

中文摘要

本論文針對近年來國內較常發生的電纜終端接頭因施工不良所造成的事故進行研究，在不影響現行施工法的前提下，研擬可行的方法，降低電纜終端故障的可能性，除施工不良，亦對於製造及環境不良所造成的電纜終端事故作廣泛性的探討。

本論文提出一套新的設計概念，乃在電纜終端添加半導體層，以抑制現行設計因施工不良所造成的非均勻電場，並以現有的冷縮式套管為例，將此設計納入至該套管的構造中，再利用有限元素法進行數據模擬，分析此一套新的設計可能衍生的問題，嘗試將該新設計之下的終端結構最佳化。經由數據模擬分別在正常施工與施工不良的條件下，評估添加此層後電場的改善狀況，最後評估此結構是否能通過現行的耐電壓試驗。

模擬結果顯示：此一套新的設計結構在假設的各項施工錯誤狀況下皆可以發揮其抑低電場分佈不均的效果，包括正常施工以及各類常見的施工狀況，且在耐壓試驗中，也可有效降低最大電場值。本研究雖然僅執行數據模擬，但模擬結果顯示：此項新設計在電纜終端的非均勻電場之抑低方面，具有應用潛力。

英文摘要

This thesis investigates the cable terminal fault, focusing on the faults caused by improper termination fabrication work which has been recently recognized as the major root cause for cable outage in Taiwan. The thesis presents a new design concept to reduce the probability of cable terminal outage which intends not to cause any variation on the presently existing fabrication work procedure of cable termination. In addition to the improper fabrication work, other root causes for the cable terminal outage have also been studied in this thesis.

The new design concept presented in this thesis is by adding an additional semiconductive layer to the cable terminal so that the ununiform distribution of electric field can be effectively reduced. The new design has been tested on the cold-shrinking termination which is presently extensively used in the low and medium voltage of power system. To evaluate the effectiveness of purposed concept, numerical simulation has been done by using the Finite Element Method. Through the simulation, the author intends to find out the optimal design structure for coldly shrunk terminal and also the potential difficulty in future application of the design. This thesis also simulates the electrical field of cable terminals with a variety of improper fabrication works and cable environmental conditions, as well as the ability of the new design to withstand the voltage tests.

The evaluation shows that the new structural design of cable terminal can mitigate the ununiform distribution of electrical field under the most common improper fabrication works, no matter the cable is operated under the normal operation condition state or under the withstand voltage test. Although the simulation is done only here to verify the effect of the new design, the simulation results show that the design can indeed reduce the vulnerability of cable terminal caused by the improper fabrication work, and has a high potential in the future application.