Sustainable innovation

Commitment to innovation

Being a leader means knowing how to innovate. The Prysmian Group seeks to generate innovation, quality and know-how, with a view to developing innovative products and systems with a lower environmental impact and higher value added for customers, even in those sectors in which products are largely standardised.

The Group's commitment to innovation and the development of new products with a reduced environmental impact stems from the conviction that this is the best way to guarantee economic sustainability over the long term. Such a commitment is essential in order to assure well-being and the quality of life in today's society and for future generations. In particular, development projects seek to increase the efficiency and reliability of the finished products offered by Prysmian while, at the same time, lowering energy and power losses, as well as reducing greenhouse gas emissions and the consumption of electricity and water during the production processes.

Sustainability is a constant focus for the Prysmian Group, in step with the times and the markets; it is not only a prerogative for research, development and innovation in the more developed countries, but also for that performed in the emerging countries. Investment in sustainability helps, in fact, to lower risk in places where energy costs are rising and access to energy sources remains unstable. In addition, the Group's engineers employ advanced tools to validate the performance of our cables and simulate applications, even before any prototypes are made. This process helps to maximise the use of laboratory time, for example by avoiding unnecessary repetitions, and therefore reduce the consumption of materials and energy.

Spending by Prysmian on Research, Development and Innovation during 2016 totalled about 83 million euro[10], confirming our constant commitment and focus on sustainable growth over the long term.

Work dedicated to the optimisation of costs via the Design-To-Cost (DTC) programme has also continued. This methodology is used to lower production costs, both when developing a new product and when re-engineering an existing product. This programme achieved cost savings totalling almost 17 million euro in 2016. More than 1,100 projects have benefited from this programme.

The Group's constant drive to innovate is also supported by 17 Centres of Excellence, which have their headquarters in Milan and employ more than 550 experienced professionals.

Cables as the driver of sustainability

Sustainable innovation had a profound effect on Prysmian during 2016. On the energy and telecommunications fronts, the Group reached a series of technological milestones that will have a considerable market impact in terms of energy saving and sustainability. Key among these, HVDC technology will enable large quantities of electricity to be transmitted over long distances, frequently across national borders. In a world first, Prysmian has launched systems using 700 kV (PPL) and 600 kV (XLPE) HVDC cables, which guarantee increases of up to 15% in power transmission capacity and network reliability.

[10] Including 75 million opex and 8 million capex.

In addition, the Group has extended P-Laser technology – for the manufacture of cables that are 100% recyclable and eco-sustainable – to HVDC systems, by bringing to market the P-Laser 600 kV, which can achieve cost reductions of up to 30% per MW transmitted.

In addition to the application of P-Laser technologies to terrestrial and subsea HVDC cable systems, marking an absolute innovation in the cables industry, the Group has also introduced a 66 kV cable system, which represents the highest voltage for electrical connections between offshore wind turbines and enables wind farms to lower their costs by up to 15%. This system has been qualified for the Offshore Wind Accelerator (OWA) programme promoted by Carbon Trust, an independent company based in the UK whose mission is to stimulate the accelerated achievement of a low-carbon, sustainable economy. The OWA project is one of Carbon Trust's most important R&D programmes and, with support from the UK government's Department of Business, Energy and Industrial Strategy (BEIS) and from the Scottish government, its objective is to reduce the cost of offshore wind energy via the development of innovative ideas and their translation into commercial solutions.

UNIVERSITIES AND RESEARCH CENTRES

Prysmian has established consolidated collaborative relations with major universities (more than 40 agreements) and research centres in various countries around the world: China, Netherlands, New Zealand, Brazil, Finland, UK, United States, Spain and Italy. Such collaboration is strategic for Prysmian, in order to keep constantly updated about all technological innovations and ensure adoption of the most advanced technologies available to the scientific community.

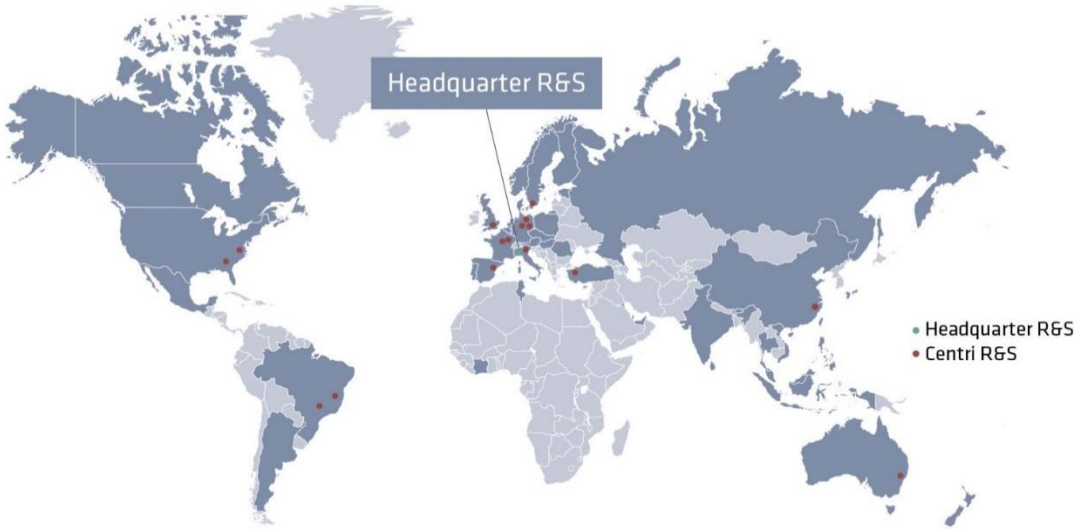
Among the numerous collaborations, those with the following bodies are particularly worthy of mention:

- Politecnico di Milano
- University of Milan-Bicocca
- University of Salerno
- University of Palermo
- Department of Information Engineering, University of Padua
- Department DITEN, University of Genoa
- National Electrical Energy Research & Application Center (NEETRAC)
- Georgia Institute of Technology
- University of South Carolina
- Centro di Pesquisa e Desenvolvimento em Telecomunicacoes (CPqD)
- Universidade de São Paulo (USP)
- Universitat Politecnica de Catalunya
- Shanghai TICW

During 2016, the Prysmian Group continued work on the project to develop subsea cables using the composite materials technology identified, together with MIP (Politecnico di Milano) by applying a new methodology for innovation: the design-driven funnel. In addition, in collaboration with Human Foundation, the Group has launched the second edition of the Technology for Human Beings contest, which assesses the undergraduate and post-graduate dissertations of engineering, physics and science students enrolled at Italian Universities, on topics relating to the applicability of new technologies to sustainable development. This year, Prysmian chose to focus on *Sustainable Development Goals*: the theses submitted analysed the following topics from a technical/applications point of view:

- Resilient infrastructure, fair, responsible and sustainable innovation and industrialisation
- Access to information and communications technology
- Sustainable models of production and consumption: sustainable and efficient management of natural resources
- Technologies and access to economic, reliable, sustainable and modern energy systems

Cash prizes were awarded to 3 first-cycle dissertations and 3 second-cycle dissertations and the winners of each category were offered a six-month internship with the firm. The Scientific Committee consisted of experts on the topics addressed by the competition appointed by Prysmian and Human Foundation. The objective of this project, in line with the Corporate Citizenship and Philanthropy Policy, is to support the study of sustainable technologies with potential practical applications in the sectors in which the Group is active. One of the winners of the previous edition (2015) has been employed by the Group.



83 million (1% of sales) invested in R&D

17 R&D centres

Over **550** professionals

4,651 patents

Main projects

Prysmian developed numerous R&D projects during the year. The most significant are presented in this section.

Energy

Submarine cables

The year saw completion of the type-approval process and a good part of the production of the 50 Hz 220 kV cable, with 1,200 mm^2 copper conductors. In addition, a new design of unipolar cable, with optical elements incorporated in the sheathing, was installed and entered into service as part of the undersea project in the Philippines.

The Group has continued work on new splicing techniques linked to the diameter of the conductors, making it possible to join large aluminium conductors and splice conductors with different sections and made of different metals, for both 320 kVDC and 220 kVAC systems. The development work includes testing and long-term trials that will be completed in the coming years.

With regard to the development of systems for installations at great depth, the prototype with optimised double sheathing has been completed and tested internally, confirming the feasibility of installations at depths of up to 3,000 metres.

In addition to the work on MI (Mass Impregnated) cables intended to improve the recovery plan for the WesternLink project, the first phase of research has been completed into alternative materials and optimisation of the design and production process, obtaining internal qualification at 700 kV.

With regard to the project for 600 kVDC extruded cables, the first positive results have been confirmed for application of the XLPE and P-Laser technologies. In particular, feasibility studies have been carried out for the development of long distance EHVAC submarine systems (up to 200 Km), as well as for the monitoring (partial discharges) of long distance EHVAC or DC submarine systems, using the Prycam Gate technology.

Lastly, the project for the implementation and industrialisation of lead-less submarine systems, with welded copper sheathing, has been approved and launched at the Pikkala factory in Finland. The industrialisation work will be completed by the end of 2017.

Terrestrial cables

With regard to the product development of EHV terrestrial cables, the development and type tests have been completed on the new 600 kV HVDC system with extruded sheathing, as certified in accordance with the CIGRE TB496 specifications. This important result is a milestone in the cable transmission of power, enabling the transportation using a single bipole of power in excess of 2.6 GW. The know-how of the Prysmian Group, in terms of materials, technology and electrical testing, was decisive in achieving this result. HVDC systems are preferred for high power transmissions via insulated cables over long distances.

In terms of EHV product development, three prototype cables with extruded insulation have been produced with Milliken conductors comprising 2,500 and 3,500 mm^2 section copper with aluminium sheathing welded longitudinally; the two 2,500 mm^2 prototypes have been insulated with alternative materials with respect to those currently used.

T&I (Trade and Installers)

With regard to the T&I business, R&D has focused on three key topics: safety, sustainability and new product indicators.

On the subject of safety, the entry into force of EN 50575, a harmonised European standard, on 10 June 2016 was an important change. There will be a one year transition period before this standard becomes compulsory throughout the European Union (on 1 July 2017). During this period, it will be possible to launch old products compliant with current national legislation, as well as new products compliant with the new EU directive. Nevertheless, only the latter will be authorised for sale from 1 July 2017 onwards. As a consequence, all affiliates of the Prysmian Group operating in the European countries covered by the new legislation are making a major effort to align the characteristics of their product portfolios (cables for permanent installation in closed environments) with the performance categories adopted by each country.

This development activity is accompanied by intensive certification work, given that the new standard establishes very rigorous criteria for the testing and type approval of the cables concerned. In this regard, the results achieved during 2016 mean that we can view with optimism the 1 July 2017 deadline, when the CPR (Construction Product Regulation) comes into force in EU countries.

Oil & Gas

This year, the O&G sector focused on two main aspects. The first related to the development of solutions designed to increase the safety of cables used in Gas (formerly LNG) projects. One of the most significant efforts made involved the assessment and improvement of seals against the passage of gas via cables connecting areas at risk of explosion with those at lower risk or the exterior. Consistent with the vision of the Prysmian Group, this project seeks to offer customers support in assessing the effects of cables and complete systems, and not just technical solutions.

The other area of focus for development activities related to Electrical Submersible Pumps (ESP). The Prysmian Group is currently developing a new generation of products that will have a vast range of applications (for operating conditions that are more or less challenging), with accelerated testing procedures on full-scale samples, as well as hybrid solutions for Downhole Technology that cope with high temperatures and are highly resistant to corrosion, which is a new concept in this sector of the market.

OEMs

With regard to cables for special OEM (Original Equipment Manufacturer) applications, the breadth of the product portfolio and the number of live applications has resulted in a substantial number of development projects dedicated to various markets and customers. The main efforts are concentrated on the application of methodologies for extreme climates – such as in the Arctic – and for the North American, Australian and Chinese markets.

Development and Transfer of Technology

In terms of Development and Technological Improvement, the project to optimise conductors for medium and high voltages has continued, with a view to reducing the weight and diameter of cables, while complying with

the regulatory specifications for resistance under direct current. Work this year has focused on aluminium, given the 2016 production mix. Weight savings of around 1-1.5% have been achieved and work to rationalise the grades of aluminium used has been completed, resulting in a shift from 16 to 12 and, therefore, savings for the purchase and management of raw materials.

Monitoring systems

With regard to the Prycam technology, work on the development of Pry-cam® Gate was completed during 2016. This new patented technology can automatically measure the time interval between two partial discharges and therefore establish, with absolute certainty, if an accessory or a stretch of cable is affected by partial discharges, without having employ any kind of expertise or AI algorithms. Pry-cam® Cable is a second important innovation at an advance stage of development. This hybrid cable, used exclusively for sensing, is consider to be the embryo of the next generation of integrated monitoring systems, which is currently under development for presentation in 2017.

Telecom

Optical fibre

In terms of the optical fibre sector, 2016 saw further improvements in the process of manufacturing fibres at the factories in the USA and Brazil, where an autonomous production process is now operational.

Numerous Group factories have been equipped to produce BendBrightXS (BBXS) fibres, which perform better than competitive products in the presence of micro and macro bends. The bending performance of this fibre, even at low diameters, means that it can be used in the manufacture of smaller cables for various layers of FTTH (Fiber to the Home) networks.

With regard to multi-mode fibres, adoption of the OM5 standard from September confirms the leadership of the Group in this sector too. In particular, this fibre is able to transmit 4 channels at 25 Gbit/s, or even 50 Gbit/s, at wavelengths of between 850 nm and 950 nm.

Another important innovation benefits from the Few Mode technology. In single mode fibres, information is coded and sent in association with a single mode of transmission, while in few mode fibres it is associated with a few modes of transmission. A number of preliminary tests, conducted together with various partners, were successful in the transmission of data (100 Gbit/s systems with 10 Gbit/s signals transmitted at 1310 nm in each mode) and in the field of access networks.

Optical cables

Group activities in the optical cables field principally involved three types of product. Firstly, Flextube cables have shown their suitability for many markets and their production has been extended to multiple factories. A version for aerial cables (ADSS), operating under adverse environmental conditions, has also been industrialised. Cables with 2,112 fibres have been developed and installed successfully, while work continues with a view to obtaining cables with 4,000 fibres.

Development activity on the Multiloose family of cables has mainly focused on reducing their diameter, in order to maximise the number of fibres that can be blown into the dedicated underground conduits. In these cases, the high level of stress to which the fibres are subjected requires them to perform particularly well.

Lastly, the range of ribbon cables has been extended by adding 864 fibre and 1,728 fibre products (UL Riser Rated Indoor/Outdoor cables), which lower cost and complexity within Hyper Scale Data Centers. Our "dry" cable technology has also been certified for highly saline environments.

Accessories and connectivity

With regard to connectivity, Prysmian has continued to develop new accessories for the use of FTTH (Ultra Broadband Access networks). The Group has focused on the cabinets, with the development of optical distribution racks (switches), joint boxes for the splicing of cables, and termination solutions for customers with wall-mounted boxes. A series of new components has been designed to supplement the range of multifunction joint boxes (Compact Joint - CMJ, Medium Joint - MMJ and LMJ) and make them suitable for global markets. In addition, a new range of termination caps has been developed, specifically for the French market, and industrialised at the Menzel plant (Tunisia).

The Connectivity products currently under development include the PBO solution designed to simplify externally protected connectors, ROE16 and ROE32 optical distributor termination boxes for the Italian market, a new modular Subrack System (SRS) increasing joint/termination capacity from 48 to 144 fibres in the same space (1U), that should become available in May 2017, and the design of plastic versions of the modular racks (currently made from metal) for the French market.

OPGW (Special and submarine optical cables)

Efforts with regard to OPGW cables have concentrated on developing the portfolio of steel tubes in the high fibre content segment: both central tube structures (1x96fo) and multi-loose structures. A number of steel tubes for OPGW applications have also been developed and qualified.

With regard to the transfer of technology, the production of ALPA/ALPAM and sheathed submarine cables has been moved from Delfzijl to Vilanova.

Multimedia and Data Centre solutions

Improvements were made during 2016 in the solutions based on the discontinuous metallic ribbon in category 6A U/UTP cables for cabling structured using copper cables.

In addition, there have been interesting developments in the remote-powering technology. In particular, Power over Ethernet (PoE) technology has been incorporated in a family of cables, optimised for connections over longer distances than is standard for cat. 7 cables, that supply both power and data in order to connect such devices as wireless access points and security cameras. A complete family of optical cables, based on Flextube technology, has been developed for the cabling of buildings.

There were further developments with regard to data centres during 2016. Working together with an industrial partner, the first fully cat. 8.2 connection has been qualified and is now available on the market. This product allows transmission at 40 Gbit/s over a 30m copper channel.

High speed (40/100 Gb/s) cables using MM fibre have also been developed and are available in two versions: Plenum/Riser and low emission of toxic fumes and gases.

Lastly, the Group is making a major effort to adopt the EU Construction Product Regulation (CPR). Most of our existing products will be classified in accordance with the new fire resistance classes, but development work is in progress in order to achieve the more advanced categories.

Industrial innovations

Prysmian is strengthening the exploratory studies into materials, in view of the strategic role they play in the technologies employed by cables and accessories. The main results achieved during 2016 include:

- Laboratory production of joints with variable resistance compounds, confirming the good performance of the materials studied. As a result, full-size joints have been made for electricity testing in a circuit.
- Production of new compounds with high electric permittivity for both joints and terminals, enabling new accessories to be qualified in the 36 kV class.
- The Group is considering the use of grafene and nanotubes in polyethylene sheathing in order to improve, respectively, its impermeability to water and its conductivity. A further area of research into nanotubes relates to their possible use in low voltage insulation, in order to determine if they might help inhibit the propagation of flames.
- Studies are currently under way into substances that absorb water without subsequently releasing it, which might provide solutions capable of replacing the metal insulation used in the Group's products.
- Experimental work continues on the light sheathing of submarine cables, with a view to optimising the designs for new cable structures. In addition, Prysmian is working with an external supplier on the joint development of a new traction element.
- A special type of polymer that absorbs methane has been identified and synthesised. The method for assessing the efficiency and effectiveness of absorption at ambient temperature and at 70°C has also been optimised. The Group is moving on to industrial trials, in a bid to confirm the good performance found in the laboratory.
- A number of analytical techniques have been defined in order to improve our understanding of the behaviour of cable materials (content of the ashes of materials for fire-resistant cables, impermeability of paper and PPL at various temperatures, simulation of the jacketing and impregnation of insulation with PPL, efficiency of water absorption of swellable tapes).
- The study of polymers resistant to oils, considering both thermoplastic and cross-linked materials, is still in progress. This study is supported by the development of a new method of cross-linking using a process similar to that of silanes, but with improved cross-linking density.
- The new Afumex compounds for high levels of CPR classification have been industrialised and commercialised, confirming the high levels of fire resistance expected.
- Prototype cables have been made in Australia, the United Kingdom and Italy with enamelling compounds that have intriguing fire-resistant properties. Experimental work on this product will continue during 2017.
- Based on a system of tests devised and carried out by the Group, it has been shown that aluminium coating is more resistant to corrosion than zinc in aggressive environments (being the combined presence of salt water, H2S and CO_2).

- The use of tetrazoles to inhibit the corrosion of aluminium has been shown to be a valid alternative to the current methods. At least 200g are being synthesised for an industrial trial. In addition, we are studying suitable methods for applying these inhibitors to aluminium wire.

Rationalisation and management of materials

- Work on the approval of alternative materials, especially those of major technical or commercial importance, is continuing throughout the Group in order to eliminate monopoly suppliers.
- Work to rationalise the raw material codes for cables has been completed.
- Software has been written that will make the specifications of raw materials available at the time that the material code is activated. This software will supply all the specifications to Prysmian in a unified database that can be searched.
- Software for cataloguing the technical sheets of compounds has been written and is now being implemented.

THOUGHTS ABOUT THE ENVIRONMENT

The R&D activities of the Prysmian Group dedicate great attention to the social and environmental aspects, seeking to use materials that do not represent a hazard for human health or the environment. Efforts include performing up-front analyses of the data for materials, in order to check their possible impact on the environment and the Group. During the year, the Group therefore developed initiatives and projects designed to reduce the environmental impact of the product range.

In order to increase the efficiency and reliability of finished products while, at the same time, lowering the dissipation of energy and power, Prysmian has worked to reduce the set-up times of the machines used and increase the speed with which products are manufactured. As a result of introducing these innovations, the Group has achieved greater manufacturing efficiency, increase the volume produced per unit of time and, consequently, reducing the energy consumed per unit of production.

Additionally, all HV projects have focused on increasing the transmission capacity of links and therefore improving efficiency, while the monitoring systems developed by the Group seek to facilitate the management of assets, by optimising losses and downtime.

Lastly, with regard to the new generation of Afumex LS0H cables, energy consumption during production has been reduced significantly and better surface finishing has been achieved by the development and industrialisation of new formulas. Examples of this initiative within the Telecom business include the efficiencies achieved in the manufacture of data transmission cables and optical cables with loose tube and Flextube micro-module design. In a specific improvement programme, the speeds of the buffering lines and the insulation lines were compared at various factories, using a best practices approach. This resulted in efficiency improvements, as well as a reduction in the energy consumed by these manufacturing processes.

Improvements achieved in relation to the Category copper cables included reductions in conductor diameter and ribbon width, as well as the thickness of the insulator. The use of recycled materials has been further optimised at a number of factories.

With regard to optical cables, where filler is normally used to block the longitudinal penetration of water, the Prysmian Group's 'dry/dry' platform has been further developed.

The family of dry/dry cables with Flextube micro-modules has been expanded. This technology is used advantageously to reduce installation times even further and thus lower the total cost of the system. Elimination of the filler in fact facilitates recycling and the separation of components.

Another important step has been taken in reducing the energy consumed to manufacture optical fibres. The system employed to mesh the plastic sheathing of the glass is phasing out the use of UV lamps in favour of LED lamps. The qualification trials have already been completed: the energy consumed to manufacture a bobbin of fibre could be reduced by more than 20%.

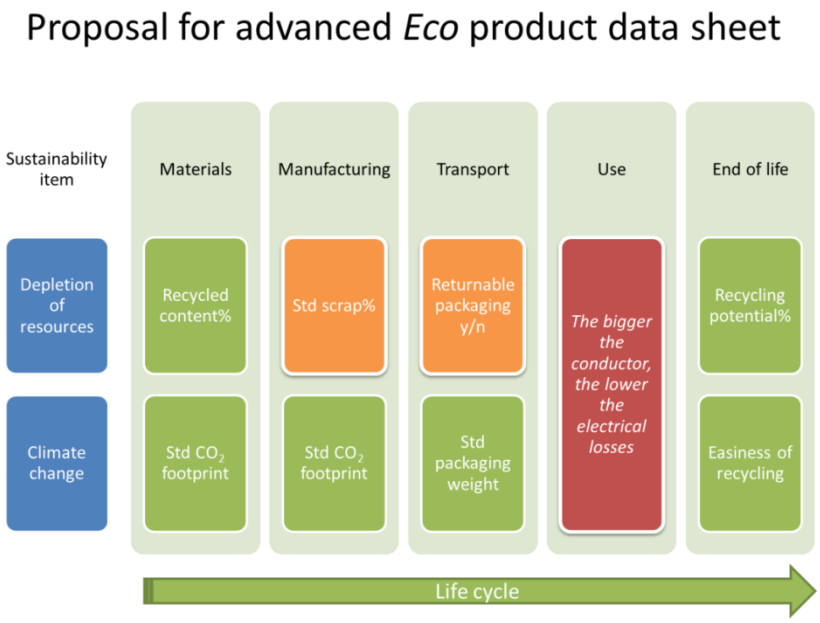
With regard to the Gas Getters technology, further industrial trials have identified the possibilities and limitations of the system. Initial studies of materials capable of absorbing water and gas vapour have produced interesting results.

Lastly, improvements have been made to the cables manufactured using PVC compounds or halogen-free formulations, in order to reduce the quantity of materials used in a considerable number of products.

CFP – Carbon Footprint

Work has started on the development and application of a tool capable of providing a partial assessment of the environmental impact of Prysmian products, in terms of their carbon footprint (CO_2 equivalent) and recyclability.

These parameters will be assessed with reference to the standard design data for each product (BOM and Routing), considering just that part of the life of each cable directly controlled or influenced by the manufacturer. The intention is to apply this tool extensively to the Group's products. A pilot project will be carried out during 2017, followed by application on a vast scale in 2018.



NPI – New Products Introduction

An information tool has been developed to monitor and quantify the impact of the development of new products at all Prysmian Operating Units. The tool is applied to new products, classified into three categories (Innovation, Product Development and Technology Transfer), and the economic results, sales and contribution margin are assessed over the first 3 years in the life of each new product, starting from the first sale.

Eco-sustainable solutions

Afumex family

In line with the main developments of safe, reliable and sustainable technologies, Prysmian has once again confirmed its pioneering and innovative spirit by continuing to expand the range of Afumex Green cables. The new member of the Afumex family, Afumex Green 1kV, is now the safest and most sustainable cable on the market.

With this launch, the traditional petroleum-derived polyethylene, used for insulation purposes, is replaced by bio-polyethylene ("green" polyethylene) derived from sugar cane, which is 100% renewable, certified at international level and reduces CO_2 emissions. It is calculated that for every tonne of green polyethylene produced, more than two tonnes of carbon dioxide are captured from the atmosphere.

Afumex Green 1kV cables meet the standards (NBR5410 and NBR12570) for electrical installations in areas with a high concentration of people in a confined environment. The new green cables are used to power machines, equipment and lighting systems in general; accordingly, they are particularly suitable for stadiums and arenas, airports, shopping centres, libraries, museums, cinemas, theatres, underground railways, data centres, hospitals, schools and commercial and residential buildings.

The Afumex Green range does not propagate flames in the event of fire and has very low emissions, without any toxic gases. As a result, it is the safest range on the market. These cables are extra flexible, have a double layer, do not contain lead or other heavy materials, and resist temperatures of up to 90 degrees.

P-Laser

P-Laser is the first high performance, eco-sustainable cable for electrical circuits. Produced using recyclable materials, P-Laser lowers the environmental impact of circuits while also raising their efficiency and power transportation capacity.

The Prysmian Group's R&D department has completed a project that compared the environmental impact of two different systems for the production of medium voltage power cables: P-Laser and XLPE. This study used the Carbon Footprint methodology to quantify the entire environmental impact of each system in terms of its emissions of CO_2 equivalent. The results showed that the CO_2 emissions associated with P-Laser cables are 30% of the total emissions attributable to XLPE cables, being about 800-1,000 kg of CO_2 for each kilometre of cable produced. The Group is ready with the market launch of an innovative product offering better performance at a lower cost. In particular, the new P-Laser 525 kVDC cable (HVDC technology) represents a point of strength for Prysmian, as it will be manufactured using materials that are completely recyclable with, at the same time, a reduction in CO_2 emissions. The manufacturing process has just one continuous phase, without chemical reactions, thereby making the product faster with a lower consumption

of energy and release of greenhouse gases. At the same time, the technology employed also achieves a 10% reduction in power transmission costs with respect to the classic XLPE technology.

P-Laser 600 kV HVDC

Prysmian has launched an innovative technology for power transmission networks that guarantees better electrical performance, lower costs and greater environmental sustainability. The 600kV P-Laser cable, designed for direct current (HVDC) applications, is more efficient to manufacture than traditional XLPE cables. The world's most powerful cable solution for the transmission of electricity is considered to be an innovation of strategic importance in the field of high voltage cables. In particular, the product is able to reach the maximum level of power transmissible while reducing costs by up to 30% per MW transmitted.

Aircraft completes flight around the world using solar energy

After a journey of 40,000 km that took more than 500 hours, leaving from Abu Dhabi and landing in Asia, Japan, Hawaii, the United States and North Africa, the Solar Impulse 2 has completed a world tour fuelled solely by solar energy. This achievement, unparalleled in the history of aviation and energy engineering, was supported by Prysmian, which supplied 150 km of cables designed specifically for the devices that distributed power throughout the entire aircraft.

COMMITMENTS FOR THE FUTURE

In 2017, the Prysmian Group is committed to pursuing product development that increases the efficiency and reliability of products, while also reducing the dissipation of energy and power. Implementation of the Design To Cost (DTC) project will also continue, resulting in reductions in the weight of conductors and direct materials used in the production of cables.

Intellectual property rights

Protecting the portfolio of patents and trademarks is a key part of the Group's business, particularly in relation to our strategy of growth in high-tech market segments. In particular, the intensive R&D activity carried out in the Energy Projects, Energy Products and Oil & Gas segments, as well as in the Telecom sector, has resulted in further growth in the number of patents held by the Group, especially in the high-tech and high value-added segments. These justify the major investment made in these areas by the Group in recent years, and protect the current and future activities of these businesses.

As of 31 December 2016, the Prysmian Group holds 4,651 patents and patent applications throughout the world, covering 749 inventions (of which 210 in the Energy Projects and Energy Products segments, 13 in the Oil & Gas segment and 526 in the Telecom sector). A total of 31 patent applications were filed during 2016, of which 20 in the Telecom sector and 11 in the Energy sector. Following examination, 183 patents were granted during the year, 47 by the European Patent Office (EPO) and 33 in the United States.

The most important products, typically involving specific characteristics or a specific production process, are protected by trademarks that allow them to be identified and guarantee their uniqueness. As of 31 December 2016, the Prysmian Group owns 570 trademarks, with 2,597 registrations in the various countries in which we operate, covering the names and logos of our companies, activities, products and product lines.