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## Intelligent DTS and PD monitoring system for underground distribution network

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Condition monitoring of distribution equipment is essential for the prediction of distribution system failures. So, KEPCO developed several intelligent distribution equipment which can diagnose its aging status through the special sensors and be monitored by distribution automation system.

At present, intelligent circuit breaker, switchgear, recloser, transformer and surge arrester were developed. It can communicate with control center of distribution automation system through RTU by DNP3.0 protocol. And also KEPCO proposed diagnosis criterion for efficient maintenance. All of these intelligent equipments will be installed in Jaeju smart-grid demonstration site.

Although underground cable is also important distribution equipment it did not considered for on-line monitoring. So, intelligent underground cable monitoring system is under development. It is distributed temperature monitoring system using fiber optic cables. PD monitoring system is also added for the splice monitoring. This system can predict failure and conduct fast restoration owing to fast failure detection and exact fault location.

DTS is common technology for underground transmission cable but it is expensive solution for the underground distribution cables. So this paper proposes economic DTS solution with PD monitoring system.

Key features of this system are as follows

We installed two stainless tube having 4 optical fiber cables under the jacket with natural wires (Fig 1). Two of 4 optical fiber cables will be used for the laser path. This system is connected to the distribution automation system and operator can manage the monitoring route of cable by manual. In addition it can monitor all feeders by turns automatically.

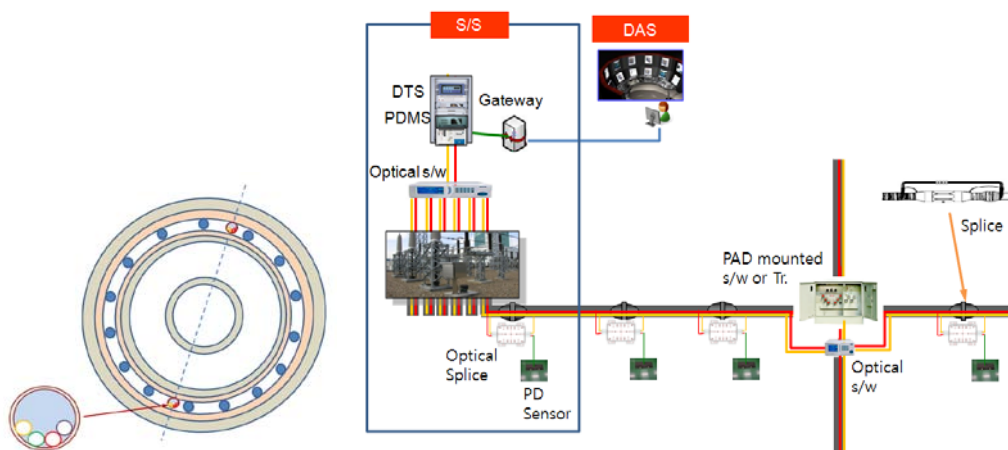


Fig. 1 Optical fiber embedded cable and intelligent DTS system for distribution cable monitoring

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1. It can select monitoring feeder and also it can trace all the branch line using specially designed optical switch which is installed at the position of pad mounted switchgear and transformer and it's route determined by the command from distribution automation system. So we can monitor all feeders by only 2 channel DTS.
2. For the premolded splice we installed optical splice which has communication port for the connection of portable PD measurement system. So we can gather PD data from splices during specific period. And at this place we can measure ambient temperature and splice surface temperature simultaneously because one of optical fiber is installed on the surface of splice and the other is installed on the earth wire (Fig 2).

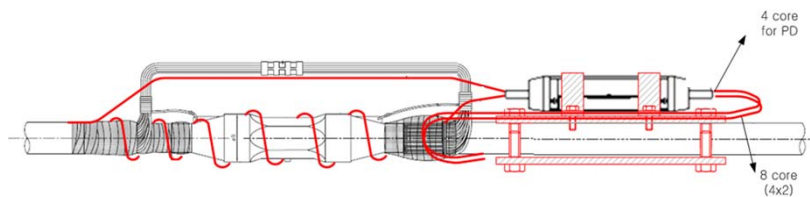


Fig. 2 Optical splice and installation layout

Optical communication is essential for smart distribution management. So utilities can construct communication network easily and economically by optical fiber embedded underground cable.

If utilities use optical fiber embedded underground cable for the communication they have to predict cable failure or prevent fault propagation in order to maintain communication reliability.

So this paper proposed specially designed DTS for the economic monitoring for distribution cable. It is also can be considered as a smart grid solution for failure prediction and fast restoration of distribution network.