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Ventilation Analysis and Simulation for Inverter of Photovoltaic Power Plant

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Abstract

Inverter is one of the most important equipment in photovoltaic power plant. Ventilation cooling can affect inverter efficiency, and then affect the photovoltaic power plant reliability. This paper analyses several different ventilation schemes for integrated inverter, and compares two CFD models which are ventilation with and without hood and duct using simulation software "ANSYS FLUENT". The CFD simulation shows that hood and duct can improve the cooling effect. The paper shows that inverter ventilation with hood and duct can reduce the energy cost and ensures the photovoltaic power plant reliability, this ventilation scheme is recommend for inverter room ventilation.

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Keywords: Photovoltaic power plant; Inverter ventilation; Energy saving

1. Introduction

1.1. Inverter ventilation is essential for photovoltaic power plant

With the increase of requirement for electric power and decrease of fossil energy, photovoltaic power plant has a great development. Inverter is one of the most important equipment in photovoltaic power plant. Solar battery change solar energy to direct-current and the inverter change the direct-current to alternating-current for transmission into the facility's electrical distribution system. To find the efficient method for inverter ventilation can

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reduce the energy cost and ensures the photovoltaic power plant reliability, it is essential for photovoltaic power plant.

1.2. Inverter structure and specification

Louvers are at the bottom of inverter, air flow enter the inverter from the bottom louver and into the inside of inverter, after absorbing heat the air is exhausted by axial fans through the top. A control system is provided for inverter, and the air flow rate can be automatic adjusted according to the supply air temperature. One "SG500KTL" inverter specification is shown in table 1. The performances of axial fans of the inverter are shown in figure1.

Table 1 main specification for one 500kW inverter

type	SG500KTL
Max input Electric current	1200A
Nominal alternating-current output power	500KW
Max alternating-current output power	520KW
Max alternating-current output current	1070A
Max efficiency	98.7%
Euro efficiency	98.5%
Operating environment temperature	－25℃～＋55℃
Operating environment humidity	0～95%，no dew
Cooling	Air-cooled
Size (WxHxD)mm	2800×2180×850
weight	2288kg