SUCCESS STORY

Flagship GIL Project for High-power, Long-distance Transmission

Stäubli played a pivotal role in constructing China's groundbreaking 220 kV Gas-Insulated Line (GIL), which spans an impressive distance of 30 km.

The business needs

The Jiangsu Nantong Bin Jiang region of China is a major center for the textile and food industries. With the city expansion and the need for green development, the original overhead transmission line in Nantong City required a complete renewal. This transmission line was one of the earliest long-distance lines, facing increased energy demand and high load, pushing it to its limits. Thus, a massive relocation project incorporating the latest technology was initiated. The GIL emerged as an alternative to overhead lines. Stäubli's customized ML-CUX was used for the busbars in the extensive Bin Jiang GIL pipeline gallery project.

Extreme Humidity and Temperature Range – the Project Challenges

GIL systems are increasingly installed to meet the growing energy demand in highly industrialized areas. The Bin Jiang GIL project encountered several challenges, including extreme humidity and temperature ranges. While their design, construction, and installation are complex, GILs offer advantages such as minimal landscape disruption, space efficiency in cities, low electromagnetic radiation, and a safe alternative to overhead lines. In the Bin Jiang GIL Pipeline Gallery project, the original four 220 kV high-voltage overhead transmission lines were converted into a shallow underground pipeline gallery, standing at around 1.5 me-

Industrial Connectors:
MULTILAM flexo ML-CUX
Application: Gas Insulated Switchgear

- Excellent rated and short circuit current-carrying capacity
- Minimal transition resistance and contact heating
- Excellent behavior and lifetime for thermal bus bar expansion
- High impact, shock and vibration resistance

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The customized MULTILAM flexo type ML-CUX demonstrated its unwavering strength and successfully passed the toughest load tests under the most challenging conditions.

Power Transmission and Distribution

ters tall. The pipeline's total length spans approximately 30 kilometers, making it the longest line at the same voltage level in China.

The construction of the Bin Jiang GIL pipes encountered numerous challenges, including complex pathways crossing rivers, roads, and difficult terrain like the harbor access road and Yangtze River Road. Pipe jacking, a tunneling method with minimal surface disruption, was employed to bypass these obstacles and city intersections.

A safe and reliable busbar connector is a key factor for power transmission on the 250 kV gas-insulated transmission lines. The pipe jacking spanned approximately 240 meters, with a maximum inclination of around 10 degrees. Challenging geological conditions and structural hurdles necessitated accommodating large angles and elevation variances in the design.

The Stäubli engineers faced two major difficulties. Firstly, the tolerance range of the spiral spring contacts did not align with the required deflection angle of +/- 5 degrees. Additionally, the GIL design called for a sliding lifespan of several tens of thousands of cycles over several decades. Existing solutions failed to meet these rigorous specifications. By utilizing the high-performance and flexible ML-CUX, the GIL design, specifically the pipe-to-pipe connection, achieved high reliability, simplified construction, and extended service life. Moreover, the GIL had to endure high humidity and temperatures ranging from minus 40 to plus 50 degrees.

The Stäubli Solution for GIL Busbar Connectors

The design of the 250 kV GIL busbar connector posed challenges in terms of durability, reliability, and safety. To overcome these obstacles, Stäubli engineers developed a connection solution utilizing the high-performance capabilities of ML-CUX. Machining and assembly were simplified, and only one ML-CUX unit was required instead of two spiral springs. The chosen solution involved employing an ML-CUX/62N with an approximate diameter of 100 mm. This specific configuration offered significant advantages, including exceptional tolerance absorption, the highest power density, low contact resistance, and minimal heat generation. Ultimately, the Stäubli busbar connector outperformed its competitors and successfully passed rigorous on-site tests in China.

The Chinese customer carried out the installation work, with Stäubli Hangzhou (STHZ) providing comprehensive technical support. Established in 1997, STHZ is the first Stäubli Group production site outside the European region. Customer service is a top priority here.

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In one instance, after a long meeting with colleagues from the Swiss head office, the customer required technical support at the installation site. STHZ promptly analyzed and discussed the problem. As a result, their technical support staff drove overnight to the installation site, nearly 300 kilometers away from Hangzhou, successfully resolving the issue on-site.

Stäubli's GIL Flagship Project

GIL solutions have obvious advantages such as high reliability, maintenance-free operation, long service life and comparatively low environmental impact. The Bin Jiang GIL pipeline gallery project provided valuable lessons for future large-scale projects.

The Chinese customer recognized the outstanding performance of Stäubli's ML-CUX. The successful collaboration with partners in China establishes a solid foundation for further joint applications in constructing gas-insulated pipelines. Stäubli is already involved in the Chongquing 250 kV Chenbao line GIL project.

The Bin Jiang GIL pipeline gallery project serves as a success story for all involved parties and has become a significant flagship project for the Stäubli Group.

Customer benefits

- Low installation effort
- Stable power transmission
- Long life cycle
- Material savings
- Demand-driven
- Low contact resistance and heat generation
- High flexibility and compensation for large tolerances and misalignments
- High performance and reliability guaranteed
- Consistent high quality ensured through 100% inspection

About Stäubli

Stäubli is a global mechatronics solution provider with three core activities: Connectors, Robotics and Textile. The international Group has a presence in 29 countries.

Stäubli Electrical Connectors is a specialist for advanced contact technology and technically mature solutions with a product portfolio ranging from miniature connectors up to high-power connectors for various industries.

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