Product and Service for Extra High Voltage System
Sumitomo Electric Industries, Ltd.

Leading Manufacturer of High Voltage Power Cable and Overhead Conductor

Since the founding of Sumitomo Electric Industries, Ltd. (SEI) in 1897 with copper wire production, we have developed many new technologies and products through innovative R&D activities based on SEI’s manufacturing expertise for electric wires and power cables.

Now a Fortune Global 500 company with more than 350 subsidiaries worldwide, we continue to provide a wide variety of products and remain active in support of the rising demand for sophisticated high voltage applications of cable and wire systems. We are one of the leading manufacturers in the world.

The Sumitomo Spirit grew out of the guiding principles set down by Sumitomo founder Masatomo Sumitomo in his “Monjuin Shiigaki” (the Aphorisms of Monjuin). This corporate spirit has been developed, deepened, and handed down over generations in the Sumitomo Family enterprise, and its essence was distilled in the Rules Governing the Sumitomo family established in 1882, and formulated into two business principles in 1891. Although there were some corrections to the wording, the Business Principles have been inherited with no change in the contents up to now.

- Sumitomo shall achieve prosperity based on solid foundation by placing prime importance on integrity and sound management in the conduct of its business.
- Sumitomo’s business interest must always be in harmony with public interest; Sumitomo shall adapt to good times and bad times but will not pursue immoral business.

Total Engineering

Research and Development
SEI has a research and development center. We believe that creative research and development is the vehicle for sustained growth.

Design
SEI can propose any kind of cable system according to our customer’s needs through our vast experience. We can design any overhead conductor, power cable system, their accessories and construction from the low voltage to the extra high voltage class.

Manufacturing
SEI is Pioneer and World’s leading manufacturer for O/H conductor and HV cables up to 800kV. Our products are manufactured in four major works in Japan and overseas works in Saudi Arabia and India etc.

Construction
You can choose whatever type of cable construction method you need from SEI. We are the well-experienced PTK contractor from design to installation.

Product Lineup

Overhead Aluminum Conductor & Wire
Page.6-7

Subsea Cable
Page.8-9

XLPE Cable (AC and DC)
Page.10-11

Power Cable Accessories
Page.12

Power Line Monitoring System
Page.13
The following are just a few epoch examples from our countless successes and achievements.

Regardless of insulation method, be it Fluid-Filled cable, XLPE cable or overhead wire or nor its location, be it overhead, underground or submarine, we offer and implement products and services tailored to the customers needs and objective. The following are just a few epoch examples from our countless successes and achievements.

### XLPE Cable

<table>
<thead>
<tr>
<th>No.</th>
<th>Location</th>
<th>Voltage (kV)</th>
<th>Conductor Size (mm²)</th>
<th>Cable Installation Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Abu Dhabi, U.A.E.</td>
<td>DC±500</td>
<td>1x1200</td>
<td>2008</td>
</tr>
<tr>
<td>2</td>
<td>Toronto, Canada</td>
<td>DC±400</td>
<td>1x630</td>
<td>2009</td>
</tr>
<tr>
<td>3</td>
<td>Tokyo, Japan</td>
<td>DC±350</td>
<td>3x1200</td>
<td>2010</td>
</tr>
<tr>
<td>4</td>
<td>Tokyo, Japan</td>
<td>DC±350</td>
<td>1x1267</td>
<td>2010</td>
</tr>
<tr>
<td>5</td>
<td>Tokyo, Japan</td>
<td>AC±1100</td>
<td>1x800</td>
<td>2011</td>
</tr>
</tbody>
</table>

### Fluid-filled Cable

<table>
<thead>
<tr>
<th>No.</th>
<th>Location</th>
<th>Voltage (kV)</th>
<th>Conductor Size (mm²)</th>
<th>Cable Installation Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Sydney, Australia</td>
<td>AC±400</td>
<td>1x2500</td>
<td>2008</td>
</tr>
<tr>
<td>2</td>
<td>Amsterdam, Netherlands</td>
<td>AC±330</td>
<td>1x1400</td>
<td>2009</td>
</tr>
<tr>
<td>3</td>
<td>Shanghai, China</td>
<td>AC±1100</td>
<td>1x600</td>
<td>2010</td>
</tr>
<tr>
<td>4</td>
<td>Xiamen, China</td>
<td>AC±1100</td>
<td>1x800</td>
<td>2011</td>
</tr>
</tbody>
</table>

### O/H Conductor Supply

<table>
<thead>
<tr>
<th>Type</th>
<th>Supported Area</th>
<th>Size (mm²)</th>
<th>Tension (kN)</th>
<th>Span (m)</th>
<th>Length (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gap Type Conductor</td>
<td>Domestic</td>
<td>160 ~ 2000</td>
<td>37,455</td>
<td>70 ~ 1100</td>
<td>13,377</td>
</tr>
<tr>
<td>High Type Conductor</td>
<td>Domestic</td>
<td>70 ~ 670</td>
<td>3,404</td>
<td>230 ~ 350</td>
<td>3,404</td>
</tr>
<tr>
<td>Total</td>
<td>Global</td>
<td>160 ~ 2000</td>
<td>37,455</td>
<td>70 ~ 1100</td>
<td>13,377</td>
</tr>
</tbody>
</table>
**Overhead Aluminum Conductor & Wire**

For the Advancement and Prosperity of a Society Utilizing High Level Technology

GTACSR (Gap Type Conductor) and ZTACIR (INVAR Conductor) are unique conductors to up-rate existing transmission lines' capacity with similar sag by simply replacing the existing ACSR.

To cope with new challenges, such as harmony with the environment and application for telecommunication in several transmission line project, NS-TACSR (Noise-suppressed conductor), OPGW (Composite fiber optic overhead ground wire) and LL-ACSR/AS (Low Loss conductor) have been developed.

LL-ACSR/AS can reduce transmission losses by roughly 25% compared to conventional ACSR. Transmission lines adopting LL-ACSR/AS can operate more efficiently, reducing the need of electricity from fossil-fuel power stations. AS wires (Aluminum-clad Steel wires) have been used for conventional ground wire, component wire of OPGW or as the core wire of LL-ACSR/AS conductor.
SEI is capable of providing comprehensive services from production to installation of submarine cables, contributing to power transmission infrastructure development in Japan and throughout the world. Likewise in the field of submarine cables, since having installed the world's longest submarine cable at that time of 21km in 1921, we have to date manufactured and installed over 5,850km* of submarine cables.

In addition to XLPE cable, SEI can supply MI (Mass Impregnated Paper Insulated Cable) and SCFF submarine cable. This new technology of using PPLP MI enables us to bring further capability into cable market whereby longer distance and larger power transmission is made possible. This is because oil feeding equipment which is mandatory for fluid filled cable systems is not needed and higher temperature operation is allowed than conventional MI.

* Combined records of JPS, SEI and HCL as of 2015

Subsea Cable
The Leading Company for Extra High Voltage Submarine Cable & Mass-Impregnated Cable

Unloading of MV submarine cable for oil platform

Three cable simultaneous laying and embedding by water jet plow in Hong Kong

Unique Technology
The Development of PPLP and 800kV Extra High Voltage Cable.

Realizing the achievement of 800kV class PPLP Fluid Filled Cable was a great technological milestone. The incorporation of our innovative PPLP expertise into mass-impregnated (MI) cable development is our vision having mindset to attain higher power transmission capacity. The utilization of PPLP-MI cable offers significant advantages over conventional MI in super length power transmission of HVDC for better cost and capacity performance.

Projects
Mass Production for HVDC 500kV/Kosh-MI for subsea cable project between Italy-Montenegro was commenced in 2014 (Press release). The aspiration towards greater achievements inspired us to forge ahead with the completion of PPLP-MI development for higher power capacity.
XLPE cable is now dominant in new transmission lines for both land and submarine applications. Utilizing the broad base in technological and product development knowhow accumulated from the first pioneering steps in this field way back in the 1960’s, SEI has been leading extra high voltage XLPE cable development including DC application. In 2000, we commissioned the world’s first long distance 500kV AC XLPE cable system and in 2009 we successfully put into commercial operation the world first 250kV HVDC XLPE cable system in Hokkaido-Honshu Link.

SEI provides full support towards its customers on “Full Turn Key” basis by providing high technology products, its related accessories and facilities from design, development and manufacturing right through to installation planning and implementation. SEI has consistently provided prime quality and efficient engineering in diversified arenas such as underground, submarine and bridge crossings.

**XLPE Cable (AC and DC)**

Sophisticated Technical Knowhow from Accessories to Installation Engineering

500kV XLPE cable installation work in Shinkeiyo Toyosu Line in 1996

Cable installation of DC250kV XLPE cable in Hokkaido

77kV XLPE cable installed on the world’s longest bridge in 1998

Direct burial cable installation work in Singapore

Vertical snaking for EHV XLPE cable in tunnel

$400kV 1 x 1100mm² DC XLPE submarine cable to be installed for NEMO link project

**Unique Technology**

The Development of HVDC Cable

We developed DC XLPE insulation material with the best performance. This material enables DC 400kV transmission operation with smaller conductor even under the polarity reversal condition. In-house made compound with well dispersed special filler can eliminate harmful space charge accumulation such that ultra-high electrical resistivity can be achieved for stable and reliable operation of HVDC cable system. DC 525kV system is now under development.
Power Cable Accessories

Reliable Products Assuring Complete and Timely Execution

XLPE cables accessories require advanced technology and expertise in its designing and manufacturing processes. SEI has high capability in this area, developed over a long number of years to provide our customers a complete supply of related accessories required for the installation of power cables. The prefabricated or premolded products developed from the expertise cultivated through our experience of power cables and its installation, enables the elimination/reduction of fabrication time at the site thus contributing to smooth and shorter execution in the field. Quality is also perfected by the strict inspection applied to every product before each delivery. Through the supply of these quality accessories, in conjunction with the quality cables and engineering/ supervision services provided to our customers, we have become a premier provider of EHV systems.

Power Line Monitoring System

SEI Supplies Total Solution for High Voltage Power Lines

SEI has been developing Monitoring and Sensing Systems for high voltage power line system based on fiber-optic and the latest software technology. They have improved reliability of facilities and contributed modernized maintenance work. SEI intends to go on advancing these systems and assuring our customer’s satisfaction.
Research & Development

Keeping pace with these times of increasing global energy needs and environmental awareness, we are actively developing new products and systems to include advanced materials such as ecological and recyclable materials. We are also endeavouring to improve the characteristics and reliability of energy transmission and distribution systems so that a more stable supply of electricity may be ensured for future needs whilst respecting an environment in the 21st century. New products include large-capacity transmission cables and lines, low loss power cables, high-efficiency transmission systems, and various maintenance systems to support these infrastructures.

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Application of dynamic cable for floating wind turbine

Tensile bending test (CIGRE test)

Electrical test laboratory at SEI’s factory

PTIR (Fourier Transform Infrared Spectroscopy) Analysis System, to investigate the new insulation material

DCs100kV extruded submarine cable

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