Analysis and design of an intelligent fire alarm system for UHV Substation

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Abstract. At present, the fire accidents caused by power equipment operation in substations are on the rise, especially for large transformers and high-resistance oil-filled equipment. The fire hazard and harm of electric power equipment can not be ignored. With the improvement of substation automation, Higher Requirements are put forward for fire safety, reliability, fire efficiency and preventive measures, so it is necessary to analyze and design the intelligent fire control system of UHV substation.

Keywords: UHV; substation; Intelligent Fire; Fire Warning.

1. Introduction
With China's national economy maintained, efficient and rapid development, the people's living standards have further improved, the annual power demand shows a rapid growth trend, the construction of substations is also in the growth trend. In order to ensure the fire safety of power equipment in substations, prevent or reduce the fire danger, and ensure the safety of personnel, production and property, the Fire Protection Design and configuration should follow the principle of "prevention first, prevention and elimination combined" Adopt safe and reliable means of firefighting. Prevent the occurrence and spread of fire.

2. Intelligent firefighting system
The intelligent fire-fighting system of UHV substation mainly includes fire alarm system, Foam firefighting system, indoor and outdoor fire hydrant fire-fighting system and other fire-fighting facilities (such as fire-fighting room, mobile fire extinguisher, etc.

2.1. Alarm System
The objects of fire alarm system mainly include the main control communication building, spare parts warehouse, station power room, protection rooms, battery room, firefighting foam room, main transformer and high anti-body. The fire alarm system is mainly composed of fire alarm controller, fire detector, input and output module, control module, manual alarm button, sound and light alarm, etc.. The fire alarm system is equipped with linkage module, which is
Installed in the main control building, station room, protection rooms, firefighting foam room, and linkage module is used for linkage of air-conditioning fans in each building. Temperature-sensing cables are installed in the communication room, computer room, mobile floor of Control Room, station electric room and cable trench of each protection room in the main control building. The station's UPS AC power supply is connected to the fire alarm system, and the 24V DC power supply is generated by the system itself, which can be used by all detectors. At the same time, the fire alarm system is also equipped with a DC backup power supply.

2.2. main transformer and high anti-foam Fire Fighting System
Main transformer and high usage synthetic foam spray fire extinguishing system. The fire-retardant foam liquid is used as fire-extinguishing agent in the system. Under certain pressure, a special water mist nozzle is used to cover the substation equipment. The fire-extinguishing agent has the functions of foam and water mist, such as cooling, suffocation, emulsification and isolation put out a fire quickly. The foam extinguishing system is composed of liquid storage tank, synthetic foam extinguishing agent, starting source, nitrogen power source, control valve, nozzle, pipeline, fire alarm and control system. When a fire occurs, the fire alarm and fire extinguishing controller issues instructions to open the electromagnetic actuator and the block valve corresponding to the protected object, release the starting gas, and open the power bottle group through the starting pipeline. The power source gas enters the liquid storage tank through the pressure reducing valve, the high pressure hose and the water collecting pipe, and pushes the foam fire extinguishing agent into the protected area through the blocking valve and the fire extinguishing agent conveying pipe. The Foam nozzle installed at the end of the pipe network atomizes the foam fire extinguishing agent and sprays it on the protected object.

2.3. indoor and outdoor hydrant fire fighting system
Indoor and outdoor fire hydrant fire extinguishing system according to the building using indoor and outdoor fire hydrant system configuration. The fire control system is composed of reservoir, two fire pumps (one main and one equipment), two fire pressure stabilizing pumps (one main and one equipment), one air pressure tank, fire control pipe network, indoor and outdoor fire hydrant, etc.

2.4. other fire services
There are three firefighting rooms, namely No. 1 main transformer firefighting room, No. 2 main transformer firefighting room and high resistance firefighting room. Equipped with a trolley-type fire extinguisher, fire axe, fire shovel, fire bucket and fire sandbox, in case of emergency fire.

3. Fire Prevention and control measures
(1) The substation shall, strictly in accordance with the standards for the allocation of fire-fighting equipment, complete fire-fighting hoses, fire-fighting buckets, fire-fighting shovels, fire-fighting axes and other fire-fighting equipment, and store them at designated locations in accordance with the relevant provisions. According to the fire equipment inspection cycle, carry out regular inspection qualified organizations, strengthen fire facilities management.

(2) The operation and maintenance personnel of the substation shall master the necessary fire control knowledge, carry out regular training on fire control knowledge, organize relevant departments to carry out fire control exercises, and the operators and maintenance personnel shall be skilled in using fire-fighting equipment and fire alarm system.

(3) Do a good job of substation equipment fire detection, timely detection and elimination of failure. In accordance with the peak and summer high temperature time should increase the number of patrol, increase the equipment of infrared temperature and ultrasonic fault detection.
4. Summary and outlook
In short, now in the UHV substation equipment more and more complex situation, whether the fire protection system can operate correctly and safely, effective prevention of substation fire and loss reduction plays a very important role in the safe operation of substation

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