PCS-9520

VSC-HVDC Control and Protection System

The control and protection is the brain of the entire VSC-HVDC system. The HVDC SuperCon™ control system employs tough UAPC platform designed by NR Electric. It adopts hierarchical structure, redundant design, robust control functions and comprehensive protection scheme. It monitors, controls and protects all AC and DC in the VSC-HVDC transmission system.

Control and protection system is designed based on embedded CPU, DSP, FPGA module. CPU takes care of parameter setting, display and etc, DSP is implementing calculation to achieve all control and protection function. CPLD is used for data transmission via optic fiber based on IEC standard protocol, and also for communication with SCADA through high speed Ethernet. All board cards are based on standardized and modular design.

Each VSC-HVDC system has two independent control and protection systems for redundancy to ensure high reliability. Multiple transient fault recording (TFR) functions are used for fault tracing. The recording settings are flexible to accommodate the consumer's requirements.

System Configuration

VSC-HVDC control and protection system consists of operator monitoring equipment and distributed control and protection equipment. They communicate each other via high speed Ethernet. The control and protection equipment itself, communicate and coordinate through Field Bus, i.e. CAN bus.

Operator Monitoring Equipment

Operator control system is used for the operation and monitoring of the whole VSC-HVDC system. It is composed of workstation, server and remote communication equipment, so as to achieve multiple monitoring of station, remote scheduling and centralized control.

Station operator monitoring: Providing converter station operators with an interface of monitoring and control. It provides complete monitoring, control, fault or abnormal condition handling to whole VSC-HVDC system, as well as parameter adjustment.

Remote control center monitoring: transmitting information of station level, such as parameters, data of station control and protection system, to remote control center through communication channel. Meanwhile, issuing instructions to converter station in necessary situation, and if required, it also can send parameter changing order to station level.

Centralized control center monitoring: national level control and monitoring centre, similar function to remote center, but high priority.

Control and Protection Equipment

Control and protection equipment provides comprehensive control and protection to both AC and DC system.

It includes system-level, station-level and converter-level functions, which are integrated in a single host. This design has advantages of effectively reducing interfaces and decreasing fault rates so as to improve system availability, reduce complexity and enhance reliability. AC equipment like filter bank, converter transformer, are protected by independent relays.

I/O unit is the interface between primary equipment and control system, it takes all necessary inputs, including analog and digital data of primary side to control host, and deliver control and protection orders to primary equipment.

Features

- Support electronic measuring equipment and optical measuring equipment.
- Support external coordination control system(s) to use digital communications to achieve AC and DC coordinated control.
- Support FACTS equipment to use digital communications to achieve coordinated control.
- High-performance, distributed system based on embedded hardware technology.
- Master control and protection unit uses dedicated HTM high-speed data bus, ensuring the powerful processing capability.
- Full system redundancy design, dual power supply configuration.
- Systematic design of electromagnetic shielding, strong anti-interference ability.
- Fiber media field bus, high anti-interference ability.
- Unix / Linux + Windows hybrid platform system controlled by operator, with dual advantages of both security and ease of operation.
- All devices support the remote maintenance on the workstation.
- Friendly HMI.
- Rich and accurate SOE
- Complete, accurate internal wave-recording function.
- Full-truth training systems
- Full-featured backup on-site control system.

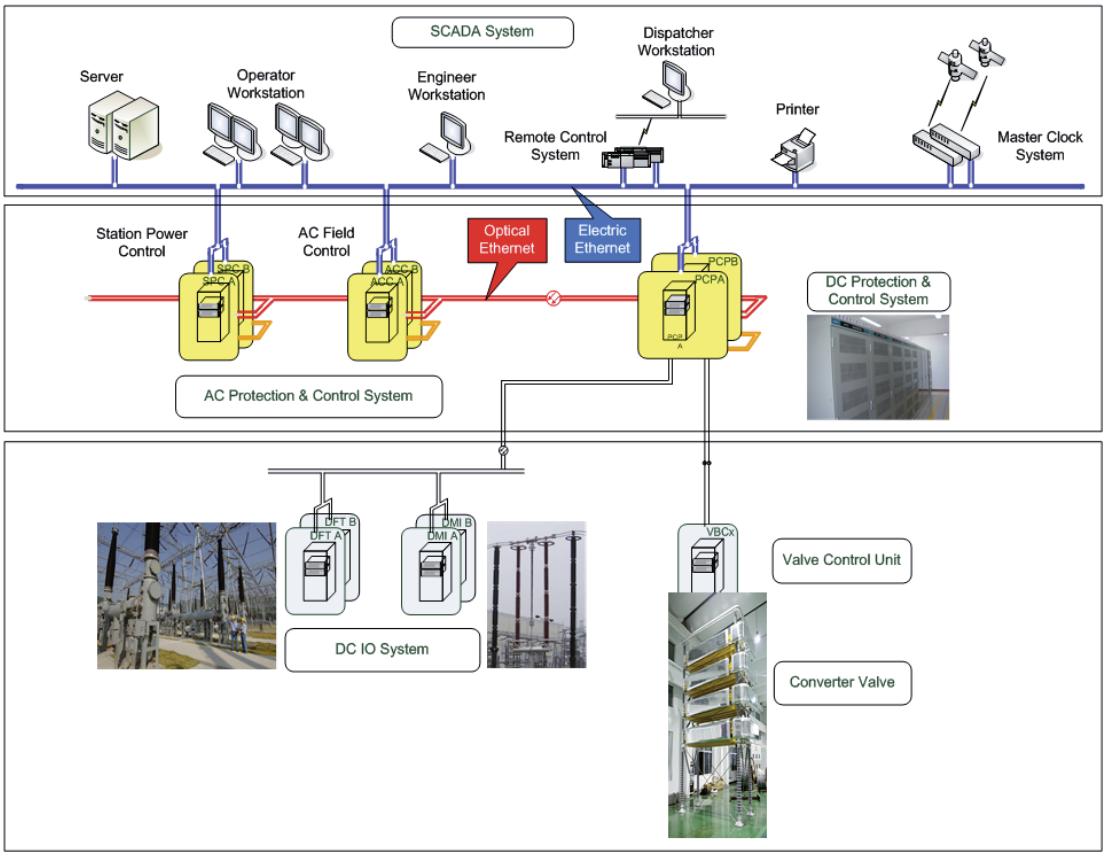

Figure 1 Configuration of VSC-HVDC Control & Protection System