



HIRSCHMANN

A **BELDEN** BRAND

Case Study

CS 202E

Qinjiandao 220kV Intelligent Substation in Tianjin City

Qinjiandao 220kV substation is located in Hongqiao district, Tianjin city in north China. In the past, this substation was an ordinary substation running based on legacy protection relays and measuring instruments.



To meet the increasing power consumption requirements by the region, as well as the expectation to increase the substation operation reliability, the customer Tianjin Electric Power Corporation decided to modernize this ordinary substation to a future proofed, intelligent IEC61850 substation.

The successful modernization of the Qinjinadao substation greatly helped our customer with gathering many important experiences on IEC61850 substation construction. Through this substation, Tianjin Electric Corporation is now capable to refurbish all its existing ordinary substations and constructing new substations based on IEC61850 standard.

This substation network adopted a layered, distributed structure, separated by Station bus Layer, Bay Layer and Process bus Layer. 100Mbps Star topology Industrial Ethernet is used in all layers. In station bus layer, all MMS, GOOSE and IEEE1588 data are transmitted in one network. In 220kV and 110kV process bus layers, SV and GOOSE are separated into independent networks. Switches used in 220kV and 110kV process bus layers are configured based on bay configuration principle.

DL/T 860 standard, China's local Power T&D industry standard, which derived from IEC61850 standard is fully implement in this Qinjiandao 220kV intelligent substation. Merging Units located in the field and IEDs are connected to protect relays and measurement devices directly via fiber optic cables. GOOSE networks are being used to collect and control signals from switchgear, etc. Communication

via process bus network, protection relays, and other measurement devices are connected to the station bus layer via double star topology networks. To ease interoperability, all fiber optic connectors consist of ST type connectors so that devices from different manufactures could be easily interconnected with each other. For those legacy devices which do not support DL/T 860 standard, they are also allowed to be connected into network through protocol converters.

System Requirements

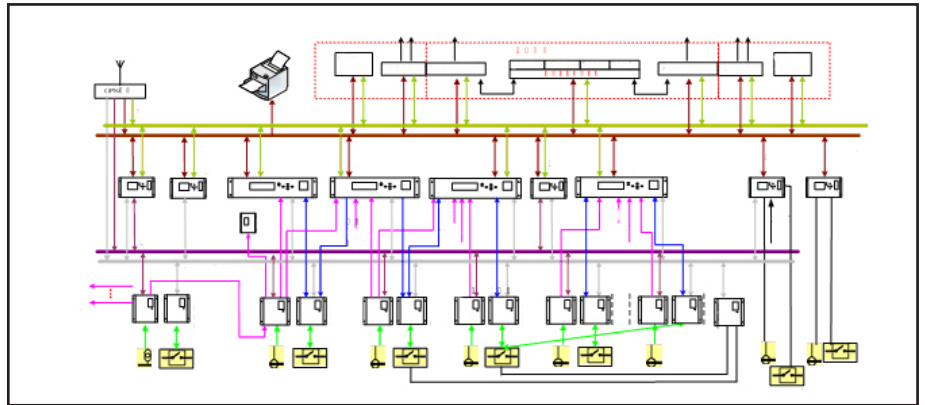
- Fully Comply with IEC61850 & IEEE1613 standard
- Fulfill requirements defined in „Intelligent Substation Design Norm – State Grid of China“
- Capable of support high precise IEEE1588 hard synchronization
- Low latency real-time data transmission
- Doubled networks to realize maximum reliability
- Switches must be reliable enough for long-term non-stop running purpose
- Withstand the harsh installation environment, (moisture and strong EMI)

**Be certain.
Belden.**



Belden Solution

- Ultra-Ruggedized MACH1000 switch, Fanless design, capable of 77-300VDC dual power input with redundant power supplies
- Capable of offering two time synchronization methods: SNTP & PTP
- GMRP for GOOSE & SV transmission
- VLAN segmentation along with QoS to ensure real-time transmission of most critical data
- Port speed limit and broadcast limit ensure max. operation safety
- Double star topology fiber optic networks are used in process bus layer, GOOSE & SV are separated into two independent networks, IEDs in process bus later are interconnected via fiber optic links
- By using SNMP protocol, switch monitoring can be easily integrated into existing substation SCADA system



Product Details

MACH1000

- Rack-mount ruggedized switch
- Maximum uptime in extreme environmental conditions
- Designed for enhanced requirements in substations
- Extended temperature range: -40°C up to +85°C



Why Belden

- High available and reliable industrial Ethernet reputed products
- Fully comply with IEC61850, IEEE1613 standard
- KEMA and State Grid A Grade Certificates
- Hardware PTP/IEEE1588 support, precision <30ns
- Many successful installation bases in intelligent substation automation as well as in whole power industry
- Flexible switch configuration, various port counts, port connector types