

High Voltage Cables



 Nexans

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Nexans Norway AS



Cable installation in Lofoten in 1961

For more than eighty years, Nexans Norway AS – formerly Standard Telefon og Kabelfabrik AS (STK) – has been the principal supplier of power cables in Norway. These eight decades have seen enormous development of the country's hydropower resources. Today, Norway's consumption of electricity per capita is higher than that of any other country in the world.

Most of the hydro-electric power stations are located in the mountains, whereas the main centres of population are in the lowland and coastal regions. Consequently, hydropower development has been accompanied by the growth of an extensive power grid for the transmission and distribution of electricity.

Underground and submarine cables are important components in the power grid. Over the years, Nexans Norway has acquired vast experience in manufacturing and installing power cable systems.



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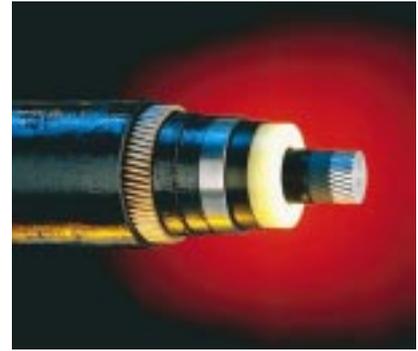
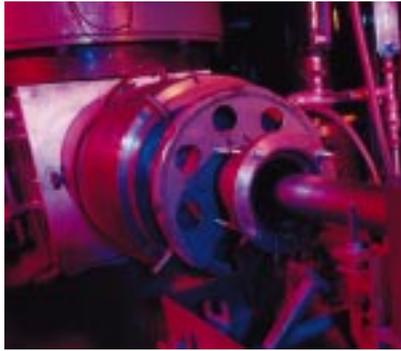
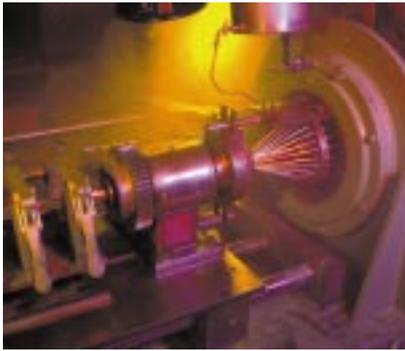
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Cable technology in the forefront





The Halden plant

The Halden plant is the main plant of Nexans Norway and is the competence center for high-voltage submarine power cables and umbilicals within Alcatel's cable activities. At this plant, research and development are carried out on a comprehensive array of power cables.

The plant, located on the Oslofjord, was built for the production of the company's first Skagerrak cables in the early 1970's. Since its erection, it has continuously been enlarged and upgraded in order to accommodate developments in the field of paper-insulated high-voltage cables for AC and DC applications, as well as for the production of high-voltage XLPE (cross-linked polyethylene) insulated cables, composite cables and umbilicals for the offshore industry. With a flexible layout and the most modern and efficient production machinery, the Halden plant supplies the most competitive cable system solutions to power utilities and the offshore industry the world over.

Paper-insulated cables

The Halden plant is equipped for handling cables of extra long length and heavy weight. The plant's layout and processes are designed to meet all special manufacturing and handling requirements for large, high-voltage cables and umbilicals, and the facility is currently able to produce cables with conductors up to 2,500 mm², and paper-insulated cables for voltages up to 765 kV AC.

XLPE insulated cables

In 1994, an entirely new production line for XLPE cables was put into operation.

The extrusion of XLPE is performed in a tower over 100 meters high. The extrusion of the conductor screen, insulation and insulation screen is performed in a single operation utilizing four extruders and one extruder head. The curing and cooling take place in a dry atmosphere of pressurized nitrogen.

Special attention is given to the handling of materials, particularly in respect to cleanliness. The raw material is fed into the extruder through a completely closed system. In the manufacturing of high-voltage cables, a special super-clean grade of material is employed in order to ensure the highest degree of purity.

Design and engineering

Power transmission systems are of vital importance, and it is essential that they should function reliably year in and year out. Since 1915, when we entered the power cable field, we have been continuously engaged in cable production and the planning and construction of power links spanning some of the most difficult terrain in the world – trackless mountains, deep fjords and wide expanses of open sea. In these projects we have gained unequalled experience, which has helped us to devise efficient and reliable designs and processes to the benefit of our customers.

Nexans Norway offers a complete range of cable designs - oil-filled, mass-impregnated and XLPE insulated for voltages from 1 kV to 525 kV. We also supply a full range of cable system accessories including joints and terminations. We can undertake complete deliveries including cable laying and electrical installation with full turn-key responsibility.

Public utilities all over the world now look to Norway for high voltage cables and for the solution of their problems in designing complete cable systems. They know that Nexans Norway means professional performance.





Husmo Foto

Engineering

Nexans Norway's standard range of cables and accessories are designed in accordance with national and international specifications, but we are fully prepared to design and supply cable systems to customer requirements.

In order to make the appropriate choice of technical solution, the following parameters should be given as early as possible:

1. Rated voltage.
2. Maximum operating voltages.
3. Insulation level (impulse withstand voltage).
4. Short-cut circuit current: Transient value and steady state value (root mean square) referred to a specific duration.
5. Transmitted power at rated voltage.
6. Sketch giving dimensions, showing layout and profile of the complete cable alignment.
7. Method of laying, thermal conditions, site conditions.
8. Standards.

Adjustment to local conditions and specific installation sites is our speciality, based on our experience from all over the world.

Turnkey capability

Nexans Norway will design a total cable system to fit any customer need, and will take full responsibility for its functioning. The company completes the entire job – start to finish – from erecting the termination site, trenches, foundations and buildings as required, to completing all electrical installations necessary.

Nexans Norway employs an engineering staff of some 250 specialists in the design and installation departments and in its laboratories. The company offers a wealth of experience gained from research and development put to test during project executions around the world.

For any high-voltage cable project, Nexans Norway is the natural choice as a turn-key partner.

Quality

Nexans Norway has established quality systems to ensure that deliveries meet agreed specifications and statutory requirements, and satisfy the needs of customers and internal users. The quality systems used in all activities leading to the delivery of products and services are certified by an accredited body (DNV) to conform to the standard BS EN ISO 9001: 1994.

Health, safety and environment

It is the policy of Nexans Norway to conduct all operations in accordance with the best-known safety practices in order to prevent accidents. This policy is relevant to personnel, environments, products and working equipment. All activities will be performed in compliance with prevailing legislation regarding health, safety and working environments.

Although the prime responsibility for safe operation rests with management, all Alcatel units consider the promotion of accident prevention and health preservation to be a major priority for employees at every level. Therefore, awareness programs and a positive attitude towards safety are important for all members of staff and management.

XLPE cables



XLPE cables

In 1967 the first power cables with XLPE (cross-linked polyethylene) insulation were installed in Norway for voltages of 12 and 24 kV replacing power cables insulated with PVC (polyvinylchloride), polyethylene and mass-impregnated paper. Experience in design, development and service rapidly proved their reliability. For 12 and 24 kV XLPE cables the statistics show approx. 0.09 failures per 100 three-phase circuit km per year; a remarkably low figure compared with other countries. Also for higher voltages the service experience is very good. This fact together with research and development of materials and processes has shown that technology is ready for cables at 420 kV and even higher voltages.

The basic advantages of XLPE insulated power cables may be summarized as follows: Because of the cross-linking the XLPE insulation can be designed for a maximum conductor temperature of 90° C and a short circuit temperature of 250° C. The extruded insulation has excellent electrical properties including low dielectric losses and allow use of simplified solutions for joints and terminations compared to oil filled cables. Thanks to the elimination of a liquid impregnant the XLPE cables are well suited for cable routes with differences in elevation requiring only standard terminations at both ends. Good mechanical properties and light weight compared with oil filled cables simplify the installation work.

The key process in XLPE cable manufacture is the extrusion of the insulation system. Ever since the introduction of XLPE insulated power cables in 1967 Nexans Norway has applied the insulation in a vertical extrusion line. In the beginning the conductor screen and the insulation were extruded in a tandem operation with cross-linking process based on steam curing and water cooling. In 1979, as a result of development in process and material technology, a new vertical extrusion line was installed incorporating triple extrusion of conductor screen, insulation and insulation screen in one extruder head.





Curing and cooling was changed to take place in a dry atmosphere of pressurized nitrogen. Today Nexans Norway operates a vertical line where the insulation system is extruded on to the conductor by four extruders feeding the material into one extruder head.

Special attention is given to material handling, particularly as regards cleanliness and temperature during storage. A special super clean grade of material which is used to ensure the highest degree of purity, is fed to the extruders in a completely closed system.

The interface between the insulation and the two screens is of vital importance for the quality of the insulation system – the more so with increasing voltage levels. The interface must be smooth with a good bond between the layers. Even small protrusions may drastically reduce the electrical properties of the insulation system. The introduction of the triple extrusion tools of our own design together with optimal process control ensures smooth interface and thereby excellent electrical properties.

Cable design

Conductor:

Underground XLPE cables used in Norway normally comprises a stranded, compacted aluminium conductor. For export markets copper is the more common conductor material and for larger conductors the segmented type of conductor (Milliken) is prevailing.

Insulation:

The insulation system consists of a conductor screen, the insulation layer and an insulation screen, all layers extruded in one operation.

Screen:

For underground cables the screen consists of round copper wires protected with an overall PE or PVC sheath.

Water blocking:

To protect the cables against ingress of water in case of damage the cables are provided with water-blocking material in the conductor and swelling tapes between the cable core and the metallic sheath.

Metal sheath:

If required the cable core is protected by a metal sheathing - either an extruded lead sheath or a metal/PE foil as a water barrier.

All submarine cables for voltages above 36 kV are provided with an extruded lead sheath and the outer protection for underground cables is normally PVC or PE sheaths.

Standards and testing:

High voltage cables insulated with cross-linked polyethylene are normally tested at four levels:

- Type test
- Routine test
- Special test
- Testing after installation

All these tests are routinely performed according to IEC 840 for service voltages from 36 to 420 kV. However, at customers' request we are prepared to test according to other standards such as AIEC, IEEE or customer specifications.

A few examples of installations

To date, Nexans Norway has manufactured more than 50.000 phase-km of XLPE cables, ranging from 12 to 300 kV, for use in Norway. Nearly 2200 km are for voltages higher than 24 kV. Norway's first 300 kV XLPE insulated cable link was commissioned as early as in 1980. The worlds largest submarine XLPE cable has been manufactured and installed by Nexans Norway in 1995 between the mainland and an offshore oil platform at the Troll field.

With regard to underground installations XLPE insulated power cables operating at voltages up to 72 kV had been installed already in 1971. 40 phase-km of 72 kV XLPE cables were installed under one contract as early as 1974. As experience grew, the advantages of XLPE cables were increasingly acknowledged, and in 1976 the first 145 kV cable was installed. Four years later, in 1980. The voltage range was increased to 300 kV. Four installations at this voltage level are now in operation in Norway.

Bergen City.

In the city of Bergen, 78 km of 145 kV underground directly buried cables without metal sheath were installed in the period 1982-1989. Conductor dimensions range from 400 to 1200 mm² compacted aluminium. The majority of these cables are 1200 mm². This double circuit cable system provides one of the main electricity supply routes to the city.

Oslo City.

A similar installation in Oslo was completed between 1987 and 1990. The 145 kV cables, of total length 45 km, were designed with a 1200 mm² conductor, water-blocked with a compound and with a lead sheath applied over a swelling tape.

USA.

For Southern California Edison Co., Nexans Norway has been an approved supplier of 69 kV XLPE cables since 1983. Some 90 km of cables with 1750 kcmils aluminium conductor in accordance with AEIC CS7 have been delivered so far. Nexans Norway has also been approved as a supplier of 115 kV XLPE cables and received its first order for such cables from SCE in 1991.

Indonesia.

In 1983 Nexans Norway installed 150 kV XLPE insulated power cables in transformer stations in Jakarta, Indonesia. Cables and accessories were installed by Nexans Norway's own jointers.

Zimbabwe.

In 1987, 88 kV XLPE insulated power cables were supplied to the Central African Power Corporation, CAPCO, Zimbabwe. These cables were installed by CAPCO's jointers.

Taiwan.

In 1991 and 1994 a total of 8,4 km 170 kV XLPE cables and 57 GIS terminations were installed in the Nan Pu Power Station in Taiwan (in co-operation with Siemens AG).





India.

In 1996 and through 1997 Nexans Norway supplied some 20 km of 220 kV XLPE underground cables to Tata Electric Power company in Bombay, India.

Submarine cables.

Although the majority of XLPE cables in Norway are laid underground, we have completed many installations of more specialized types, mainly submarine links.

As early as 1971 a 900 m submarine XLPE cable, rated at 12 kV, was laid across the Tromsøund in North Norway. This cable, which had no metal sheath, was retrieved for laboratory examination after 10 years in service. When subjected to testing by short term AC, DC and impulse voltages, no significant reduction in the breakdown voltage could be detected, as compared with a new cable.

A 72 kV three-core cable submarine cable with individual lead sheaths on each core was installed in 1977. In 1981 a 14 km 24 kV three-core XLPE insulated submarine cable was installed in one single length. Two years later a 18 km cable of a similar design was installed. Over the years some 1100 phase-km of submarine cables have been installed, 44 installations have been for voltages from 36 to 145 kV.

The first 145 kV XLPE insulated submarine cables were installed in 1981. In 1982 and 1983 two more installations were performed. The three 1200 m single-core cables for the first project were designed with lead sheath as a water-impermeable barrier. For the other project with a route length of 1000 m the customer did not require a lead sheath. No problems have occurred during the service of either project. Up to now Nexans Norway has performed 10 submarine cable installations at 145 kV.

Fairly early the XLPE insulated submarine cables were adapted by the offshore industry. In 1981 a 7 km three core cable at 35 kV was installed for Texaco Inc. Between two platforms in Santa Barbara channel in California, U.S.A. In 1982 2 lengths of 12 kV cables were laid between 3 platforms off the west coast of Africa for Saga Petroleum Benin Inc.

In 1983, a 20-km 12 kV three-core cable incorporating control cables was installed at the Frigg offshore oil and gas field in the North Sea to link the unmanned control station at the North East Frigg field to the main Frigg field platform. Because the unmanned control station was designed as a single-point moored tower, the cable had to be designed to withstand the relative movement of the base structure of the tower and the

seabed, approx. 5 million bending cycles per year. No failure has occurred since installation.

In 1987, two 24 kV submarine three-core cables approx. 4 km in length, with integrated fibre-optic elements, were installed between two oil production platforms in the North Sea, Gullfaks A and B.

A number of XLPE insulated submarine cables have been supplied to the offshore fields in the North Sea, Malaysia and Saudi Arabia. Among the special installations was the big dynamic composite cable for the Veslefrikk field and the worlds longest XLPE insulated submarine cable for the Troll field.

This three-core 52 kV cable was installed between the Troll offshore gas platform in the North Sea and the west coast of Norway. With a max. water depth of 350 m and a route length of 67 km, this is the worlds longest XLPE submarine cable.

So far Nexans Norway has installed XLPE submarine cables down to 420 m water depth.

Oil-filled cables



Cable design

The first oil-filled cables from Nexans Norway were delivered in 1938. In 1952 we manufactured and installed oil-filled cables for 245 kV. Up to the present time, we have completed an impressive number of installations for service voltages up to 525 kV, and one objective of our current research is to further extend this voltage range. Our broad base of experience comprises installations of every kind, from conventional underground systems, tunnel installations, vertical shafts more than 300 m deep without stop joints, to world records in submarine cable installations in Norway and abroad.

Various types of high voltage AC power cables are often referred to as "oil-filled cables". The type manufactured by Nexans Norway is commonly described as "self-contained low pressure oil-filled cable" with paper dielectric impregnated with a low-viscosity oil and incorporating a longitudinal duct to permit oil flow along the cable. The superior electrical qualities of this type of cable have been proven through more than 70 years of service experience.

Electrical and mechanical properties have been continuously improved by the introduction of new and better materials and advanced production techniques.

Our factory in Halden, by the Oslofjord, is equipped with modern and efficient production machinery, ensuring optimum product quality. The factory is capable of producing cables of the largest sizes, both as regards conductor dimension and external diameter, and for the highest voltages. The layout of the factory allows for highly flexible production to suit customers' individual requirements, and special equipment is provided for the handling of long and heavy cables. Thus even 525 kV cables can be manufactured in jointless lengths of 18-20 km.





Cable design

For rated potentials up to 145 kV, both three-core and single-core cables are used. Above 145 kV, all cables are of the single-core type.

Conductor

The conductor consists of concentric layers of helically wound key-stone shaped copper or aluminium wires. This structure combines excellent mechanical stability with a smooth surface, which is important in the application of the insulation.

Insulation

Oil-filled cables are insulated with cellulose paper impregnated with mineral or synthetic oil.

Metal sheath

The sheaths that serve to prevent water from penetrating the paper insulation are metal alloys. Of these, arsenic lead alloy F-3 (0,15 % arsenic, 0.1% tin, 0.1% bismuth, 99.65% lead) has proved the most suitable, thanks to its favourable mechanical properties (resistance to vibration, low creep, etc.). This alloy has been used for all high voltage oil-filled cables manufactured by Nexans Norway for the last 30 years. Other alloys may be used at customer's request.

Reinforcement

One of the characteristic advantages of oil-filled cables is that they can be designed to suit different cable routes and installation sites. To cater for differences in route elevation, suitable metal reinforcement, normally stainless steel tape, may be applied over the metal sheath. For cables designed for installation in tunnels or shafts, a combination of longitudinal and transverse reinforcement has been developed.

Outer protection

Outer protection of underground cables normally consists of an extruded polyethylene jacket.

Standards and testing

Oil-filled cables and accessories are normally designed and tested in accordance with IEC Publication 141-1: "Tests on oil-filled and gaspressure cables and their accessories". As required, oil-filled cables and accessories can be manufactured and tested in accordance with specific national standards or customer requirements.

A few examples of installations

The topography of Norway is such that cables often have to be laid along routes with large differences of level, and we have installed 36 - 420 kV cables with static pressures varying from 30 kp/cm² at one end to 0.2 kp/cm² at the other end. Systems of this kind have been installed at several underground power stations in Norway. Our wide experience in the field of oil-filled cables formed the basis for major export contracts including vertical shaft installations. A few examples are given here:

TVA, Racoon Mountain

In 1976 Nexans Norway installed 14 SCOF 161 kV 3250 MCM (1647 mm²) cables at Racoon Mountain Pumped Storage Plant near Chattanooga, for the Tennessee Valley Authority. Average route length between switchyard and powerhouse is 640 m, with a 305 m vertical shaft.

PG&E, Helms Project, California

In 1981/82 Nexans Norway installed 10 single-core, oil-filled 230 kV 2000 MCM (1013 mm²) cables for Pacific Gas & Electric Co at Helms Pumped Storage Plant in the Sierra Nevadas. The cables connect the switchyard and the powerhouse and are installed in a 300 m vertical shaft. Average route length is 450 m. The operating pressure of the cables is 30 bar.

PLN, Jakarta, Indonesia

In the period 1983 to 1985 Nexans Norway installed two double circuit routes with 150 kV cables in Jakarta, 9.3 km and 5.6 km route length respectively, requiring a total of 94.8 km of cable. The routes go through very congested areas, generally with a high water table, putting installation performance to the test. Installation of a third double circuit route, approx. 12 km long was completed in 1990.

City of Oslo

In the late 1960s, the steady rise in Oslo's peak load necessitated reinforcement of the links between substations around the city. In 1969, 2000 m² aluminium conductor cables operating at 300 kV were installed as a part of the main feeder around Oslo. The 9 km installation was divided into three separate hydraulic sections and seven crossbonding sections.

Singapore

In 1984/86 Nexans Norway installed four circuits of 230 kV oil-filled power cables in a tunnel beneath the busy shipping channel of East Jurong Fairway, from Seraya to the main island of Singapore. Each circuit, comprising three cables with 2000 mm² copper conductors transmits 500 KVA.

The cables were installed without joints. The 2.6 km lengths were transported in 150-tonnes steel baskets and pulled into the tunnel by means of 60 synchronized pulling machines along cable ducts cast in the tunnel floor. To perform this exacting task, Nexans Norway employed a technique specially developed for projects of this kind.





The Vancouver Project - the highest voltage and capacity

From 1982 to 1984, 234 kilometers of 525 kV AC oil-filled submarine cable were installed between Vancouver Island and mainland British Columbia, Canada. Both the system voltage of 525 kV and the transmission capacity of 1200 MVA for a single circuit are the highest achieved in submarine cable installations ever. Six single-core cables were installed in the cable route of 30 and 9 kilometers. C/S Skagerrak was used for the project, after having been rebuilt for world-wide voyages, adjusted for passing through the Panama canal and equipped with dynamic-positioning equipment.

Nexans Norway participated in producing 50 percent of the cables, and performing the entire laying operation.

The Oslofjord, Norway

From 1959 to 1980, the Norwegian Water Resources and Electricity Board installed three high-voltage submarine cable systems manufactured by Nexans Norway to strengthen the power transmission network on both sides of the Oslo Fjord and the link between the Norwegian and Swedish transmission grids.

In 1959 and 1960, six 300 kV cables were laid across the fjord, transmitting a total of 730 MVA. In 1974 and 1975, six 420 kV cables were installed with the added transmission capacity of 1710 MVA. Finally in 1980, another six 420 kV cables (two circuits) with the added transmission capacity of 1650 MVA were installed. The route length is six by 17 kilometers.

Kafue Gorge, Zambia

In 1989, Nexans Norway participated in the restoration of the cable links at the Kafue Gorge Power Station, Zambia's principal source of power supply.

The urgency of this assignment led to a decision to transport the 33-tonnes cable drums by air. One of the world's largest aircraft, the Antonov 124, was chartered to lift the 345 kV oil-filled cables from Norway to Lusaka airport. This was probably the first transport of its kind in the history of high voltage cable installation.

With responsibility for the second and third restoration stages, each comprising 300 MW transmission links operating at 345 kV, Nexans Norway has confirmed its capabilities in serving customers at distant locations and under tropical site conditions.

Bergenshalvøens Kommunale Kraftselskap

In 1995 Nexans Norway supplied 300 kV LPOF cables for a total route length of 15 km for one of the largest Norwegian power utilities. Due to the crossing of an environmentally sensitive area an underground cable system was chosen instead of overhead lines.

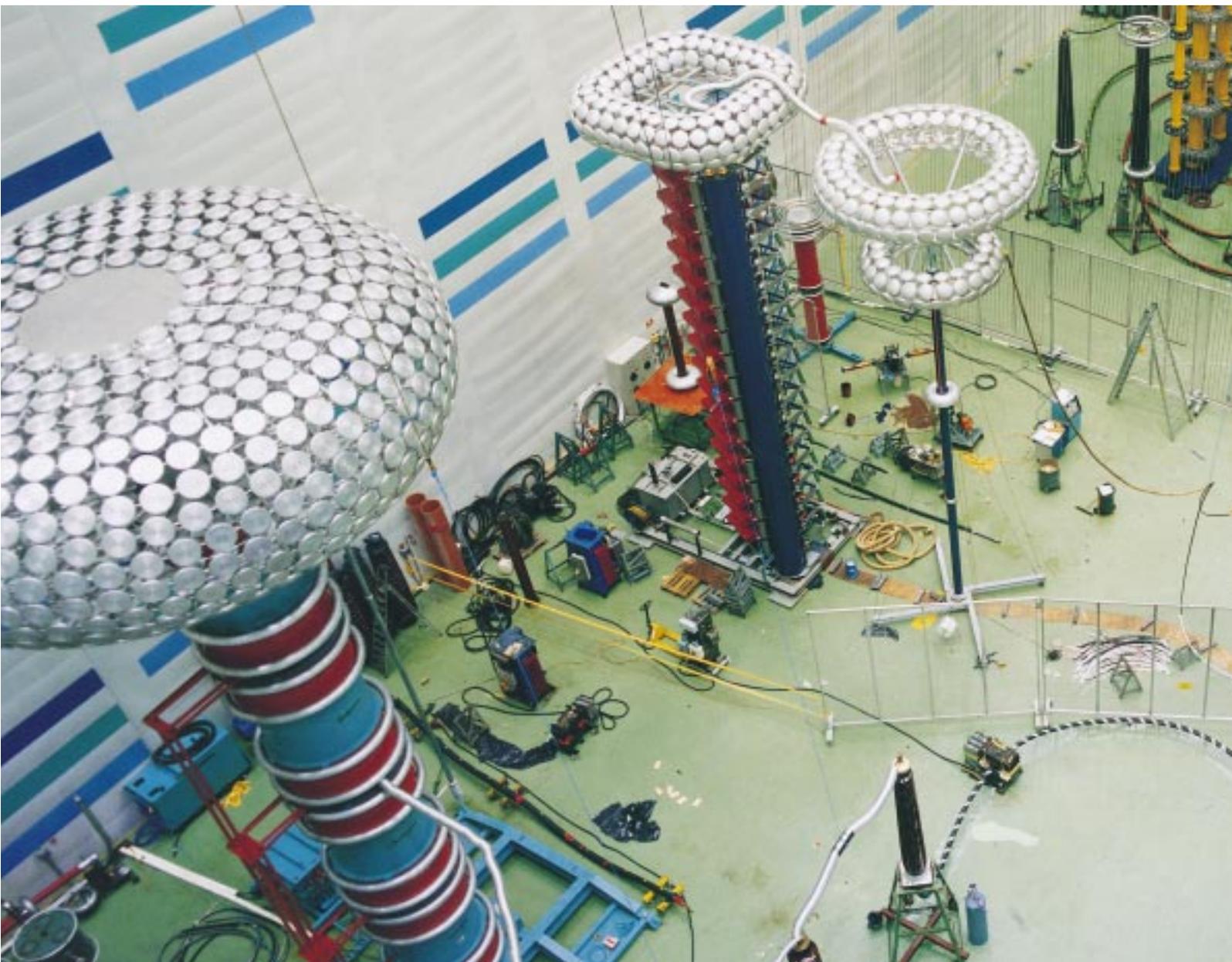
Saudi Aramco

In 1996 Nexans Norway supplied two circuits 230 kV oil-filled cables with joints and outdoor sealing ends etc. for the Saudi Aramco's oil refinery at Ras Tamera. Installation of the system took place in cooperation with local sub-contractors in 1997.

Aqaba Bay

In 1997 Nexans Norway supplied and installed a total of 53 km of 420 kV oil-filled cables across the Aqaba Bay between Egypt and Jordan. The crossing has a max water depth of 840 m which is a world record for LPOF submarine cables.

Development for future needs



Research and development

It is Nexans Norway's philosophy to focus on customers needs which lie ahead. Development of products and services is an inseparable part of the company's goals and objectives, as well as a part of its daily work.

Beside testing our own products, we offer domestic and foreign customers facilities for the testing of virtually any type of component for power transmission systems.

High-voltage laboratory

New goals have led to the investment in an advanced high-voltage laboratory at the company's Halden plant. This new laboratory - unique in its size and level of technology - is equipped with the latest appliances for the electrical testing of high-voltage components in accordance with international standards for rated voltages up to 765 kV AC and 800 kV DC. Flexible use of floor space is ensured by equipment being moved with the help of air cushions.

The laboratory plays a key role in making the Halden plant an important center in the field of high-voltage technology.





Materials research and development center

This center brings together the disciplines of metallurgy, instrumental and chemical analysis as well as the electro-technical testing of materials, models and polymeric technology.

Besides serving the high-voltage cable production in Halden, the center acts as a service unit for all divisions in Nexans Norway and is a coordinating link to other cable plants within Alcatel Cable as regards special materials analysis.

As a part of the competence center for submarine and offshore cables and umbilicals within the cable group, the center is also responsible for research and development within

these product ranges. It is continuously involved in the study of the electrical and mechanical properties of materials used in special cables produced today, as well as for future products.

The center operates four different units:

- Chemical laboratory
- Electro-technical laboratory
- Materials- and extrusion technical laboratory
- Metallurgical laboratory

Mechanical tensile, bending and torsion testing is performed on full-scale prototype cable samples in a test plant which simulates laying and service conditions. Tension is applied from a hydraulic piston to a maximum of 150 tonnes, and the cable is bent around different sheaves - with

diameters of 1.5 to 10 meters - in order to simulate the stress induced around the laying wheel of the cable-laying vessel.

These advanced laboratories form the basis for Nexans Norway's engineering research and product development and offer power utilities and the offshore industry the top-notch testing facilities needed during all stages of a project.

Cable accessories and installation services

For all cable installations, we offer purpose-designed accessories, manufactured and tested in accordance with the same international standards as the cable itself, in most cases IEC standards.



Accessories

We supply purpose-designed accessories for each particular cable system. All our accessories are manufactured and tested in accordance with international recommendations (mainly IEC). As essential components of transmission systems, their quality is of the utmost importance.

Joints and terminations for oil-filled cables are type-tested for system voltages up to 525 kV, for XLPE cables up to 420 kV. We supply transition joints for the connection of oil-filled cables to XLPE types, and systems for cross-bonding of sheaths. Our range also includes oil-immersed sealing ends and connections to SF₆ insulated busbar systems up to 420 kV.

For detailed information about our range of cable accessories, see separate brochures dealing with accessories for oil-filled and XLPE insulated cables.



For oil-filled cable systems, Nexans Norway designs pressure systems for relevant site conditions including necessary stop joints, oil pressure tanks or pumping plants, oil-feeding systems and relevant alarm and monitoring equipment.

Based on extensive experience with the installation and maintenance of oil-filled power cable systems, Nexans Norway has recently designed and put into operation a number of modular pumping plants used to maintain oil pressure in oil-filled cables.

These simplified-design plants have separate modules for each cable, with main pressure modules used as a back-up system. A programmable logic controller (PLC) unit is used for control functions during operating conditions and should an emergency situation arise, it alarms and prints to the nearest manned control center.

It has been a design criteria to ease supervision and reduce maintenance of the pumping plant, thus increasing the reliability of the cable system and minimising outage time. Experience with the company's new pumping plant has already proven outstanding performance and has led to repeat orders from our Norwegian customers and the first installations abroad.

Installation capability

The installation of oil-filled or XLPE power cables requires a staff of experienced engineers and teams of qualified jointers with specialised tools and equipment for the job.

Our installation department undertakes cable laying and protection, complete electrical installation and commissioning in accordance with customers' requirements.

Our engineers and jointers have extensive experience from a wide variety of installations - underground, tunnel and submarine - in Norway and worldwide, in conditions and climates of every kind. For detailed information, see our reference lists and separate brochure on submarine cable installations.

We have developed special tools, equipment and techniques for

- handling of exceptionally long cables in underground and tunnel installations.
- handling of exceptionally long length pulling ashore operations.
- handling and installation of long cables in vertical shafts, i.e. with very high pressures at the lower end.

A full range cable supplier

Nexans Norway is a technologically advanced company operating four complete cable factories, all fully automated and able to meet nearly every power and telecommunication cable requirement. In addition to its main Halden plant, the company operates the three following plants.

The Namsos Plant – Low- and medium voltage cables

At this plant in central Norway, Nexans Norway employs the very latest in manufacturing techniques for low and medium-voltage power cables. The production range covers a standard range of installation cables up to 1 kV and power cables for 12, 24, and 36 kV.

The plant is unique in its operating efficiency and flexibility. The granulated-plastic raw materials are transported in pipelines from central storage tanks to extruders. The entire production run is high-speed, while the production line is easily adjustable. In addition, an internal computer-operated system of Automatically Guided Vehicles (AGVs) guarantees a smooth and efficient transport flow.





The Rognan Plant – Communication cables

The development and manufacturing of communication cables takes place at the Rognan plant, north of the Polar Circle.

The product range covers conventional copper cables and fibre optic cables; however, more and more of the activity is related to special telecom cables basically used in the offshore industry or in submarine telecom systems.

The main products and areas of applications are fibre optic submarine cables for repeaterless system (>300 km), electrical umbilical cables or opto/electrical umbilicals, elements for composite structures like power + fibre or steel tubes + fibre + copper, dynamic umbilicals for operation of Remotely Operated Vehicles (ROV's), seismic cables, special telecom topside cables (fire resistant and mud resistant).

Expansion, investment in new and efficient production equipment, strict quality control and product development have been significant factors in the plant becoming an efficient manufacturer able to adapt to customer requirements.

Nexans Norway is today one of the world leaders in the field of repeaterless submarine fiber-optic cables with accumulated supplies of some 5.000 km of cable.

In addition to supply of cables the division undertakes engineering tasks related to accessories (joints/terminations/special tooling) required for installation and maintenance purposes. Also, extensive test facilities are available in-house to ensure proper qualification of cable designs.

The Langhus Plant – Low voltage cables and heating systems

In 1992, a new manufacturing plant and central warehouse was established in Langhus, outside Oslo. This plant's product range covers installation cables in the 1 kV range, as well as heating cables - comprising more than 450 different types of cables altogether. Nexans Norway is the market leader for these products in Norway, and exports them on a world-wide basis as well.

One special range of product made at the plant is halogen-free safety cables for industrial and domestic use onshore. During a fire, these cables are virtually gas-free and smokeless, making escape routes safer and preventing corrosion in expensive equipment.

New technology and demands have led to the creation of a unique environment for ongoing product development at the plant. Machinery and facilities have been erected for efficient and automated production, which has been carefully adapted to varying market requirements.

The Langhus Plant is also the logistic center of Nexans Norway. The central warehouse is designed to serve our customers with flexible and efficient distribution of more than 1,000 different products.

It comprises a computer controlled high bay storage facility, shelf storage for cables of smaller diameters, and a covered outdoor shelf storage area for the larger types of cables.