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Design of Temperature Control Drying System for Electric Cabinet Based on Resource Allocation

Junjie Yin
North China Electric Power University
Beijing, 102206
alanncepu@foxmail.com

***Abstract*—In this paper, we propose a design scheme for the temperature control drying system of the cabinet based on resource allocation. Through the research on the temperature control drying system of the existing household electric cabinet, the possible failure effects of electrical equipment under high temperature, high humidity, electromagnetic interference, etc., and the shortcomings of the existing temperature control drying system are discussed. The device proposed in the paper has reasonable structure and convenient use, reduces the occurrence of faults and improves the safety factor. Considering the power constraints of the entire system, we propose a resource allocation (RA) to maximize the temperature and humidity of all unit spaces. We show that when there is no prior knowledge of statistical information, the temperature and humidity control effects achieved by the proposed technique are ideal.**

Keywords—Electrical Equipment, Temperature control, Dry, Resource allocation (RA)

I. Background

The main metal damage patterns of electrical equipment are classified into corrosion, fatigue, friction, wear, etc., which have a great impact on the life of the equipment. China has reached or approached the international advanced level in research and design of conventional electrical equipment, marine and explosion-proof electrical equipment, and has accumulated rich experience in manufacturing, manufacturing and maintenance. It has basically met the electrical engineering application under normal environment and general use conditions. However, the application of electrical equipment under special environmental conditions is far from enough.

II. Factors affecting the corrosion of electrical equipment

The factors affecting the corrosion of electrical equipment are complex. With the climate and the region, the temperature, humidity and electromagnetic interference of the surrounding environment are very different, and the degree of corrosion of electrical equipment is also different.

A. Temperature Influence.

The more important effect of temperature is the condensation of the metal surface when the temperature is greatly reduced, resulting in accelerated corrosion. The temperature difference between day and night is large, and the indoor and outdoor temperature difference will cause condensation to occur. If condensation occurs periodically, rust is most serious. In some continental climates, the temperature difference between day and night is very large, causing a sharp change in relative humidity, causing moisture in the air to condense on the surface of the equipment, causing corrosion. The operation of some electrical equipment will also increase the temperature difference near the equipment, thus accelerating corrosion.

When the temperature rises, the metal material softens and the mechanical strength will decrease significantly. If the copper metal material has a long-term working temperature of more than 200 ° C, the mechanical strength is significantly reduced. The mechanical strength of aluminum metal materials is also closely related to temperature. Generally, the long-term working temperature of aluminum should not exceed 90 °C, and the short-time working temperature should not exceed 120 °C. If the temperature is too high, the organic insulating material will become brittle and aging, and the insulation performance will be degraded or even broken down.

B. Humidity Influence.

When the relative humidity of the surrounding environment of metal storage is lower than its critical value, the temperature has little effect on the corrosion rate, and the temperature is high. Because the environment is dry, the metal is not easy to rust. When the relative humidity reaches the critical relative humidity of metal corrosion, the influence of temperature will play a large role. At this time, the temperature increases by about 2 times for every 10 °C increase in temperature.

Excessive humidity reduces the insulation strength of electrical equipment. On the one hand, the humidity is too high, so that the insulation performance of the air is lowered, and many places in the switchgear are insulated by the air gap. On the other hand, the moisture in the air adheres to the surface of the insulating material, so that the insulation resistance of the electrical equipment is lowered, especially in equipment with a long service life. Since there is accumulated dust inside to absorb moisture, the degree of moisture will be more serious and the insulation resistance is lower. The leakage current of the equipment is greatly increased, and even the insulation breakdown occurs, resulting in an accident.

C. Electromagnetic Interference.

Electromagnetic interference between devices increases the additional losses of the transmitting, transmitting, supplying,

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and powering equipment, overheating the equipment, and reducing the efficiency and utilization of the equipment. Since the frequency of the harmonic current is an integral multiple of the fundamental frequency, when the high-frequency current flows through the conductor, the effective resistance of the conductor to the harmonic current increases due to the skin effect, thereby increasing the power loss and power loss of the device. To make the heat of the conductor serious.

D. Power Constraint.

In the past, people have been hoping to maintain a dry environment in the environment by setting up a uniform ventilation dehumidification system. Facts have proved that it is difficult to fully realize the ideal environment for electrical equipment. The energy consumption of dehumidifying and damp proofing by air conditioner dehumidifier is quite large, and it is difficult to bear the electricity bill. On the other hand, it is also a great waste to consume so much electric energy. It does not meet the national energy conservation policy and does not meet the needs of building a conservation-oriented society. It is of great significance to study the moisture-proof technology of electrical equipment.

During the operation of the system, the unit equipment monitors the temperature and humidity in the unit space through temperature and humidity sensing and other related situations, and continuously uploads the collected data to the server, and then the server adjusts the temperature and humidity of the whole space through resource allocation to ensure the equipment. Operating normally. Considering the limited overall power, the overall system needs to achieve a goal of energy saving and emission reduction while maintaining a good operating space environment while maintaining a good operating space environment.

III. SYSTEM UNIT EQUIPMENT DESIGN

A. Design Details

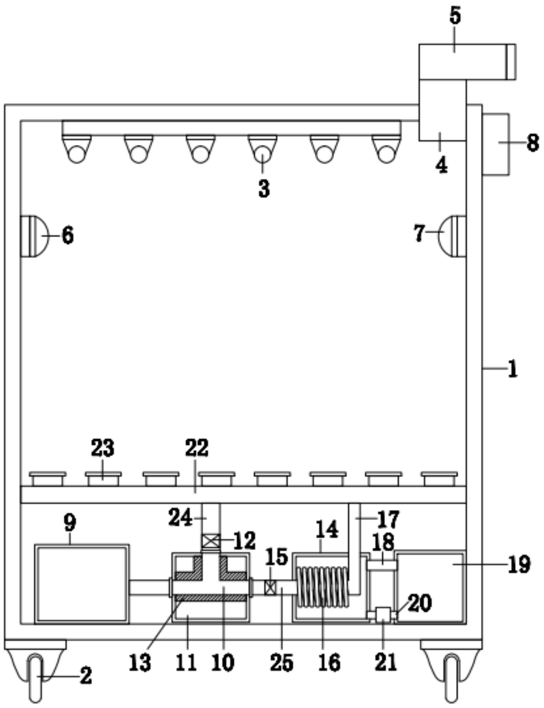

Fig1. Electric cabinet temperature control drying unit

The electric cabinet temperature control drying unit device shown in Fig. 1 comprises (1) electric cabinet (2) universal wheel (3) lighting device (4) air guiding tube (5) exhaust pipe (6) temperature sensing device (7) Humidity sensing device (8) control device (9) blowing device (10) T-tube (11) heating device (12) first solenoid valve (13) heating block (14) heat exchange box (15) second electromagnetic Valve (16) heat exchange coil (17) first air outlet pipe (18) water outlet pipe (19) cold water tank (20) drain pipe (21) cooling device (22) horizontal pipe (23) air outlet (24) second out Duct (25) straight tube.

B. Working Principle.

When using, set the preset value of temperature and humidity in the control device 8, set the lighting device 3 to facilitate the inspection and maintenance of the inner cavity of the electrical cabinet 1, and the temperature sensing device 6 and the humidity sensing device 7 detect the electrical Temperature and humidity in the interior of cabinet 1.

(1) When the temperature is higher than the present value, the air blowing device 9 starts to work, the first electromagnetic valve 12 is closed, the second electromagnetic valve 15 is opened, and the wind enters the tee pipe 10 from the connecting pipe through the straight pipe 25 to the heat exchange plate. In the tube 16, from the first outlet pipe 17 to the horizontal pipe 22, the cooling operation is performed through the air outlet 23, and the cold water is cooled from the cold water tank 19 through the outlet pipe 18 into the inner space of the heat exchange tank 14, thereby cooling the wind. The water passes through the drain pipe 20 to the cooling device 21 and enters the cold-water tank 19 again for recycling, thereby saving water resources.

(2) When the humidity is higher than the present value of humidity, the air blowing device 9 starts to work, the second electromagnetic valve 15 is closed, the first electromagnetic valve 12 is opened, the heating block 13 starts to work, and the wind flows from the tee 10 to the second in the air duct 24, the horizontal pipe 22 is discharged from the air outlet 23 for drying. The utility model has the advantages of reasonable structure, convenient use, effective reduction of leakage phenomenon, reduction of occurrence of failure, and improvement of safety factor thereof.

(3) When the humidity is lower than the present value of humidity, the humidifying device starts to work, the second solenoid valve 15 is closed, and the first solenoid valve 12 is opened. The cold water enters the inner cavity of the heat exchange tank 14 from the cold-water tank 19 through the outlet pipe 18 to cool and humidify the wind, and the airflow with higher humidity is injected into the operating environment of the equipment.

Compared with the prior art, the beneficial effect of the design is: the drying device of the electrical cabinet, by setting the temperature sensing device and the humidity sensing device, detecting the temperature and humidity of the inner cavity of the electrical cabinet, when the temperature is higher than the preset value When the first electromagnetic valve is closed, the second electromagnetic valve is opened, and the air outlet of the air blowing device is cooled through the air outlet through the heat exchange box. When the humidity is higher than the preset value, the second electromagnetic valve is closed, and the first electromagnetic valve is opened. The air blower device is dried by the heating device through the air outlet. The design is reasonable in structure and convenient to use, effectively reducing the leakage phenomenon, reducing the occurrence of faults and improving the safety factor.

IV. Conclusion

The design is reasonable, easy to use, effectively reduce leakage, reduce the occurrence of faults, and improve the safety factor. Therefore, studying the moisture-proof technology of electrical equipment and the design and manufacturing methods of moisture-proof power distribution equipment have important practical significance and practical value for improving the construction and maintenance management level of China's power industry and improving the efficiency of use.

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