

Fiber Optic in the Offshore Industry – It's time for a change

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Abstract: Fiber optic technology is not yet widely used within the offshore industry, despite the huge advantages that it offers in comparison to current traditional solutions. This paper aims to explain how fiber optics can be used in several applications, and the corresponding solutions that Diamond offers for these purposes.

1 Introduction

Offshore industry is showing a steady growth in control systems and increased communication bandwidth, thus resulting in the need for even more reliable and flexible communication systems that help to reduce any downtime which could incur millions in lost production.

So, as communication system complexity within the offshore industry continues to increase, the need to provide real-time control and data acquisition will drive the communications bandwidth up to the point where copper will not be the only communication medium within this environment.



fig. 1 HE-2000 multi-channels fiber optic connector

Optical fiber, a proven technology for communication and sensing, can provide secure solutions to the offshore industry thanks to its properties and its important technical advantages over traditional instruments, such as immunity to electromagnetic interferences, chemical damage and ability to transmit multiplexed data over large distances.

Optical fiber deployment will also be more evident wherever high-power machinery is placed, as these installations will continue to be dependent upon the noise immune communication properties of optical fiber.

2 Applications

Producers of oil and gas, and wind energy recognise the benefits of strategic investments of fiber optic within offshore plants, which enables improved production, safety and quality of life.

Fiber optic is suitable for use for many applications within the offshore oil industry.

For example, fiber can be used to provide high bandwidth and stable communication with subsea and down-hole equipment, which may include a range of passive optical sensor heads for measuring

temperature, pressure, flow, vibration, strain and chemicals etc.

In this case, the build and installation costs of umbilicals can be significantly reduced when fiber replaces copper, thanks to a large reduction of the umbilical cross section.

It can also be used, in both the oil/gas industry and for wind energy plants, for the construction of an undersea fiber optic Gigabit Ethernet network, designed to provide connectivity between several offshore platforms, where each platform can be mated with transceivers in each cable station, allowing a direct connection to onboard routers and a local area network.

Furthermore, oil, gas and wind energy plants are often placed in deep waters, and this calls for even more lightweight structures manufactured with composite materials. Such materials allow the embedding of optical fiber FBG (Fiber Bragg Grating) sensors, which are capable of measuring and monitoring a structure's mechanical stresses, temperature, pressure etc.

For wind turbines, FBG sensors can also be embedded within the composite layers of the blades during their construction, allowing monitoring of the loads on the rotor blades. This enables the turbine operator to use the measurements for the real-time adjustment of blade position for increasing output and improving balance and stability.

Fiber optic solutions enable other applications within wind plants. For example, cabling the structure for data transmission of wind speed and direction, air temperature and relative humidity measuring systems. This data allows service program optimisation with resulting lower maintenance costs.

Last but not least, video surveillance of offshore plants is possible with a fiber optic network; this is to increase security and to monitor and manage plant activities and emergencies from a central point that can also be located far from offshore structures.



fig. 2 Fiber optic network for Wind Farms

3 About Diamond

DIAMOND is a leading global supplier of high-precision fiber optic solutions and has been successfully serving several markets for over 30 years. Diamond is known as a dynamic and innovative company which provides reliable, customised components and equipment, in response to increasingly demanding customer requirements.

Established in Switzerland in 1958, in addition to its headquarters, Diamond can count on an extensive international distribution network with 5 subsidiaries and over 30 representatives.

Our solutions set standards regarding simplicity, quality, installation, safety and maintenance.

Diamond uses state-of-the-art tools and systems and devises new technologies to develop and manufacture fiber optic products and equipment that anticipate changing customer requirements and market trends. All this is also possible thanks to the engineering capabilities of the approximately 50 employees in the R&D department, who have also enabled Diamond to become the owner of over 70 patents and to develop unique production tools and processes.

Fiber optic solutions that satisfy the increasing demands for customer-specific challenges and requirements can only be offered from companies like Diamond with mechanical, optical, assembly and measurement competencies.

Diamond also has its own test and calibration laboratory, accredited by the Swiss Accreditation Service as a testing laboratory STS 333 for fiber optic components, and as a calibration laboratory SCS 101 for fiber optic measurement instruments in accordance with the standard ISO / IEC 17025:2005.

Furthermore, the quality of our products and processes are overseen by a quality management system complying with ISO 9001 and ISO 14001 for the environmental management system.

4 Solutions and Products

Without doubt, connectors designed for use in harsh environments must withstand special conditions in terms of adverse temperatures, shocks, vibrations, tensile stress, external pressure, corrosive surroundings etc., which are beyond environmental conditions typically endured by standard commercial connectors and cable assemblies.



fig. 3 OD3 Dual channels fiber optic connector

DIAMOND has therefore responded to this growing demand by developing a wide range of strong, reliable, customisable indoor/outdoor field optical solutions with superior optical performances.

Take, for example, the new ruggedized IP67-rated metal OD3 connector based on two F-3000™ (LC compatible) SFF connectors, or the four-channel (IEC 60529 compliant) X-BEAM genderless connector that uses lens-based expanded beam technology for ease of cleaning and mating in outdoor applications.



fig. 4 X-BEAM four channels fiber optic connector

Noteworthy is also the upcoming push-pull four-channel plastic connector **HE-2000** which includes a modular and configurable hermaphrodite hybrid (optical/electrical) insert based on Diamond's "Alberino" 2.5mm ferrule terminus, for easy field termination and repair.

Diamond also offers high-quality field termination, inspection equipment and fiber handling tools; including solutions for preparing, cleaning, inspecting, mounting, splicing and repairing fiber optic components in the field. These complete sets are easy to use, ergonomic, light yet also robust.

Diamond not only offers its own solutions as final products, but is also open to cooperation with other solution providers already serving offshore industry markets.

5 Conclusion

We are sure that Diamond solutions and technologies are able to help to develop the future within the offshore industry and can fulfil your own unique requirements.

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