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The role of vacuum circuit breakers in traction substations

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Abstract:

This paper investigates major points of the role of vacuum circuit breakers in traction substations. Therefore, research has been analyzed both analytical and theoretical aspects of the circuit breakers in traction cases. In conclusion, research has been pinpointed outcomes and shortcomings of the vacuum circuit breakers in traction substations.

Key words: *role, vacuum circuit, breakers , traction, subtractions*

1. Introduction

The railway power supply system is the main hardware circuit breaker between the electrical equipment and devices used in traction substations, and the continuity and reliability of the power supply is directly related to it.

Switches are the main switching apparatus used for connecting and disconnecting high-voltage circuits in normal and emergency modes. Modern vacuum circuit breakers are used in the power supply system with voltage from 6 kV to 220 kV.

Vacuum circuit breakers have a relatively small length of arc formed during the cutting process in the arc quenching chamber, which allows them to be produced in smaller volumes than air and oil circuit breakers. Vacuum circuit breakers are preferred over other circuit breakers due to their simplicity of structure, reliability, installation in any position, abrasion resistance, small size, absence of fire and explosion hazard, absence of noise during shutdown, environmental resistance, ease of use and low operating costs.

On electrified railways are used vacuum circuit breakers VVF - 27.5 (switch on the vacuum for feeders tyagovoy podstantsii peremennogo buckle). VVF - 27.5 circuit breaker PE-11 consists of a column of porcelain bushings mounted on top of the base on which the drive is placed. Three vacuum arc extinguishing chambers of the KDV-10–1600–20 type are located in the upper three bushings, and in the lower bushing are mounted traction pulls and levers. The VVF-27.5 circuit breaker consists of three identical arc extinguishing chambers connected in series. Each chamber consists of a ceramic body, movable and immovable contact bottom and top metal flanges, a seal that provides tightness between the chamber and the moving contact, a screen that protects the ceramic walls of the chamber from dust generated by arc combustion. The current conductor of the movable contact and the contact bus of the stationary contact are connected by a flexible bus.

Under the contact tires are located dampers, which are designed to absorb the shock energy of the moving contacts during the break of the circuit breaker. Springs are placed between the rings attached to the ends of the moving contacts and the traverses fixed to the body of the breaker.

The electromagnet of the drive connects the circuit breaker using a lever system, while the springs are tightened. The spring hook holds the switch in the connected position. Switching off the circuit breaker is done using a second electromagnet. The circuit breaker must be connected to the mains via clamps.

The main disadvantage of vacuum circuit breakers is the increase in design costs due to the high cost of the circuit breaker when used for the protection of power supply systems above 35 kV. But to achieve the convenience and reliability mentioned above, one can turn a blind eye to the economic disadvantage.

Currently, special high-voltage vacuum circuit breakers are used to connect and disconnect electrical circuits in high-voltage lines. One of them is VVD8-10 -

vacuum circuit breaker. To increase the reliability of the power transmission line in the railway power supply system, special equipment is installed in this vacuum circuit breaker, and this equipment is the basis for long-term reliable service of the circuit breaker. This device is used to turn on and off the current in one or more electrical circuits. This switching device is widely used in the working processes of railway power supply systems of foreign countries.

To increase the reliability of the power transmission line in the railway power supply system, as well as a new generation of modern switching hardware uses a vacuum recoupler that works the same in normal and fault modes.

The main function of the vacuum reclaimer is to automate and increase the reliability of the power transmission line. The application of the recouler provides rapid shutdown in distribution networks. It automatically shuts off the fault location separately, automatically disconnects the damaged section, automatically reconnects the line, restores the source, and collects information about the operating modes of the power transmission line.

The vacuum recloser includes a vacuum circuit breaker and a control unit. The difference of the control unit from others is its resistance to environmental influences and low power consumption. If the source that supplies the recluse is out of order during operation, an automatic backup battery is added. Alternatively, it is possible to accurately transmit data in different operating modes via a vacuum recoupler.

The electrical equipment of the railway power supply system using a vacuum recoupler is reliably protected and ensures the long-term operation of this line without damage.

In conclusion, traction substations in the railway power supply system should use new, modern, wide-capacity electrical equipment to ensure the continuity of the work process and increase the service life of the factors that affect its reliability.

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