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A Review Paper on Extending the Contact of Cabled Oceanic Observatories

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ABSTRACT:

The network of submarine cables circling the globe connects most of the major population centers. This network is rising, driven by increasing international telecommunications and the internet. There is a widespread network of submarine cables throughout the world. The network is continuing to grow speedily, driven by an increasing demand for telecommunications and the internet. Submarine cables are at threat from both natural and human activities. To make sure connection of service, some form of protection must be provided.

In the submarine cable laying industry there are currently two primary users of installation services, the Telecoms industry and the business industry. There is a growing third market in the submarine cable and installation services industry. Underwater generating stations that must be interconnected and the fact that in some situations, such as underwater fiber optic cabling units must every so often be surfaced for maintenance and/or repair [1].

This paper provides an introduction to submarine cabling data transmission and powering architectures associated with cabled ocean observatories, and to install submarine fiber optic cable (SFOC) and power cables also describes the elements needed to broaden observatory exploration reach with undersea repeaters [1].

Keywords: ***undersea cable; submarine amplifiers; repeaters; fiber optic***

I. INTRODUCTION

Fiber optic cables are the medium of choice in telecommunications infrastructure, allow the transmission of high speed voice, video, and data traffic in project as well as service provider networks. Depending on the category of application and the reach to be achieved, a variety of types of fiber may be considered and deployed.

Key benefits of undersea cable include marvelous data transmission bandwidth offered by optical fiber and the ability to power systems from seashore. Underwater fiber optical cable technology developed for international telecom applications has been combined with subsea hardware along with connection techniques to make available offshore oil and gas conveniences with high bandwidth [3]. This repeater that is optically-amplified technology applied to cabled ocean observatories can extend to bring about of both the observatories and their instrument packages[2].

II. A TYPICAL NETWORK CONFIGURATION

The geographical route of a submarine cable system, strength of the cable, and its union topology vary for different systems. An undersea system provides transmission paths between stations in different countries through optical fibers confined by a cable. The first cable segment out from the station, the seashore end cable, is usually covered to a depth of at least 1 m. The kind of cable used in subsequent cable sections and the depth of the lay depend on the terrain of the sea bottom. Typical depth of the sea-bed sections is at least 1000 m [5].

There are four to six fibers fixed in grooves in a centrally situated polyvinylchloride (PVC) slotted core protected by an elastomeric casing within the center of the cable structure which is enclosed by steel wires and a copper tube that provides a barrier to doorway of water and carries the electrical current[2]. This is enclosed with polyethylene insulation. The basic cable configuration is suitable for deployment more than 1000 m deep where the risk of damage to the cable is little.

Cable to be use in trivial waters is usually reinforced and covered for protection against fishing action, ships anchor as well as even nibbling from sharks in various areas [1].

Figure 1. Submarine Cables

Each cable subdivision is intended for error-free discovery, and the renewal process is to be repeated indefinitely with no degradation. This remarkable performance requires extremely complex and high-speed electronic circuitry plus highly reliable electro-optic devices in every repeater [2]. Present high-speed circuitry for regenerative submarine technology is limited to data transmission at 560 Mbit/s. New technology is necessary to boost system capacity and performance at cheap circuit cost [5].

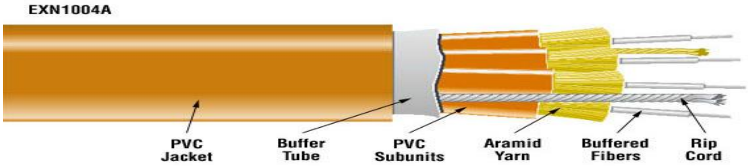

Figure 2. Data Transmission Cable, Fiber Optic Cable

Optical amplifiers boost transmission rate by eliminating the call for high-speed electronics in repeaters. Restoration occurs only at the terminal location. The optical signal transmitted from each terminal location remains in optical form all over its journey to the remote location. Submarine repeaters supply only optical gain, which disburse damages for the reduction of the transmitted signal as it propagates through the fiber cable.

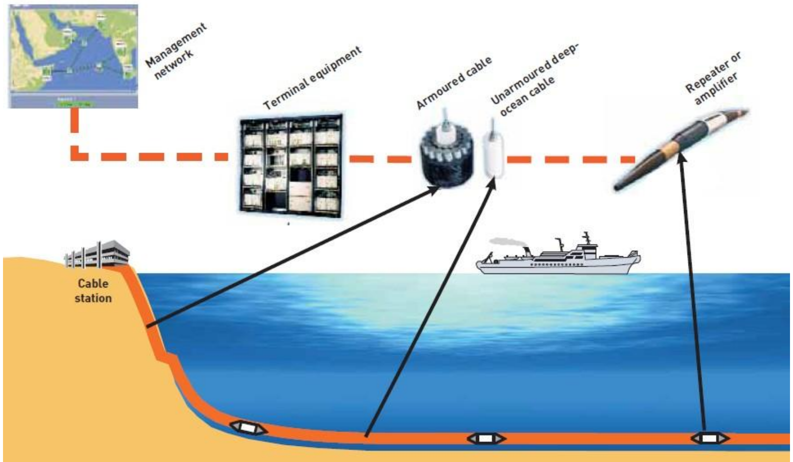

Figure 3. Cabling Installation

The repeater contains a few comparatively simple circuitry for pump power regulation, receipt of supervisory orders and response of key amplifier parameters like gain, output control. To succeed for submarine exploit, all these machinery of the repeater necessity meet up standards of high reliability.

Figure 4.Cabling Installation Tools

III. SUBMARINE CABLE ADVANTAGES

Cable links connecting nodes and sensors have typically been limited to short distances, approximately 5 km most, for subsea installations using an ROV spool-type approach. Industry standard cable laying vessels are able to loading and laying extra than 10,000 km, even though most extension cable links are unlikely to exceed 100 km due to the transponder and electrical power supply capabilities of main nodes [3].

Cable ships present a robust means to set up these longer extension cables. Cable laying vessels offer accuracy route placement of cables and use proven cable installation equipment like drum engines along with linear cable engines [1].

Figure 5. TE SubCom's Reliance Class Cable Installation Ship

A further advantage to using cable ships is the capability to at the same time to deploy and bury cables to depths of as much as three meters below the ocean floor.

Sea reinvest machinery allows for one-pass lay along with interment of cable, with repeaters, eliminating the need for post-lay burial [3]. Avoiding the need for a second or third pass with a jetting ROV reduces the overall setting up interval. Cable interment provides significant protection of subsea cables by greatly reducing the threat of external violence faults due to fishing, trawling, and anchoring action [5].

IV. CABLE MAINTENANCE

Cable Repair Cutting Drive: Different repair methods are used in different depths and conditions: One common method starts with the ship dragging a cutting grapnel to cut the cable. For cables buried deeper than 1 m into the seabed, multiple cutting runs may be needed to find the cable[4].

Cable Repair Recovering First End: After the cutting drive, the holding drive picks up one end of the cable. The end is tested to see if there are any more faults between it and shore. Any damaged cable is cut out until the end tests clear to shore.

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Figure 6. Launching a TE SubCom Seaplow

Cable Repair Recovering Second End: After any damaged cable is removed from the first end and it tests clear to beach, the first end is left on a drift. The second end is picked up also tested, and any damage cable is cut out [4].
Splicing emergency Cable (Initial Splice): After all damaged cable is detached, the ship adds a piece of emergency cable long enough to reach between the ends. Below the ship is performing the Initial Splice (first end of the spare cable).
Repair Final link: The length of emergency cable needed depends on the quantity of cable removed and the water depth. If much length is added, an additional repeater may be needed. Below the ship is making the Final link.
Lying out & Burying Final link: After the final link is completed and tested, it is lowered carefully to the ocean floor. The Final link may be buried with a Remotely Operated Vehicle (ROV) for protection, if ocean floor setting allows [4].

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