

电力电容器与无功补偿

POWER CAPACITOR & REACTIVE POWER COMPENSATION

DIANLI DIANRONGQI YU WUGONGBUCHANG

西安电力电容器研究所主办



桂容谐平

GUI RONG XIE PING

桂容谐平 G-SVC

高压静止式动态无功补偿装置

- ★ 立式阀体设计: 占地小, 维护方便, 最高电流可达3000A。
- ★ 响应速度快: SVC整体响应速度小于10ms。
- ★ 系统可靠性高: 控制保护系统采用军工级原装进口硬件平台和软件开发系统。
- ★ 冷却方式灵活: 根据不同工况采用风冷、水冷或者热管冷却。
- ★ 工程力量强: 在冶金、电网、新能源等行业均有多年供货业绩(包括SVC技改升级的工程案例)。



浙江桂容谐平科技有限责任公司

地址: 浙江省杭州市余杭区余杭塘路2630号

电话: 0571-89987188 传真: 0571-89987533

邮编: 311121

网址: www.zjgrxp.com



ISSN 1674-1757



9 771674 175202



一流的电能质量综合治理专家!

A Leading Expert in Comprehensive Control of Power Quality!

《电力电容器与无功补偿》 第4届编委会名单

主任委员:元复兴
副主任委员:周会高
委员:(以姓氏笔画为序)

王 耀 王崇祐 刘水平 同向前
汲胜昌 张万荣 张丹丹 张建平
张建军 张春朋 李 化 李 电
李志远 杨一民 陈才明 张勇军
肖 遥 张悛宁 卓 放 段晓波
祝令瑜 倪学锋 徐 政 党智敏
袁铁江 梁 琮 贾 华 黄 莹
葛磊蛟 葛锦萍 储松湖 翁利民
薛 晔

中文核心期刊

中国期刊全文数据库全文收录期刊
万方数据库数字化期刊群入网期刊
中国期刊订阅指南信息库收录期刊
第四届陕西省科技期刊优秀期刊奖
主管、主办:西安电力电容器研究所
编辑、出版:《电力电容器与无功补偿》
编辑部

总 编:周会高
主 编:杨佩侠
责任编辑:于淑霞 谭艺玲
编 辑:杨文荣

地 址:西安市西二环北段18号
邮政编码:710077

电 话:(029)84221423
传 真:(029)84221423

在线投稿:www.dldrq.com

电子邮箱:dldrqxb@163.com

dldrq@126.com

出版日期:2020年10月25日

印 刷:西安新华印务有限公司

国内发行:陕西省邮政报刊发行局

订 购 处:全国各地邮局

中国标准连续:ISSN 1674-1757

出 版 物 号:CN 61-1468/TM

邮发代号:52-13

每期定价:¥15.00元/本

广告经营许可证号:6101004001036

目 次

● 无功补偿与滤波 ●

电缆贯通线分布电容计算方法及无功补偿

..... 李岩,刘云鹏,穆全儒(1)

现行保护机制对10 kV无内熔丝电容器组早期故障预警策略的影响

..... 张鹏,杨栋,陆承与,王加臣,翟国柱(6)

金属冶炼厂谐波抑制与无功补偿方法

..... 代少君,李建业,刘健霖,李妮,石莹,谭文明(12)

基于PLC的12 500 kVA硅铁炉短网补偿系统的设计应用

..... 何晓靓,高琪,景宇富,芦锋,雷梅梅,李瑾,李娜(17)

一起并联电容器装置损毁故障分析

..... 郭磊,张卓,张劲光,王栋,张科,董曼玲,李东亚(23)

电容器组不平衡电流调平方法

..... 黄银龙,罗光辉,董超群,赵胜男,乔王瑜,罗晓晨(29)

± 800 kV湘潭换流站调相机与特高压直流输电无功电压协调控制策略研究

..... 洪权,李辉,宋军英,郭思源,吴晋波,朱维钧,欧阳帆,徐浩(35)

基于滑模变结构及内模控制的SVG无功补偿控制策略仿真研究

..... 冯骞,刘桂英,欧阳盟盟,粟时平,陈志强,何柳(40)

基于模块化多电平换流器的无功补偿控制策略研究

..... 纪斌,王立永(46)

基于改进NSDE算法的有源配电网多目标无功优化

..... 龚雪娇,郝东光,朱瑞金(54)

基于MISOCP的主动配电网有功无功协调动态优化

..... 陈永进,陈志峰(60)

长距离长链式弱系统无功配置优化研究

..... 刘增训,陈典,吕鸣镝,肖景良,秦晓辉(67)

● 电容器 ●

高压全膜电容器内熔丝温度场仿真分析

..... 国江,马跃,朱庆东,朱文兵,黄想(74)

过渡金属氧化物在超级电容器中的研究进展

..... 王长城,胡红利,李龙,闫新育,董海健(81)

● 电容式电压互感器 ●

电容元件温度特性、老化和受潮对 CVT 计量精度的影响研究
..... 李鹏程,徐宏伟,丛中笑,贺鹏,陈翔翔(88)

● 配套设备 ●

电流互感器末屏断裂缺陷及其影响分析
..... 李文燕,刘江明,张翻喆,艾云飞,周杰,刘昌标,谢斯晗(95)
一起气体绝缘式电流互感器放电现象分析 徐鹏,曹雅榕,赵文翰,姚庆悦,甘强(99)
基于有限元的干式空心电抗器振动特性研究 戴锋,高爽,宋博,秦延山,程骏(104)

● 系统应用研究 ●

四种典型直流故障处理方案下柔性直流输电系统的故障穿越特性对比研究
..... 陈凌云,程改红,王琼芳,严铭,张哲任,徐政(110)

谐振接地系统单相接地故障有源电流注入全补偿消弧研究
..... 李琦,彭书涛,任冲,张志华,赵倩(118)

应用自适应下垂控制及补偿环节提高微网暂态性能研究
..... 魏斌,王薇,边庆超,王加祥(125)

基于双层迭代并行方式的线损在线计算方法研究
..... 易锴,王维洲,井天军,王耿,拜润卿(131)

低压配电网分段和联络开关优化配置方法研究
..... 张明明,秦平,陈永进,贺诗辉,王兆健(138)

基于功率传输分布因子和支路暂态稳定性函数的电网关键线路综合辨识方法
..... 田鑫,李雪亮,孙俊德,张玉跃,葛磊蛟,葛贤军(145)

计及不确定性的配电网故障恢复两阶段优化
..... 蒋天元,郝丽丽,王辉,王昊昊,李威(150)

基于电压薄弱环节识别的配电网供电恢复策略
..... 王辉,郝丽丽,黄梅,张圣健,王轶峰,吉宇,李乃双(158)

中低压配电网差异化节能降损对策研究
..... 黄炜,江金群,陈卫钢,陈佳鹏,黄焕斌(164)

● 清洁能源领域应用技术 ●

风力发电超高次谐波发射特性分析
..... 李琼林,张博,刘云博,陶顺,徐永海(171)

基于深冷液化空气储能的风电消纳策略研究
..... 滕婕,杨德州,贾春蓉,王洲(180)

基于新型变步长电导增量法的 MPPT 算法研究
..... 张忠,杨宝峰,李志伟,李勇,韩俊飞(187)

随机光照强度下光伏阵列的 MPPT 控制研究
..... 闫群民,王俊杰,朱娟娟,王雨阳(192)

基于非合作-博弈的电采暖优化推广
..... 宋新甫,张红,高明,翟旭京,许叶林,朱咏明(198)

● 广告单位 ● (5)

● 征稿启事 ● I

CONTENTS

● **Reactive Power Compensation and Filter** ●

- Distribution Capacitance Calculation and Reactive Power Compensation of Cable Line
..... LI Yan, LIU Yunpeng, MU Quanru(1)
- Effect of Current Protection Mechanism on Early Fault Warning Strategy of 10 kV Capacitor Bank Without Inner Fuses
..... ZHANG Peng, YANG Dong, LU Chengyu, WANG Jiachen, ZHAI Guozhu(6)
- Harmonic Suppression and Reactive Power Compensation Method at Metal Smelting Factory
..... DAI Shaojun, LI Jianhui, LIU Jianben, LI Ni, SHI Ying, TAN Wenming(12)
- Design Application of Short-network Compensation System for 12 500 kVA Ferrosilicon Furnace Based on PLC
..... HE Xiaoliang, GAO Qi, JING Yufu, LU Feng, LEI Meimei, LI Jin, LI Na(17)
- Damage Fault Analysis on High Voltage Shunt Capacitor
..... GUO Lei, ZHANG Zhuo, ZHANG Jinguang, WANG Dong, ZHANG Ke, DONG Manling, LI Dongya(23)
- Unbalanced Current Adjustment Method for Capacitor Bank
..... HUANG Yinlong, LUO Guanghui, DONG Chaoqun, ZHAO Shengnan, QIAO Wangyu, LUO Xiaochen(29)
- Study on Reactive Voltage Coordinate Control Strategy for Synchronous Condenser of ± 800 kV Xiangtan Converter Station and UHVDC
..... HONG Quan, LI Hui, SONG Junying, GUO Siyuan, WU Jinbo, ZHU Weijun, OUYANG Fan, XU Hao(35)
- Study on Simulation of SVG Reactive Power Compensation Control Strategy Based on Sliding Mode Variable Structure and IMC
..... FENG Qian, LIU Guiying, OUYANG Mengmeng, SU Shiping, CHEN Zhiqiang, HE Liu(40)
- Research on Reactive Power Compensation Control Strategy Based on Modular Multilevel Converter
..... JI Bin, WANG Liyong(46)
- Multi-objective Reactive Power Optimization of Reactive Distribution Network Based on the Improved NSDE Algorithm
..... GONG Xuejiao, HAO Dongguang, ZHU Ruijin(54)
- Dynamic Optimization of Reactive Power Coordination in Active Distribution Network Based on MISOCP
..... CHEN Yongjin, CHEN Zhifeng(60)
- Study on Reactive Allocation Optimization of Long Distance and Long Chain Weak System
..... LIU Zengxun, CHEN Dian, LYU Mingdi, XIAO Jingliang, QIN Xiaohui(67)

● **Capacitor** ●

- Thermal Field Simulation Analysis of Internal Fuse in High Voltage Film Capacitors
..... GUO Jiang, MA Yue, ZHU Qingdong, ZHU Wenbing, HUANG Xiang(74)
- Research Progress of Transition Metal Oxides in Super Capacitor
..... WANG Changcheng, HU Hongli, LI Long, YAN Xinyu, DONG Haijian(81)

● **Capacitor Voltage Transformer** ●

- Study on Influence of Temperature Characteristics, Aging and Moisture of Capacitor Element on CVT Metering Accuracy
..... LI Pengcheng, XU Hongwei, CONG Zhongxiao, HE Peng, CHEN Xiangxiang(88)

● **Auxiliary Equipment** ●

- Analysis of Current Transformer End Shield Breakage Defect and Its Influence
..... LI Wenyan, LIU Jiangming, ZHANG Xuanzhe, AI Yunfei, ZHOU Jie, LIU Changbiao, XIE Sihan(95)

Discharge Phenomenon Analysis of Gas Insulated Current Transformer

..... XU Peng, CAO Yarong, ZHAO Wenhan, YAO Qingyue, GAN Qiang(99)

Study on Vibration Characteristic of Dry-type Air-core Reactor Based on Finite Element Method

..... DAI Feng, GAO Shuang, SONG Bo, QIN Yanshan, CHENG Jun(104)

● Research on System Application ●

Comparative Study on DC Fault Ride-through Performances of Flexible HVDC Systems Under Four Typical DC Fault Clearance

Schemes CHEN Lingyun, CHENG Gaihong, WANG Qiongfang, YAN Ming, ZHANG Zheren, XU Zheng(110)

Study on Full Compensation Arc Suppression of Active Current Injection for Single-phase Grounding Fault of Resonant Grounding

System LI Qi, PENG Shutao, REN Chong, ZHANG Zhihua, ZHAO Qian(118)

Study on Improving Transient Performance of Micro-grid by Application of Adaptive Droop Control and Compensation

..... WEI Bin, WANG Wei, BIAN Qingchao, WANG Jiexiang(125)

Study on Online Calculation Method of Line Loss Based on Double-layer Iterative Parallel Method

..... YI Kai, WANG Weizhou, JING Tianjun, WANG Geng, BAI Runqing(131)

Study on Optimal Allocation Method of Section and Loop Switches in Low-voltage Distribution Network

..... ZHANG Mingming, QIN Ping, CHEN Yongjin, HE Shihui, WANG Zhaojian(138)

Comprehensive Identification Method for the Key Transmission Lines of Power Grid Based on Power Transmission Distribution Factor and Branch Transient Stability Function

..... TIAN Xin, LI Xueliang, SUN Junde, ZHANG Yuyue, GE Leijiao, GE Xianjun(145)

Two-stage Optimization on Fault Recovery of Distribution Network Considering Uncertainty

..... JIANG Tianyuan, HAO Lili, WANG Hui, WANG Haohao, LI Wei(150)

Power Supply Recovery Strategy of Distribution Network Based on Weak Voltage Area Identification

..... WANG Hui, HAO Lili, HUANG Mei, ZHANG Shengjian, WANG Yifeng, JI Yu, LI Naishuang(158)

Study on Differentiated Energy Saving and Loss Reduction Countermeasures for Medium-voltage and Low-voltage Distribution Network

..... HUANG Wei, JIANG Jinqun, CHEN Weigang, CHEN Jiapeng, HUANG Huanbin(164)

● Application Technology in the Field of Clean Energy ●

Ultra High Harmonic Transmission Feature Analysis of Wind Power Generation

..... LI Qionglin, ZHANG Bo, LIU Yunbo, TAO Shun, XU Yonghai(171)

Study on Wind Power Absorption Strategy Based on Cryogenic Liquefied Air Energy Storage

..... TENG Jie, YANG Dezhou, JIA Chunrong, WANG Zhou(180)

Study of MPPT Algorithm Based on New Variable Step Size Conductance Increment Method

..... ZHANG Zhong, YANG Baofeng, LI Zhiwei, LI Yong, HAN Junfei(187)

Study on MPPT Control of Photovoltaic Array Under Random Light Intensity

..... YAN Qunmin, WANG Junjie, ZHU Juanjuan, WANG Yuyang(192)

Optimization Promotion of Electric Heating System Based on Non-cooperative-game Theory

..... SONG Xinfu, ZHANG Hong, GAO Ming, ZHAI Xujing, XU Yelin, ZHU Yongming(198)

Sponsored by:Xi'an Power Capacitor Research Institute

Edited by:Editorial Office of POWER CAPACITOR & REACTIVE POWER COMPENSATION

General Editor:ZHOU Huigao

Chief Editor:YANG Peixia

Add:No.18, the North of the No.2 West Ring Road, Xi'an, Shaanxi 710077, P.R.China

Tel:+86-29-84221423

Fax:+86-29-84221423

Website:www.dldrq.com

Email:dldrqxb@163.com dldrq@126.com

Distributed by:Shaanxi Office of Postal Service

版权声明

1.本刊对发表的文章拥有出版电子版、网络版权,并拥有与其他网站交换信息的权利。本刊支付的稿酬已包含以上费用。

2.本刊文章版权所有,未经书面许可,不得以任何形式转载。