Research on the Role of Virtual Simulation Technology in the Optimization of Equipment and Instruments in Medium Voltage Non-Power Outage Operation

Jiajian Luo1,*, Dengmin Sun1, Shuisheng Lai1, Yuqiang Chen1, Kai Zhang1, Zenglang Wu1

1Guangzhou Power Supply Bureau of Guangdong Power Grid Co., Ltd, Guangdong, China

*Corresponding author e-mail: luojiajian@gzpsb.org

Abstract. With the development of The Times, the level of science and technology in China has made new breakthroughs. The development of medium-voltage engineering benefits from the innovation of science and technology, and has developed to a new height. At the same time, the simulation technology of medium-voltage non-power outage equipment engineering has also made new breakthroughs, which is widely concerned by the medium-voltage engineering practitioners. Engineering simulation is the key to the quality of medium-voltage engineering, and the engineering simulation technology of medium-voltage non-power off operation equipment directly affects the quality of engineering simulation. The development and innovation of this technology have become an important way for the development of medium-voltage engineering industry. Therefore, this paper firstly gives a brief overview of the engineering simulation technology of medium-voltage non-power outage operation equipment, which is suitable for the background of The Times, and then conducts in-depth research and analysis on the innovative development and future trend of the engineering simulation technology of medium-voltage non-power outage operation equipment, hoping to bring positive influence to the development of medium-voltage engineering industry.

Keywords: Medium Voltage Power Failure, Simulation Unit, Urbanization Construction, Innovation and Development

1. Introduction
With the development of The Times, the level of science and technology in China has made new breakthroughs. The development of medium-voltage engineering industry has benefited from the innovation of science and technology and reached a new height, which provides a good ecological environment for the development of medium-voltage non-power failure equipment engineering simulation technology. Therefore, combined with the background of The Times, this paper deeply discusses the innovative approaches and future development trend of the simulation technology of medium-voltage non-power outage operation equipment engineering, hoping to provide some reference for the development of medium-voltage engineering industry [1].

2. Overview of engineering simulation technology of medium voltage non-power outage operation equipment

With the continuous increase of China's population, equipment can be seen everywhere, which means that the medium-voltage power failure operation of the project has higher and higher requirements for equipment simulation and other technologies. Compared with the underlying equipment, the design of the equipment is more seismic design and underground space design, which is to better ensure the quality and safety of the medium-voltage project. Virtual simulation technology, as the most representative equipment technology in domestic medium-voltage engineering projects, can effectively ensure the stability of the equipment, but in the process of simulation, it should be noted that simulators should strictly follow the requirements of virtual simulation technology to ensure that the geological standards meet the requirements. However, once the simulated survey data do not meet the requirements of virtual simulation technology, the simulated pile system and prestressed anchor rod should be adopted to ensure the simulation quality of the equipment, as shown in Figure 1 below:

![Virtual Simulation Technology](image)

**Figure 1. Application of virtual simulation technology in real equipment**

In the process of equipment simulation, it is necessary to temporarily match the load-bearing facilities such as reinforcement pile, underground supporting wall and retaining pile according to the simulation situation. Under the condition of meeting the engineering simulation standards, the virtual simulation technology design of load-bearing integration can not only ensure the requirements of the load-bearing
in the simulation process. It is worth noting that the improvement and innovation of virtual simulation technology can better ensure the scientific rationality of technological innovation, so as to avoid the occurrence of adverse problems [2-4].

3. Innovation of engineering simulation technology for medium voltage non-blackout operation equipment

3.1. Innovation in prestressing technology

The innovation of engineering simulation technology of medium voltage non-power off operation equipment is inseparable from the innovation and development of prestress technology. External prestressing is different from the simulation method of traditional construction. External prestressing technology can effectively improve the problems caused by prestressing tendons in the concrete section, such as minimizing the friction between the prestressing tendons and the pipeline structure, which provides greater convenience for the maintenance and management of the equipment in the later period.

In prestressed technology innovation, external prestressing technology is widely used in the simulation process, and in the technology system, unbonded type of external prestressing using the most, the technology features simple easy to operate, in the process of actual simulation, and the pipe structure formed by the friction fell to the lowest, compared with the traditional prestressed simulation, which not only improve the quality of the project simulation, but also bring good economic benefits for the enterprise.

3.2. Innovation in simulation technology

As a key part of the engineering simulation technology of medium-voltage non-blackout operation equipment, the innovation of the technology can be mainly divided into the following two aspects: the innovation of drilling technology and the innovation of simulation technology. Drilling technology is indispensable in the process of simulation, which belongs to one of the basic technologies. Before drilling simulation, the simulation environment should be cleaned up first to ensure the precision of borehole position measurement. The measuring tools used need to be calibrated before each use [5,6].

3.3. Innovation in equipment support technology

With the increase of China's population and the acceleration of urbanization, the city is full of high-rise buildings and more and more equipment, which means that the medium-voltage power failure operation of the project has higher and higher requirements for equipment simulation and other technologies. Compared with the underlying equipment simulation project, the medium-voltage engineering design adds seismic design and underground space design, which are all designed to better meet the functional needs of social development. Equipment support technology, as one of the important basic simulation technologies in equipment simulation, directly affects the overall quality of equipment simulation.
Therefore, during the simulation of equipment support, the technicians should fully investigate the simulation environment, and the simulation can only be carried out when the conditions of equipment support are met. When the simulated geological environment does not meet the relevant standards, it is necessary to change the geological environment with the help of simulated piles and prestressed bolts to create the simulation conditions of equipment support. Technical personnel change the geological environment, decorate the simulation pile and prestressed anchor, there are many problems, form a certain barrier for simulation, so technical personnel first will fall to the simulation of underground pipe and cable buried distribution investigation, measuring the related parameters of rock and soil and groundwater at the same time, prepare before the simulation can effectively ensure the smooth progress of the simulation [7,8].

4. Development trend of engineering simulation technology for medium voltage non-power outage operation equipment

4.1. Higher science and technology content

With the development and progress of The Times, the development and innovation of science and technology has become the core competitiveness of each enterprise. Therefore, in the future development of engineering simulation technology of medium voltage non-power failure operation equipment, it is necessary to keep up with the trend of The Times and improve the technological level. Medium voltage not outage operation and equipment engineering and technical level of ascension is mainly manifested in the following several aspects: first, pay attention to the medium voltage power not operation equipment engineering simulation technology research and development of science and technology, promote the theoretical research to practical results, such as the simulation units before simulation, in order to ensure the smooth progress of the simulation process, need project funding and payment accounts, but it will need to use the scientific calculation and means to improve calculation efficiency and accuracy, but also with the help of more advanced instruments and equipment to the simulation environment of the detection, provides important technical guarantee for the subsequent simulation. At the same time, optimizing the structure of human resources, improving the efficiency of
engineering simulation, and establishing a more scientific and reasonable simulation system are inseparable from the improvement of the level of science and technology.

4.2. The trend of ecological development is obvious

Along with the development of The Times, industry competition is intense, due to the shortage of resources, energy, promote the ecological industry development has become the important way of sustainable development of all walks of life in our country, more and more enterprises realized the importance of energy conservation and emissions reduction, which not only bring new economic growth point for the enterprise, but also make important contribution to environmental protection in China [9].

![Figure 3](image-url)

**Figure 3.** Medium voltage non-power outage equipment applied in ecological environment

As shown in Fig. 3, the ecological development of simulation technology for medium-voltage non-power failure operation equipment engineering is mainly reflected in the use of simulation materials. The simulation process is optimized with the help of advanced equipment and instruments to minimize the loss of simulation materials and provide a good ecological environment for the development of green engineering projects.

4.3. Requirements for intelligent development

With the continuous innovation of science and technology, the development of information and intelligence has become the future development trend of all walks of life. The development of intelligent machinery can not be separated from the development and application of information technology. For example, in the process of equipment simulation, during the operation of the crane, it is necessary to strictly control the transport parameters to achieve accurate transport of equipment and materials, so as to avoid the occurrence of high-altitude simulation and other security problems. In addition, intelligent development is also focused on equipment management, the construction of efficient simulation equipment management system, intelligent troubleshooting and troubleshooting of instruments and equipment, problems are found and timely reported to deal with, so as to ensure the quality and progress of simulation [10].

5. Conclusion
With the acceleration of China's urbanization process, medium-voltage power failure operation is also developing rapidly, which is due to the innovation and development of medium-voltage power failure equipment engineering simulation technology, which provides an important technical guarantee for the quality of simulation. In order to better meet the needs of the development of The Times, it has become an effective way for the industry to improve the market competitiveness to promote the technical innovation of equipment medium-voltage power failure operation.

Acknowledgments

Science and technology project: The third task for key technologies research and application of non-service interruption working in distribution network—Study on equipment optimization and task information with benefit evaluation model of non-service interruption working. (GZHKJXM20190107).

References

[1] Chen N, Li W W, Nie L X, et al. Research on the Simulation Technology of Virtual Hand Interventional Manipulation in the Virtual Environment[J]. Applied Mechanics & Materials, 2014, 665:698-705.

[2] Shi X, Zhang S. Research on the Application of Virtual Simulation Technology in Simulated Training[J]. DEStech Transactions on Social Science Education and Human Science, 2019(esem).

[3] Nguyen V H, Nguyen L, Tran T, et al. Integration of SCADA Services and Power-Hardware-in-the-Loop Technique in Cross-Infrastructure Holistic Tests of Cyber-Physical Energy Systems[J]. IEEE Transactions on Industry Applications, 2020, PP(99).

[4] Forneris S G, Scroggs N H. NLN scholars in residence conduct research on virtual simulation and the clinical faculty role.[J]. Nursing education perspectives, 2014, 35(5):348-349.

[5] David, G, Pitt, et al. Virtual reality systems and research on the perception, simulation and presentation of environmental change[J]. Landscape and Urban Planning, 1992, 21(4):269-271.

[6] Shuai T, Weijun W, Shu L, et al. Research on Control Technology of Distributed Power Generation Virtual Synchronous Generator[J]. IOP Conference Series: Earth and Environmental Science, 2021, 657(1):012083 (9pp).

[7] Timokhin P Y, Mikhaylyuk M, Vozhegov E M, et al. Technology and Methods for Deferred Synthesis of 4K Stereo Clips for Complex Dynamic Virtual Scenes[J]. Programming and Computer Software, 2021, 47(1):67-75.

[8] Liu C. Research on kinematics simulation of maintenance and inspection robot in nuclear power plants[J]. Journal of Huazhong University of Science and Technology(Nature Science Edition), 2008.

[9] Middleton V E. Imperfect Situation Analysis: Representing the Role of Error and Uncertainty in Modeling, Simulation and Analysis[J]. 2014.
[10] Vries L D, May M. Virtual laboratory simulation in the education of laboratory technicians-motivation and study intensity[J]. Biochemistry & Molecular Biology Education, 2019.