Ningbo Orient 220kV optic/electric composite submarine cable uses XLPE Superclean™ for island power

case study

The background

Ningbo Orient leads the way

From its founding in 1998, Ningbo Orient Wires & Cables Company Ltd has grown rapidly to become a major wire and cable manufacturer for the full range of power transmission applications. Of particular importance is its special expertise in the design and development of AC and DC submarine cables, in respect of which it has played a key role in drafting the national standard.

Given its industry leadership position the company was a natural choice for the China National Grid as the supplier for its Daishan-Dajiaoshan cable project in Zhejiang Province. The purpose of the project is to deliver a secure power link for Dajiaoshan Island, through connection with the grid serving Daishan and Zhoushan Islands, to meet the energy demands of a growing population, as well as industrial and commercial expansion. The project required the provision of 20.7km of 220kV submarine cable with integrated power and signal transmission capability – the first 220kV optic/electric composite submarine cable of its kind for the China State Grid.

The challenge

Minimal impact on marine environment

Part of China's largest archipelago, comprising nearly 1,400 islands, Dajiaoshan, Daisha and Zhoushan are situated on the South side of the Yangtse River Delta, adjacent to Shanghai and Hangzhou, as well as the deepwater port of Beilun. The business of this high growth economic zone is a comprehensive mix of industry, shipping, fishing and tourism and, as such, conservation of the environment and its resources is the guiding factor in all developments.

The single core cable was to be laid in three parallel lines from Dajiaoshan Island to the island of Daishan where it would be connected into the Zhoushan–Daishan power grid. Meeting tough environmental protection requirements was not the only challenge to be faced. Up to that point, there was no pre-existing experience in China of manufacturing 220kV composite optical submarine cable, let alone on the scale – 20,700 meters – necessary for this project.

It was clear that the choice of material would be of critical importance in designing the cable to satisfy conditions relating to the environment, meet performance reliability criteria. And, not least of all, it would have to provide for ease and speed of processing the significant length of cable needed, to achieve economic and timely production without any compromise in mechanical properties.

Daishan-Dajiaoshan submarine cable installation

Submarine cable accessories installation

The solution

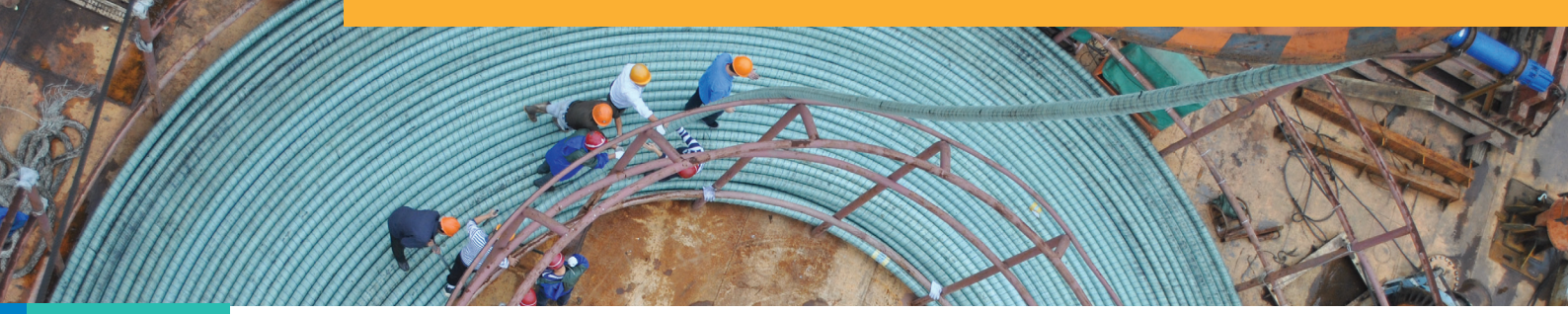
Satisfying efficiency in power delivery

Following a detailed review, Ningbo Orient selected Superclean™ LE4244S insulation and Supersmooth™ LE0500 semiconductive cross linked polyethylene (XLPE) compounds from Borealis and Borouge, as the most comprehensive materials solution for the submarine integrated power and signal transmission cable.

RIENT PEARL

BOREALIS Borouge

SHAPING the FUTURE with PLASTICS



Superclean insulation compounds are produced using advanced, clean-manufacturing techniques that ensure they are contamination-free, thereby minimising the stresses of high voltage operation, and their cleanliness is maintained to the point of delivery. Moreover, Superclean LE4244S has very low-sag properties and is specially designed for extrusion on MDCV or CCV lines. Its low-sag property enables the production of 'thick insulation' high voltage cable on CCV lines with significantly improved roundness.

Furthermore, Superclean insulation performance is enhanced when is used in conjunction with Supersmooth semiconductive shielding compounds. The smooth surface offered by these materials creates an even interface between the insulation and semiconductive layers in power cables, reducing the risk of electrical stress build up (and cable failures).

The benefits

Long-term high performance reliability

Superclean compound excludes contaminates larger than 100 microns in size and controls those below 70 microns. This gives assured high levels of cleanliness and, therefore, reliable long-term performance. Supersmooth compound provides an optimally smooth shielding/insulation interface to minimise electrical stresses and ensure a consistently stable power flow. This is borne out by actual performance. Since its installation between Dajiaoshan Island and the Zhoushan-Daishan grid in 2010, the Ningbo Orient 220kV XLPE optic/electric composite submarine cable system has demonstrated consistent, fault-free reliability.

In addition, the submarine cables are buried to a depth of 1.5-2m in the seabed, avoiding any interaction with the undersea environment and eliminating the risk of being accidentally dredged by anchor cables or fishing nets or lines.

Summary table

Name of Project	Daishan-Dajiaoshan Cable Project
Customer	China State Grid
Cable producer	Ningbo Orient Wires & Cables Company Ltd
Application	Cable materials for high voltage submarine power line • Voltage 220kV • Cable length 20.7km • Conductor size 500mm^2
XLPE material used	• Superclean LE4244S crosslinkable low density polyethylene insulation compound • Supersmooth LE0500 crosslinkable semiconductive shielding compound
Functional requirements	Consistent high voltage performance and reliability over a long working life

Borealis and Borouge are leading providers of innovative, value creating plastics solutions. With more than 50 years of experience in polyolefins and using our unique Borstar® technology, we focus on the infrastructure, automotive and advanced packaging markets across Europe, the Middle East and Asia. Our production facilities, innovation centres and service centres work with customers in more than 170 countries to provide materials that make an essential contribution to society and sustainable development. We are committed to the principles of Responsible Care® and to leading the way in 'Shaping the Future with Plastics'™.

Borouge Pte Ltd
1 George Street | #18-01 | Singapore 049145
Tel +65 6275 4100 | Fax +65 6377 1233
Website www.borouge.com | Email info@borouge.com

BOREALIS Borouge

SHAPING *the* FUTURE *with* PLASTICS