

电机与电器

40.5 kV SF6充气式开关柜三维电场分析

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摘要: 建立了40.5 kV、2 000 ASF6充气式开关柜的三维电场分析的有限元模型。针对产品实际结构的复杂性,应用网格划分控制工具的参数设置和疏密网格等分网方式对模型进行网格划分,按照实体模型的边界线或边界面的曲率排布设置了中间节点、边中节点,使有限元模型与实体模型的边界更吻合。同时采用局部细化、重新分网等方法提高网格的质量。考虑大型稀疏方程组迭代收敛以及收敛速度快慢的问题,通过几种求解方法的比较,选用不完全乔类斯基共轭梯度(incomplete Cholesky-conjugate gradient, ICCG)算法进行大型有限元方程组的求解。该文通过计算分析获得了充气柜2个气室(隔离开关室和断路器室)的电位和电场强度的分布规律,以及相关结构参数对电场分布的影响,从而对SF6充气柜(cubicle gas-insulated metal-enclosed switchgear, C-GIS)的绝缘结构设计提供理论参考。

关键词: 不完全乔类斯基共轭梯度算法 SF6充气柜 有限元法 电场

Three Dimensional Electric Field Analysis of 40.5 kV SF6 Cubicle Gas-insulated Metal-enclosed Switchgear

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Abstract: Three dimensional electric field analysis finite element model was built. For the complexity of actual product structure, the model was meshed by using the parameter settings and sparse and dense meshes of the grid dividing control tool. The intermediate nodes and the nodes on model sides were set according to the curvature arrangement of boundary lines or boundary faces in real model, it can make a better coincidence between boundaries of finite element model and real model. Some methods such as partial thinning mesh and remesh can improve the quality of mesh. For the problem of iteration convergence and convergence speed in the large equations set, the large equations set were solved by adopting incomplete Cholesky-conjugate gradient (ICCG) algorithm selected in comparison with some other solution methods. The electric potential and electric field distribution and the effect of configuration were gained through analysis and calculation. These results also proposed theory advice for the insulation configuration design of SF6 cubicle gas-insulated metal- enclosed switchgear(C-GIS).

Keywords: incomplete Cholesky-conjugate gradient algorithm SF6 cubicle gas-insulated metal-enclosed switchgear finite-element method electric field

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