

输配电及供电

利用模拟热荷法计算地下电缆稳态温度场

梁永春 李延沐 李彦明 柴进爱 王正刚 李忠魁

西安交通大学电气工程学院 西安交通大学电气工程学院 西安交通大学电气工程学院 西安交通大学电气工程学院 郑州电业局 郑州电业局

摘要: 根据电场和温度场的相似性, 提出了用于计算地下电缆群稳态温度场的模拟热荷法。利用热路的方法将电缆金属套损耗和铠装层损耗归算到电缆导体。利用调和平均法对电缆导体外的多层介质进行处理, 最终将电缆等效为导体和外护层的2层结构。根据换热量相等的原则, 将地表空气对流换热系数等效为一定厚度的土壤。在电缆线芯和空气中用模拟热荷代替原来的线芯损耗和空气对土壤温度场的影响。然后根据镜像法, 按照地表空气等温、导体等温以及外护层和土壤边界温度梯度相同列出约束方程组。利用高斯法求解方程组, 求得地下电缆群稳态温度场的分布。试验和有限元仿真验证了模拟热荷法在地下电缆群稳态温度场计算中的有效性。

关键词: 地下电缆群 稳态温度场 热路 调和平均法 模拟热荷法 镜像法

Calculation of the Static Temperature Field of Underground Cables Using Heat Charge Simulation Method

LIANG Yong-chun LI Yan-mu LI Yan-ming CHAI Jin-ai WANG Zheng-gang LI Zhong-kui

Abstract: Heat charge simulation method which was derived from comparison of electric and thermal field was presented to calculate the static temperature field of underground cables. Losses in cable sheath and armor were moved into cable conductor by thermal circuit method. The cable which was composed of multiple layers was equivalent to two layers, conductor and outer layer, by harmonic mean method. The coefficient of air convection on ground was substituted by equivalent depth of soil based on the equivalent quantity of heat exchanged between ground and air. Some heat charges were used to simulate the loss in cable core and the temperature of air. The constraint equations of isothermal and the same temperature gradient were established by mirror method. Gauss method was used to solve these equations and calculate the static temperature field of underground cables. The test and finite element method (FEM) simulation have proved that heat charge simulation method is effective to calculate the static temperature field of underground cables.

Keywords: underground cables static temperature field thermal circuit method harmonic mean method heat charge simulation method mirror method

收稿日期 2007-01-09 修回日期 1900-01-01 网络版发布日期

DOI:

基金项目:

通讯作者: 梁永春

作者简介:

作者Email: yongchunliang@stu.xjtu.edu.cn; lycoccean@163.com

参考文献:

本刊中的类似文章

Copyright by 中国电机工程学报

扩展功能

本文信息

- ▶ Supporting info
- ▶ PDF(270KB)
- ▶ [HTML全文]
- ▶ 参考文献[PDF]
- ▶ 参考文献

服务与反馈

- ▶ 把本文推荐给朋友
- ▶ 加入我的书架
- ▶ 加入引用管理器
- ▶ 引用本文
- ▶ Email Alert
- ▶ 文章反馈
- ▶ 浏览反馈信息

本文关键词相关文章

- ▶ 地下电缆群
- ▶ 稳态温度场
- ▶ 热路
- ▶ 调和平均法
- ▶ 模拟热荷法
- ▶ 镜像法

本文作者相关文章

- ▶ 梁永春

PubMed

- ▶ Article by