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QUESTION N° : 2.6

1. Background

In Japan, Some strands of conductor for overhead transmission lines passing through various environments are sometimes melted by a fault arc. The fault arc is caused by several factors. For example Lightning, Crane, Birds, Snow/Ice and so on. Damaged conductor may break if not repaired because the tensile strength of the melted conductor is weakened due to a decrease in cross-sectional area and applied heating on it. Therefore it is necessary to find damaged points and repair them.

2. Example of method to identify fault location

In identify location, the first step is to narrow down the fault location by using sensors. And then, the fault point is identify by visual inspection using drone or telescope. The sensors which are used to narrow down the fault location is as follows:

【fault sector system】

In the fault sector system, electromagnetic sensors are installed on the towers at certain intervals for the towers between the substations. When a failure occurs, the sensor detects electromagnetic changes due to the fault current. The fault sector is identified the location by using the characteristics of fault currents flowing towards the substation on the power supply side. The sensors information can be checked on the office PC through the network, and the approximate section can be immediately identified.

【Fault locator system】

In the fault locator system, current transformer are installed on the ground wire at certain intervals for the towers between the substations. When a failure occurs, the sensor detects fault current value. The fault current in each tower is simulated in advance for each fault situation. The location of the fault can be identified by comparing the measured fault current value with the simulation. The sensor information can be checked on the office PC through the network, and the fault location can be immediately identified.

3. Improving accuracy of residual tensile strength

In the evaluation of the residual strength of the melted strand, the melted depth in consideration of variations in visual inspection is set as a threshold, in order to avoid the complication of repair judgment and to evaluate the strength on the safety side. Therefore, there is a certain margin in the evaluated residual strength, and it is possible to expect a large residual strength by refining. It is considered in the near future that it is possible to refine and automate repair judgment with drone camera images by using AI technology that applying relationship between high-precision images of melted conductors and the residual strength of the conductors as training data.

4. Conclusion

This paper presents a method for narrowing down fault location, and improving accuracy of residual tensile strength. We believe that introduction of drone technology and AI technology will allow us to greatly refine and automate these work. Therefore we will work on this in line with technological advances.