural rainwater air cooling to realize the efficient heat dissipation of distributed energy equipment. It provides a reference for the development of distributed energy technology.

1. Introduction
At present, some distributed energy equipment (we will discuss the small wind power generation equipment in this paper.) cannot effectively dissipate heat when working efficiently due to structural problems [3], which leads to the shortened service life of equipment. The large-scale construction of distributed energy is imperative at present, and the following small wind energy equipment with poor heat dissipation is popularized on a large scale. In this paper, we focus on the need for solving the heat dissipation problem of such equipment.

2. The heat dissipation principle of the device.
We design a heat dissipation device for this kind of equipment to solve the above problems. We arrange a semiconductor refrigeration piece in the reservoir. The inner wall of the first inner chamber has a fan and a ventilation pipe through the reservoir. The second inner chamber has a rainwater collection pool. We arrange a first water inlet pipe between the reservoir and the rainwater collection pool and a second water inlet pipe on the reservoir.

When there is more rain, we collect rainwater through the rainwater collection pool and send the rainwater to the reservoir via the first feed line. When there is less rain, the second feed line drains water to the reservoir. We cool the water in the reservoir by the semiconductor refrigeration piece. The fan draws in air from the outside. (Because the ventilation pipe runs through the reservoir, the cooling of the water in the pipe makes the air to the energy equipment control room cold. This results in better cooling effect. Solve the problem of poor heat dissipation effect of existing devices [5]. It can tackle the problem of poor heat dissipation effect of existing devices.
3. **Overall system architecture**

We devise a system to provide a distributed energy equipment with high efficiency and heat dissipation. We aim to solve the technical problem that the traditional central control box of distributed energy in the existing technology usually carries out heat dissipation by radiator fan or radiator hole. The traditional heat dissipation method has poor heat dissipation effect and is easy to cause equipment damage.

3.1. **System composition**

The device comprises a house body, a roof, a first partition, a reservoir, a rainwater collection tank, a fan, a semiconductor refrigeration plate and a ventilation pipe.

3.1.1. **Partition.** The roof is removable and connected to the house and is located above the house. There is a first partition board in the house body which divides the house body into the energy equipment placement room and the heat dissipation room. The energy equipment storage room has distributed energy equipment and central control equipment. The cooling chamber has a second baffle which separates the cooling chamber into the first and second inner chambers. The first inner chamber provides a reservoir, the reservoir provides a groove, the groove provides a semiconductor refrigeration sheet. The inner wall of the first inner chamber is provided with a fan, and the intake end of the fan runs through the house and is located on the outside of the house. The outlet end of the fan has a ventilation pipe, which runs through the reservoir. There is a vent on the first baffle and the end of the ventilation pipe away from the fan is inside the ventilation hole. The second chamber has a rainwater collection tank. One end of the rainwater collection pond is fixedly connected with the second bulkhead. The other end of the rainwater collection tank runs through the roof. There is a first water intake pipe between the reservoir and the rainwater collection tank. The reservoir also has a second water inlet pipe. The second water inlet pipe runs through the house and connects with the external water.

The plating plate comprises a first plate body, a connecting plate and a second plate body. The first plate body is provided with a motor. The second plate body is provided with a sliding frame. One end of the connecting plate is fixedly connected with the first plate body. The other end of the connecting plate is fixedly connected with the second plate body.

The energy equipment placement room is provided with a third baffle. The third baffle energy equipment placement room is divided into the third inner chamber and the fourth inner chamber. The third inner chamber is provided with a central control equipment. The fourth inner chamber is provided with distributed energy equipment. The third baffle is provided with a plurality of through holes, and the fourth inner chamber is provided with an exhaust outlet.
3.1.2. Rainwater collection tank. The rainwater collection pool comprises a first pool body, a second pool body, a filter screen and a filter tube. The first pool body runs through the roof and the second pool body is located in the second inner chamber. A filter tube is arranged between the first pool body and the second pool body and a filter screen is arranged at the outlet of the first pool body.

The first pool body also includes a cleaning device and the cleaning device includes a motor, an output gear, a gear lever, a cleaning rod and a brush. The outer wall of the first pool body is provided with a placing plate. The motor is removably connected to the placing plate and located above the placing plate.

A sliding frame is arranged on the placing plate. The toothed rod is slidely connected with the placing plate and located in the sliding frame. The output end of the motor is provided with an output gear. The output gear is engaged with the teeth of the tooth bar. The tooth rod penetrates the first pool body. The cleaning rod is fixedly connected with the toothed rod, and is located at the end of the toothed rod way from the motor inside the first pool body. The floor brush is removably connected to the cleaning rod and is located on the side of the cleaning rod near the bottom of the first pool body.

3.1.3. Ventilation tube. The ventilation pipe includes a straight pipe, an elbow pipe and a second straight pipe. One end of the first straight pipe can be disassembled and connected with the outlet end of the fan. The other end of the first straight pipe runs through the reservoir and is removably connected with the elbow pipe, which is located in the reservoir and is arranged in a continuous bending structure. One end of the second straight pipe runs through the reservoir and is fixedly connected with the elbow pipe. The other end of the second straight pipe is located in the vent.

The internal diagram of the system is shown in Figure 2-4
4. Key technologies and implementation schemes

4.1. Filtration and cleaning of the first tank body
Because the first pool body is set as an open structure, it will accumulate leaves and other sundries at the outlet. When cleaning the first pool body, it starts the motor to drive the output gear to rotate, so that the tooth rod pushes the cleaning rod to move, and the sundries are pushed to the edges and corners of the first pool body through the brush, so as to facilitate the cleaning of cleaning personnel.

4.2. Fixation of the placement plate
Plating plate comprises a first plate body, a connecting plate and a second plate body. The first plate body is provided with a motor and the second plate body is provided with a sliding frame. One end of the connecting plate is fixedly connected with the first plate body. The other end of the connecting plate is fixedly connected with the second plate body.

The first plate body and the second plate body are fixedly connected with the connecting plate. The manufacture is made of integral molding and the structure is more solid [7]. The first plate body and the second plate body are located on both sides of the connecting plate. The installation of tooth rod and motor is more convenient.

4.3. Placement of clapboard
The energy equipment placement room is provided with a third baffle. The third baffle energy equipment placement room is divided into the third inner chamber and the fourth inner chamber. The third inner chamber is provided with a central control equipment. The fourth inner chamber is provided with distributed energy equipment.

The third partition separates the energy equipment placement room into the third inner chamber and the fourth inner chamber, so that the distributed energy equipment and the central control equipment are set separately, so as to reduce the congestion of the space and achieve better heat dissipation effect [8].

4.4. Ventilation tube
The third baffle is provided with a plurality of through-holes, and the fourth inner chamber is provided with an exhaust outlet.

The cooling gas flows from the third inner chamber to the fourth inner chamber through (via) the through-hole, so as to complete the heat dissipation of distributed energy equipment and central control equipment, and the heat dissipation gas is discharged through the exhaust outlet.

The ventilation pipe includes a straight pipe, an elbow pipe and a second straight pipe. One end of the first straight pipe can be disassembled and connected with the outlet end of the fan. The other end of the first straight pipe runs through the reservoir and is removably connected with the elbow pipe, which is located in the reservoir and is arranged in a continuous bending structure. One end of the second straight pipe runs through the reservoir and is fixedly connected with the elbow pipe. The other end of the second straight pipe is located in the vent.

An elbow pipe is arranged in the reservoir, and the elbow pipe is a connecting bending structure to extend the length of the ventilation pipe in the reservoir, so that the gas output by the fan will flow into the energy equipment from the vent after fully cooling in the reservoir [9].

5. Conclusion
There are limitations in the application of current mainstream distributed energy equipment [10]. In this paper, we design a distributed energy equipment with high efficiency and heat dissipation. We take advantage of the optimization problem characteristics of difficult to solve and simple to verify. The advantages of this equipment are as follows:

1. Using natural rain water to achieve efficient heat dissipation effect which has low cost and is easy to promote.
2. The device mainly adopts simple mechanical and electrical structure which is easy to manufacture.
3. The device is widely applicable. After adjusting the proportion of the device properly, it can be extended to other equipment for heat dissipation.

4. This equipment is pioneering equipment and fills the gap for the domestic market.

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