ST-SEWS Real-time Monitoring and Early Warning System of Submarine Optical Cables Hazards

Produced by Frame Communications

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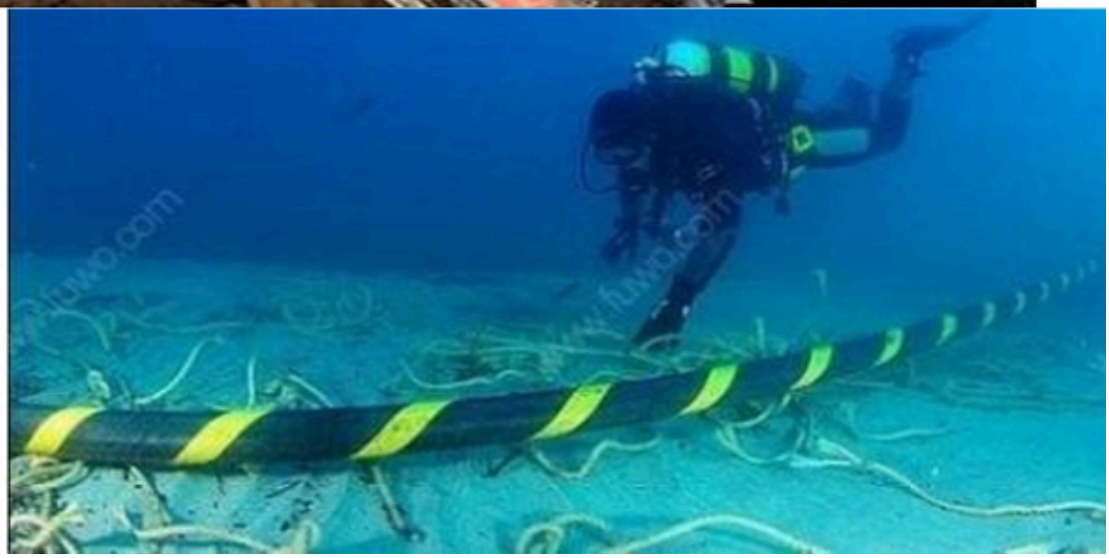
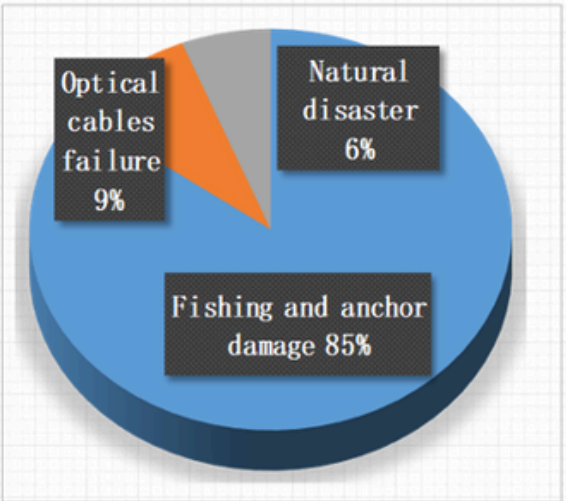
Major Needs: Submarine Optical Cable Applications and Existing Problems

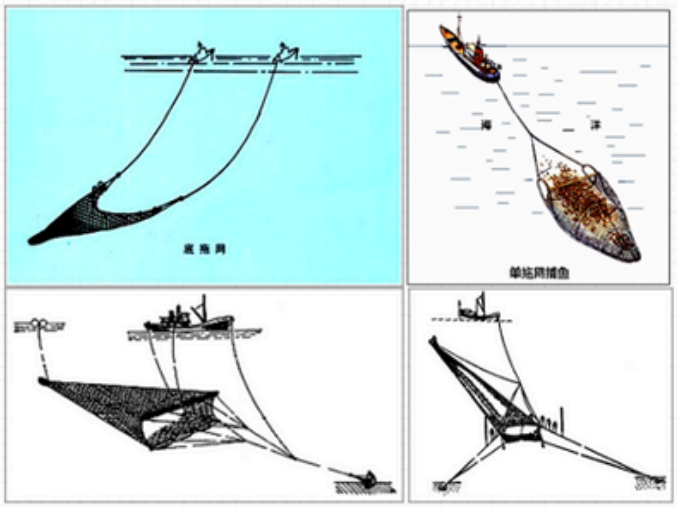


Current Existing Problems

1. Submarine Optical cable resources are already huge, and construction will be more and more in the future.
2. The cost of laying submarine optical cables is huge, and cable breakage and damage caused by human activities in offshore areas occur frequently.
3. The cost of repairing submarine optical cable is huge, each repair can take more than two weeks, with a cost of $300,000.00 US Dollars and upwards.
4. Current technology can only locate breakpoints after a submarine cable is damaged, but cannot complete real-time monitoring to alarm when potentially harmful events are imminent to submarine infrastructure.
5. The safety and longevity of submarine optical cable systems is fragile, and there is a lack of effective technical solutions for protection and early warning.



Analysis on the causes of submarine optical cable failure from one Telecom Operator



Fishing operations

After submarine optical cables are laid, the percentage failure rate caused by humans can be as high as 85%, and with heavy financial impact.

Status Around the world

Most of the existing distributed fibre optic vibration sensing systems in China are based on Φ-OTDR technology, and the current applications are mainly concentrated in the field of perimeter security monitoring. The monitoring distance is generally limited to 30~50km. This type of technology is not suitable for submarine optical cable early warning fields.

There have been no public reports on commercial cases abroad on early warning systems of submarine optical cable hazards based on optical fibre sensing technology.
Since 2010, ShinewayTech has been one of the pioneers in China to carry out research and experiments on distributed optical fibre sensing technology.

On the premise of improving the original sensitivity and dynamic range, the sensing and early warning system (SEWS) developed by ShinewayTech achieves a substantial increase in the monitoring length of the submarine cable to an unprecedented distance of 160 kilometres without repeaters, and the monitoring distance can be more than 1000 kilometres with repeaters.

Basic Methodology

Using the existing optical fibres in submarine cables to build a sensing system that is sensitive to external hazards, conduct real-time monitoring, early warning and positioning of potential hazards, and be able to alarm to give users the best opportunity to prevent them from happening. It can be combined with the maritime AIS system to track and stop the ships engaged in damage within the corresponding submarine cable section, effectively preventing submarine cable disasters and improving the safety and survivability of submarine cables.

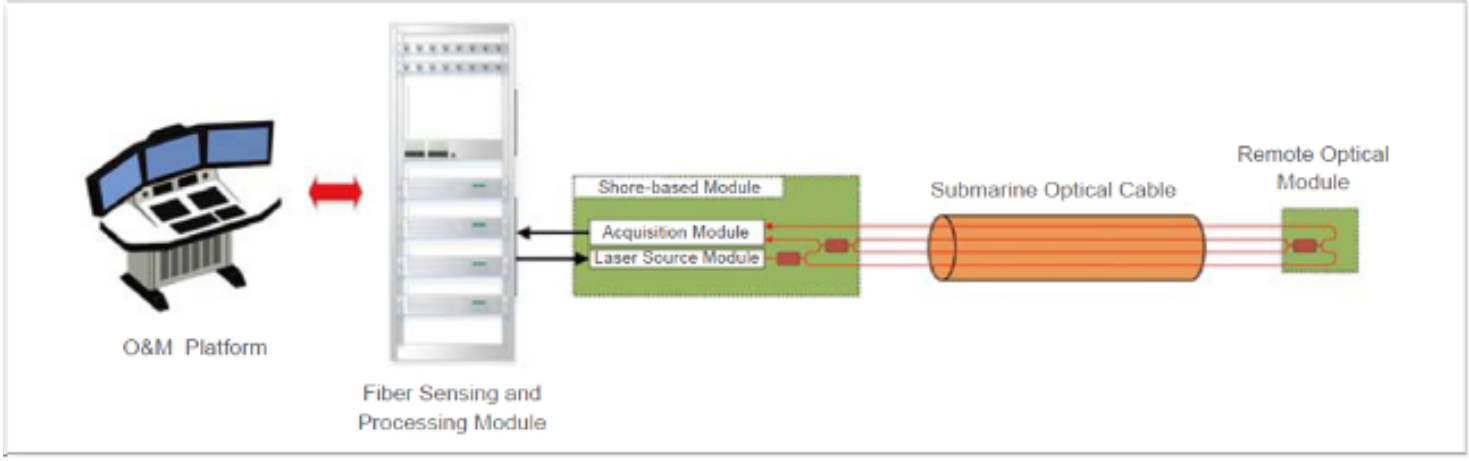
Key Usage

It solves the technical gap that current technical solutions cannot offer. This technology delivers a cost-effective solution that greatly improves the safety of submarine cables, plus greatly reduces submarine cable operation and maintenance costs.

System Composition

The SEWS system consists of three main components:

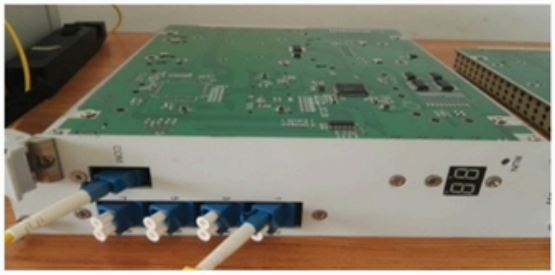
- the host of the system
- the remote optical module
- the submarine optical cable.



Core Equipment

SEWS-160 (160KM model)

SEWS-1000 (1000KM model)



Shore-based Module

Remote Optical Module

Specifications	SEWS-160 (160km)	SEWS-1000 (1000km)
Wavelength:	1550nm	1550nm
Dist. of monitoring:	160km	1000km
High spatial resolution:	≤ 50m	≤ 50m within 100KM ≤ 200m over the entire fibre span
Dynamic range	120dB	120dB
Frequency response range:	20 ~ 20KHz	20 ~ 20KHz
Warning latency time:	< 6s	< 10s
Missed alarm rate:	0%	0%
False alarm rate:	< 1%	< 1%

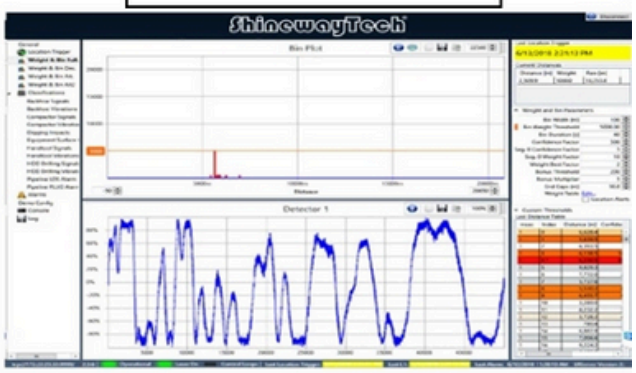
Deployed projects:

1. Monitoring of one submarine photoelectric composite cable with a monitoring distance of around 100 kilometres.
2. One submarine photoelectric composite cable monitoring and early warning project monitors 11 submarine composite optical cables at different locations, each cable is around 150 kilometres, and the total length of the submarine cable is 1,590 kilometres (no repeater monitoring method).
3. One submarine optical cable monitoring and early warning project, the total length of monitored submarine cables is about 300 kilometres (with repeater monitoring method).

Pictures from the field

Equipment rack in monitoring centre

Event positioning



Maintenance & management

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