Battle tested deployable oil and gas systems

As the use of fiber optics has increased in the oil and gas industry to enhance production, via better data reliability, availability and performance than traditional copper communication systems, so have the number of 'deployable' systems used in remote locations. These applications range from offshore and land based rig automation to realtime sensors for pipeline monitoring to systems for GEO exploration, wireless communications, security infrastructure, smart well controls, and operations control centers.

In the field, 'deployable' systems are increasingly important to ensure satellite uplink networks, DCS/PLC automation/control, CCTV for physical security, SCADA for pipeline control, monitoring and wellhead automation, as well as LAN/WAN communication infrastructures for shore to platform and inter platform connections.

In contrast to fixed installations, deployable systems are designed to be quickly installed, retracted, and then relocated in the field in some of the most inhospitable environments on earth.

As oil and gas exploration/production continues to get more remote as well as colder, hotter, or deeper, deployable systems will become even more vital to the industry.

Given the environments in which they reside, oil and gas grade fiber optic systems are typically commercialised versions of field tested, proven military grade products. As such, the component parts of the system are designed to withstand everything from dust and debris to chemical exposure, temperature extremes, UV, radiation, electrical power transients, interference, fire, moisture, humidity, water, crush, tension, flexing, impact, and vibration.

Rick Hobbs, Director of Business Development at Optical Cable Corporation (OCC), explains that when designing a deployable fiber optic system, it needs to be looked at in its entirety. Unlike fixed applications, a deployable system is designed from beginning to end (plug and play) and delivered to the customer as a complete solution. OCC designs and manufactures fiber optic cable, connectors and assembly solutions for harsh and rugged environments.

According to Hobbs, the primary elements of a deployable system include hardened cable jacketing; 'genderless' connectors for quick deployment without regard for male or female ends; hybrid systems that include copper along with fiber to deliver data communications and power; and reel systems that speed deployment and retraction while protecting the fiber while not in use, or during transit.

Hardened cabling

For purposes of deployment, OCC typically recommends its tight bound, tight buffered distribution style

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cabling, which is ideal because of its small diameter and lightweight construction.

Distribution style cables have a tight bound outer jacket, which is pressure extruded directly over the cable's core. This combination of a helically stranded core, and a pressure extruded outer jacket provides an overall cable construction that offers better crush and impact protection and increased tensile strength. This also reduces outer jacket buckling during deployment.

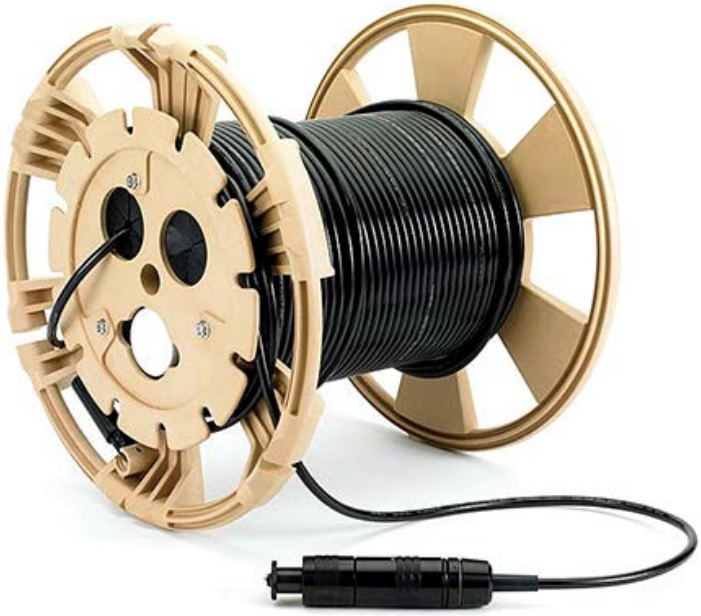
According to Hobbs, escalating degrees of cable protection are available as needed to meet the specific needs of an application.

Various jacket materials are available, including PVC or polyurethanes, which are specifically tailored to meet the mechanical and environmental needs of the application. Options within each jacket material include coefficient of friction, cold temperature flexibility and temperature range, to name a few.

Water tolerant options are available that take advantage of the qualities of tight buffered cable and super absorbent polymer aramid yarn.

Fiberglass or metal braided jackets not only provide excellent abrasion resistance, but also deliver increased rodent protection. Custom rodent resistant cables are available that include metal or dielectric armor or additives to the outer jacket.

'In deployable applications, exposed cable is often an intriguing temptation for animals, which can, and often do, chew on it,' said Hobbs.



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Hybrid cables, connectors

For applications that can benefit from fiber optics and copper, hybrid connector cables offer both within the same cabling sheath. A distinct advantage of hybrid cable connector solutions is that the customer can bundle both the high performance of fiber with the copper power or control signals in one cable. This reduces the number of cables that must be designed, purchased and deployed into a system.

It also offers distinct savings in labor and cable structure costs for the customer.

Genderless connectors

'Genderless' connectors have both male and female elements, and perhaps are more appropriately described as dual gender, and are often called 'hermaphroditic'. They are designed for quick deployment, allowing the user to unreel fiber cable without regard for male or female ends.

Companies such as OCC have further simplified the genderless design with user friendly mating interfaces

(the company's EZ-Mate family) capable of 'blind mate' and/or applications that require thousands of mating cycles.

In addition, the connector system is designed to resist extreme harsh mechanical and environmental conditions including high vibration, mechanical and thermal shock, and fluid immersion.

Another benefit of genderless connectors is that multiple identical cable assemblies can be daisy chained (sequenced) together to extend the distance of a deployable system while maintaining polarity. Polarity can be an issue when connecting an odd number of traditional male to female gender connectors. In such cases, an additional connector is required to correct polarity. However, such connectors are known for high loss and add additional components for the customer. Therefore, genderless connectors are uniquely advantaged over traditional interconnection systems.

Distances of several kilometers are possible, limited only by system link budget (dBm).

'This type of genderless connector provides extreme flexibility in the case of redeployment, where the length of the cable assemblies required for the next application are not fixed, or even known,' said Hobbs.

Reel systems

The key characteristics of a reel system in deployable fiber optic applications are that it is lightweight, rugged and stackable for storage and transit, says Hobbs.

To meet these requirements, companies such as OCC are providing lightweight alternatives to traditional metal reels. Constructed of durable, yet lightweight, impact absorbing polymers, these modular advanced reel systems (MARS®) are designed specifically for the demanding needs of harsh, oil and gas environment fiber optic installations.

Reels can be used with simple deployable axle or a flange supported deployment and acquisition system. These types of systems include A-Frames, cable acquisition cradles, transit case systems, tripods, bumper mounts, backpacks, backpacks with fiber optic slip rings, and cartridge systems.

These cartridge systems are a specially designed protective case for deployable cable reels that permits full deployment and retrieval of cable without removing the reel from the case. The cartridge system, which comes with casters, is an ideal choice in many deployable applications.

'Using a cartridge system, a single person can handle multiple spools at once and can quickly deploy fiber and rewind on the reel without assistance,' said Hobbs.

To simplify shipping and transit, cartridge systems, transit cases and reels are designed with interlocking stacking features.

Reel systems also provide a measure of protection of fiber optic cabling for unspooled cabling, or when the cabling is retracted.

'In harsh oil and gas environments, when you can put your fiber optic assemblies in a controlled environment storage system like a reel, possibly together with a cartridge, any potential damage to the cable or the connectors is minimized,' said Hobbs. 'This reduces the need to refurbish components regularly, because the system is better protected during its deployment.'

Wireless access/data communications

Although deployable fiber optic systems are largely 'wired,' hybrid cabling (the combination of fiber optic and copper/electrical within the same cable sheath) also allows for installation of wireless access points anywhere. This is ideal when access points are constantly changing.

Unlike traditional wireless networking devices that require 110 Volt AC power for each device, with a hybrid system power can be supplied in the same cable that also carries voice and data.

As a result, any 802.11 certified devices are able to communicate through the network, including personal devices such as PDAs, laptops, VOIP devices and cell phones.

This provides personnel with the means to communicate with each other and even make calls outside the system. In addition, sensor based data such as temperature, humidity, airflow and gas can also be collected and delivered wirelessly for use by the entire network.

Increasing conversion to fiber optics

According to Hobbs, there are many oil and gas companies that are converting to fiber optics as the costs for components continue to drop, making fiber a better solution than copper in most applications. Even die

hard copper devotees are moving to fiber and when they do, they rarely look back.

'When oil and gas System Engineers realise the bandwidth opportunities, they usually expand their capabilities, and identify creative new ways to enhance the solutions for their applications,' said Hobbs.

For more information about deployable fiber optic system for harsh oil and gas environments, visit www.occfiber.com.

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