High Voltage Apparatus Laboratory in XIHARI, China

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The high voltage apparatus laboratory, located within Xi’an High Voltage Apparatus Research Institute (XIHARI), Xi’an, China, is the largest high power, high voltage testing and research base in China. It has 118 staff members and 80 of them are technicians, occupying 70%. Among them, some are academic leaders with solid theoretical foundation and practical experience in the field of product testing of HV apparatus. Being designated by the nation as the competent authority for management of HV apparatus industry, the laboratory is mainly engaged in the product testing of HV apparatus and the relevant activities on development and research. In addition, it also undertakes responsibility for supervision, attestation and selective examination on the quality of HV apparatus products in cooperation with the government and the HV apparatus industry.

The laboratory consists of Business Office, High Power Laboratory, HV Laboratory, EMC Laboratory and Industrial Standard Department.

Besides doing management work for the laboratory, the Business Office is in charge of the reception and inspection of client commitments, the proposal of detailed items, parameters and requirements for the committed tests according to relevant methods, the organization, coordination and supervision of the testing work between labs., the status tracing of tested products, the analysis and summarization of test results, and the issuing of corresponding test reports. This office is the first window of the laboratory for providing relevant service to clients, such as the reservation for committed tests, the consultation, etc.

The High Power Laboratory is mainly engaged in the high-power testing of HV apparatus products and the research and development of new methods and techniques for high-power testing. This lab. has 2 sets of 12kV, 2500MVA and 1 set of 12kV, 500MVA short-circuit testing generators; large and small oscillating circuits with capacitor bank of 7.0 MJ; 3 sets of 154kV, 120GVA and 3 sets of 110kV, 90GVA short-circuit testing transformers and one whole set of equipment for temperature rising test, mechanic life test, peak withstand test and short-time withstand test. It possesses the ability to perform the 3-phase direct test for 12kV, 60kA circuit breakers and the 50kA breaking capability test for 1/2 pole of 550kV circuit breakers. While doing tests related with short-circuit breaking capability, electrical life, peak withstand test, short-time withstand test and mechanical life for HV switchgears, this lab. also performs tests, such as the short-circuit test for power transformers, the current flowing tests for reactors, line traps and enclosed bus-bars, the pressure release test for arresters, and the short-time thermal current withstand test for HV brushings.

The HV Lab. is mainly engaged in the testing of HV insulating properties for HV apparatus and the study of related measuring and testing techniques. It has one set of 2250kV/1A cascade-connected power frequency transformer, one 4800kV, 480kJ impulse voltage generator, one 3-parameter (pressure, temperature and humidity) artificial-climate chamber with a diameter of 8m and a height of 8m, one large-sized, artificial pollution freezing test chamber, and one set of 100mA, 1500kV DC test equipment. This lab. possesses the ability to perform the HV dielectric test for HV apparatuses with a voltage level up to 750kV. In addition, it also carries out some researches on the long-term charging test and partial-discharge detection for 550kV HV apparatus, and the fault location for GIS.

The EMC Lab. has testing equipment, such as one combination wave generator with an open-circuit output voltage of 0.5-60kV, one fast, transient burst generator with an open-circuit output voltage of 0.25-4kV, one damped oscillatory wave generator with an open-circuit peak voltage of 250(-10%)-2.5(+10%)kV and one electrostatic discharge generator with an output discharge voltage of (20±5)%kV. It is able to perform the electromagnetic compatibility, immunity tests for HV apparatuses, such as the lightning surge tests, the fast, transient burst tests, the damped oscillatory wave tests and the electrostatic discharge tests.

The Industrial Standard Department is in charge of professional management for the HV apparatus industry in the planning of scientific and technical development, the evaluation of scientific achieve-
ments, the quality control of HV apparatuses, the type certification of products and the technical information, etc. It is also in charge of drafting the professional standards for HV apparatuses and responsible for the affairs related to IEC TC 17 (High Voltage Switchgear and Control-gear), TC28 (Insulation Coordination), TC42 (High Voltage Test Techniques), SC17A (High Voltage Switchgear), SC17C (Metal-clad Enclosed Switchgear) and SC32A (High Voltage Fuses) in China. Meanwhile, this Dept. also participates in the activities related with the draft, revision and inspection of the relevant IEC standards in representative of Chinese National Committee.

For more than 40 years’ development since its foundation in 1958, the laboratory has continued to improve its testing capability and the quality for testing. In 1990s, the laboratory took the technical renovation and reform as a major task in the laboratory construction. While doing research work for exploring new methods and circuits for large-scale testing, the laboratory, by introducing the latest digitized measuring techniques, computer-control techniques and circuit monitor techniques, has realized computerization and formed the network for the measuring systems, the control systems, the test-circuit simulation and calculation system, and the testing report management system.

In the third-term project being under-constructed, 2 sets of 6500MVA extra-high power, short-circuit generators, and one set of double-circuit, synthetic testing system are being designed and developed. As a result of this project, the laboratory will possess the ability to perform the 63kA short-circuit breaking capability test for one whole (single) pole of 550kV circuit beakers, the 3-phase direct test for 12kV, 120kA circuit beakers, the short-circuit test for power transformers of 220 kV or less with a single capacity of 30-60 MVA and the operation tests for 500kV HVDC thyristor valve modules as well.

Being China National HV Apparatus Quality Supervision & Testing Center, the laboratory has frequent international technical exchanges and test cooperation with many foreign laboratories, such as KEMA, CESI and ABB. Many internationally famous electric-apparatus manufacturers, such as ABB, SIEMENS, VEI, Mitsubishi, etc, send their products, manufactured for sale in China, to the laboratory for testing. In recent years, the laboratory annually receives as many as 50 foreign-made or Sino-foreign cooperative products. On the other hand, some domestic large-demand users of HV apparatuses require the products that they ordered to be appended with the testing reports issued by this laboratory.

At the present, the testing service that the laboratory provides has covered more than 20 kinds of HV apparatus products. In the near future, the laboratory will continue to expand its testing range, for example, the product testing for power cables and cable accessories, and to expand its influence internationally. Meanwhile, the laboratory sincerely hopes to cooperate with HV apparatus manufacturers, users and laboratories, both domestic and abroad, to build itself toward an internationally oriented, large-sized and generalized HV apparatus laboratory.

Biography
Xue Ye was born in 1965. She is a senior engineer and is engaged in the development and research on testing techniques for HV electric apparatus products. She may be reached at No.30B, Northern Fenghui Road, Xi’an, Shaanxi 710077, China. http://www.xihari.com

2250kV, testing transformer 4800kV, 480kJ impulse generator 7.0MJ capacitor bank