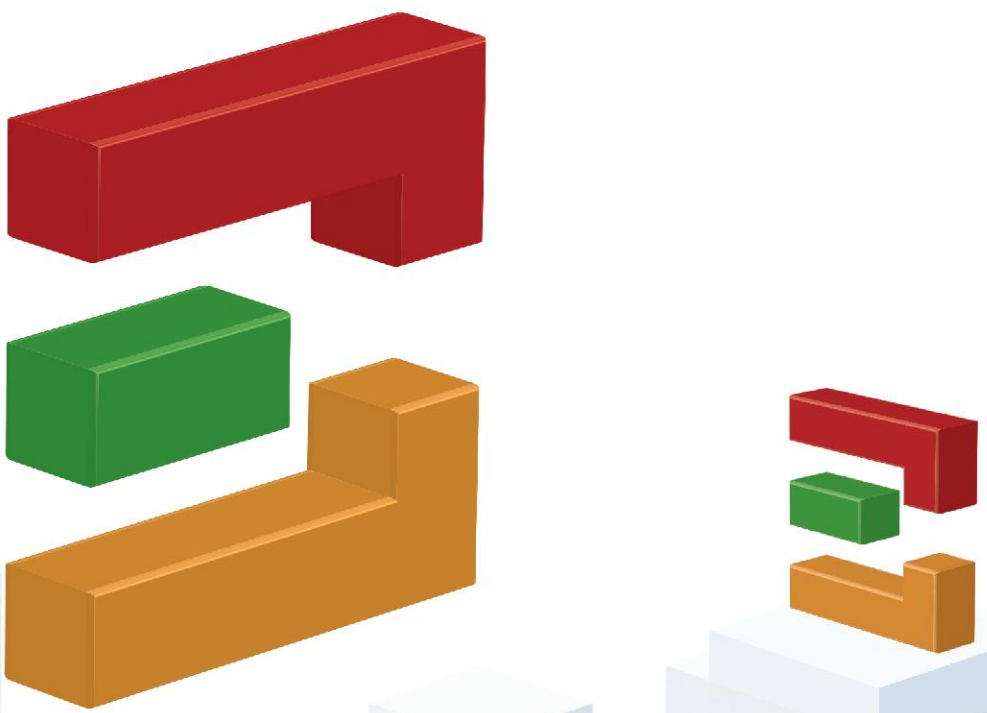
CENTRALTECH
中 联 太 信 科 技

TSNL-2000
Online Insulation Safety Analysis System



北京中联太信科技有限公司
BEIJING CENTRALTECH COMPANY LIMITED

Create a National Brand in the New Era

Become the World Champion in Online Insulation Monitoring Industry

CENTRALTECH
中联太信科技

Contents

ABOUT US

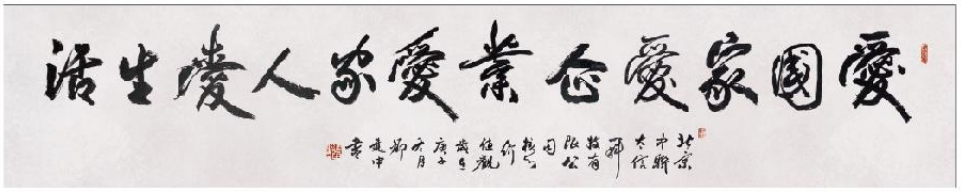
CENTRALTECH Introduction

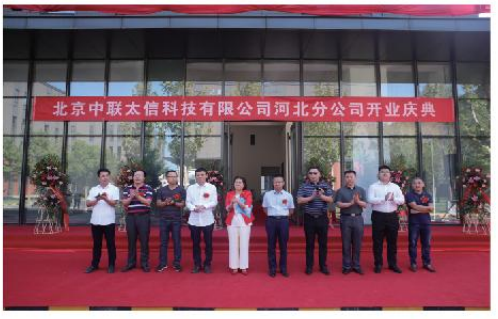
Founded in 2007, BEIJING CENTRALTECH COMPANY LIMITED is a national high-tech enterprise in China, dedicated to advancing online insulation monitoring technology. CENTRALTECH offers comprehensive industry solutions encompassing research and development, design, manufacturing, and technical services aimed at addressing insulation challenges in electric systems.

Since the foundation, CENTRALTECH has continuously focused on our mission to ensure safety and reliable operations of the power supply system. We have collaborated with several domestic and international scientific research institutions and universities and we are fully committed to solve the long-standing problems of the power supply system and all its insulation related failures. CENTRALTECH owns exclusive intellectual property rights on several core technologies and has developed world leading product series in online insulation monitoring technology. The goal of CENTRALTECH is to provide top-quality products and services to establish our own brand.

Our products are widely applied in China National Petroleum Corporation (CNPC), China Petroleum and Chemical Corporation(SINOPEC),China National Offshore Oil Corporation(CNOOC), China Petroleum Pipeline Engineering Corporation (CPPE), Chemical Processing of Coal, SINOSTEEL Group Corporation(SINOSTEEL),China Aluminum Corporation(CHINALCO),State Grid Corporation of China (State Grid), Thermal Power,Wind Power Generation, Photovoltaic Power Generation,and other industries. Our products detected and predicted potential safety hazards of insulation related failures in advance on numerous occasions and prevented tremendous financial losses. The continuous success of our products has received satisfactory recognition and gained good reputation from our clients.

CENTRALTECH Culture





CENTRALTECH Core Value: Love our country, love our company, love our family, love our life.

CENTRALTECH Vision: Established own brand and being the industry leader in the world.

CENTRALTECH Mission: CENTRALTECH aims to be the safe guard for the power supply systems for reliable and stable operation, contribute CENTRALTECH' s power to realize the one hundred-year Chinese dream.

Development History

2021

- Standardized the Online insulation monitoring device
- Passed the certification of health and safety environmental protection system
- Awarded AAA grade credit enterprise
- Becomes one of the Governing Units of Railway Traffic Safety Technical Committee of China Communications and Transportation Association
- Becomes a member of China Chemical Safety Association

2020

- Established CENTRALTECH Hebei branch company
- To build an industry-leading R&D and production base with the core concepts of building a digitalized China and Industry-college-institute Cooperation

2019

- Online insulation monitoring device was firstly used in State Grid
- Online insulation monitoring device was firstly used in the China Guodian Corporation

2015

- Online insulation monitoring device was firstly used in CNOOC Refinery and Chemical Enterprises
- CENTRALTECH was awarded the title of Zhongguancun High-tech Enterprise
- Passed the national CQC quality system certification

2012

Online insulation monitoring device was firstly used in SINOPEC Refinery Enterprises

2011

Online insulation monitoring device was firstly used in coal chemical industry

2010

The first set of online insulation monitoring device in China has passed the inspection of national authoritative testing organizations and was firstly applied in CNPC Refining and Chemical Industry Enterprises, and achieved good results

2007

BEIJING CENTRALTECH COMPANY LIMITED was established in Beijing Zhongguancun Science Park

2024

- Singapore's international engineering and technical services cooperation was officially launched, marking the successful entry to the international market
- New Technology "Instrument Failure Early Warning System" Successfully Applied for the First Time
- Finished the submission of National level "SRDI(specialized;refinement;differential;innovation)" Science and Technology Innovative Enterprise certification
- Successful developed the CHN ENERGY market

2023

- Sales has set a new all-time record and made a historic breakthrough
- A new generation of digital meters is officially put into operation
- The establishment of the International Business department officially opened the prelude to entering the international market.
- Instrument Failure Early Warning System was successfully Certified by National Authoritative Testing Organization

2022

- Online insulation monitoring technology was included in CNPC and SINOPEC corporate standards
- Has successfully applied several patents for our own technology
- CENTRALTECH was awarded the honorary title of "SRDI(specialized;refinement;differential;innovation)" Science and Technology Innovative Enterprise in Beijing

2018

- Continuously to invest in R&D and innovation, online insulation monitoring technology has made significant breakthroughs, upgraded to online insulation safety analysis system
- Has successfully applied several patents for our own technology
- Established Dynamic Mold Laboratory
- Established data management center

2017

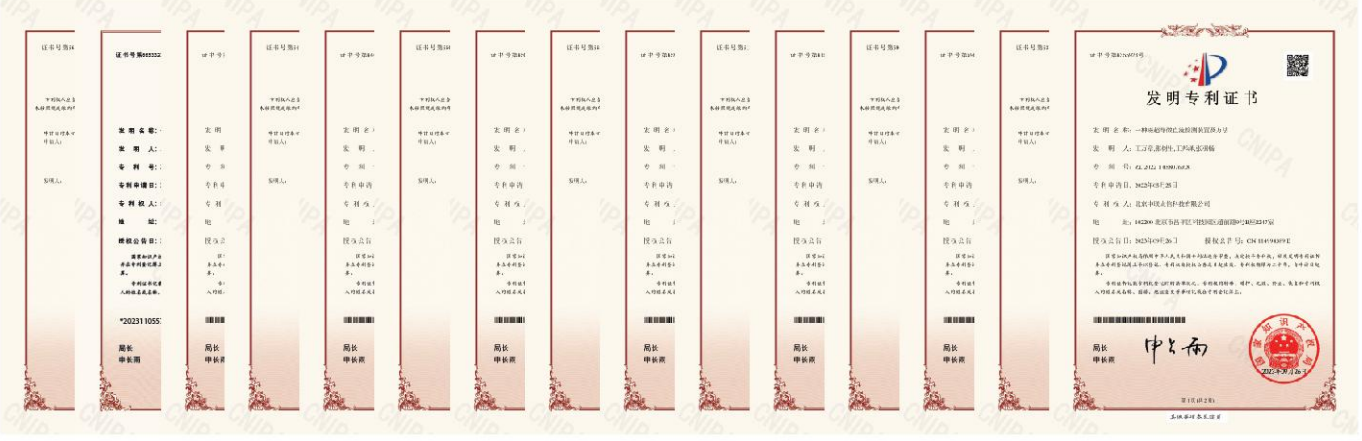
- Online insulation monitoring device was firstly used in PipeChina
- CENTRALTECH was honored as a national high-tech enterprise

After 18 years of accumulation and precipitation, CENTRALTECH never forgets the original intention, adhering to the core values of "love our country, love our company, love our family, and love our life", CENTRALTECH has the confidence to create a new era of national brand, and become the world champion of the industry!

CENTRALTECH will keep working hard, striving for greatness, pursuing excellence, and create a new era of CENTRALTECH !

DEVELOPMENT

CENTRALTECH Qualifications and Awards

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Currently Used Methods and Solutions for Managing Insulation

According to industry statistics, insulation failure of power distribution system accounts for 79.6% of electrical accidents, so the health level of insulation is crucial. Insulation is a continuous deterioration process, which has a close relationship to manufacturing, installation, and operation environment. The traditional way of insulation management is done during the acceptance test, which is before the operation of equipment, its significant feature is the need for power outages, so the operating state of the electrical system and equipment insulation value is unknown, once the insulation failure occurs, it will directly cause electrical accidents and losses.

The Work Content of Managing the Insulation:

1.Commissioning Test.

2.Insulation Preventive Test

3.Routine Inspection and Maintenance

The current used methods for managing insulation need to be implemented when the power is off, still can not change the fact insulation is the major cause of electrical accidents.

Solution

To address the sore spots of traditional electrical insulation management, TSNL-2000 online insulation safety analysis system developed by CENTRALTECH can not only accurately measure the insulation resistance value of the system busbar to ground, but also accurately measure the insulation data distribution of each branch circuit under the operating state of the electrical systems, so as to foresee the hidden insulation safety problems in advance, and eliminate the risk of insulation accidents of the electrical systems in the early stage to prevent major power supply safety accidents, the product is widely used in petrochemical, coal chemical, electric power and other industries.

A DATA

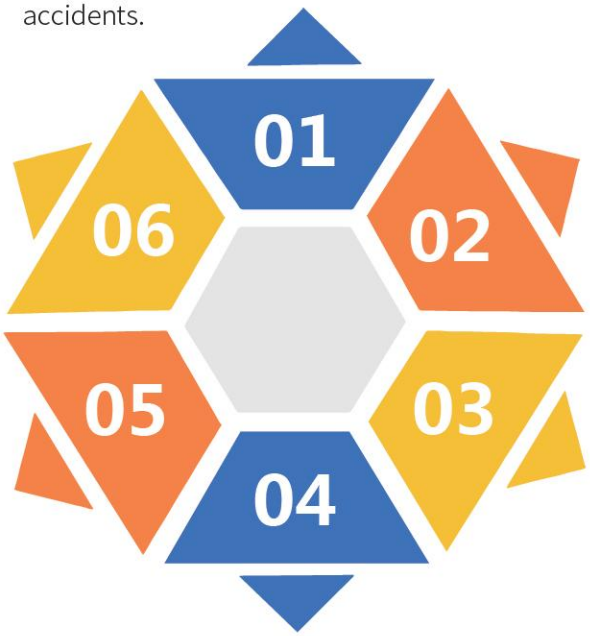
B Management

CENTRALTECH has always focused on medium voltage electrical systems and AC circuit to ground insulation measurement without shutting the power. Our technical team made key technical breakthroughs in 2018, the development of ultra-micro high-precision DC current sensors, sensing precision can reach down to 5 microamps, which is at the international leading level, so that the precise measurement of the distribution of insulation data in the operating state can be realized, laying a technical foundation for the online insulation safety analysis system.

Importance of Applying Online Insulation Safety Analysis System

Enables the ability to monitor the status of the insulation in real-time during normal operation of the power supply system; can detect abnormality in insulation status which could later develop into potential failures or accidents; By taking proactive-actions, it can prevent insulation failures in the early stage, and greatly reduce the occurrence of accidents.

Provide real-time remote consultation and services for insulation status of the power supply system enabled by cloud-service platform.



Changed the passive managing to active managing: the conventional methods for testing insulation can only be performed during system power shutdowns,whereas our online insulation monitoring technology enables real-time continuous monitoring

Provide data for digital and informational transformation in management style; improves management efficiency of the power system.

When the insulation value drops below the preset threshold the alarm is triggered, then appropriate response is needed, inspection and maintenance should be conducted. This enables fast maintenance style to respond to situations in a timely manner,instead of waiting for periodic inspection schedules to check the system status, Therefore it greatly improves maintenance efficiency.

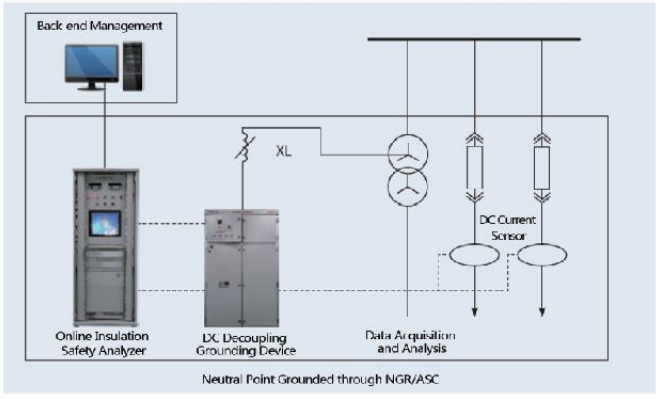
Analyzing variations in the insulation status of the system both qualitatively and quantitatively to predict potential hazards or failures, and pinpoint the location of the point of failure in the system.

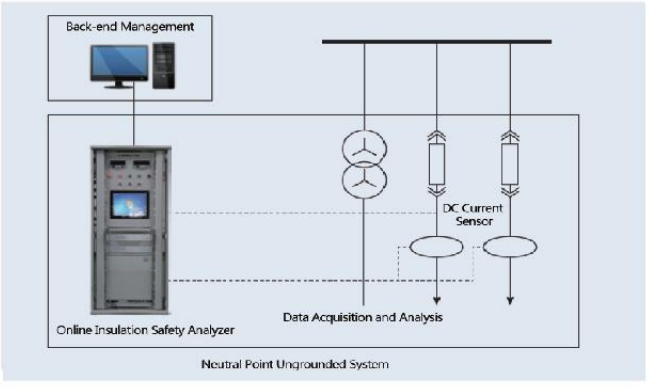
Technical Specification of TSNL–2000 Online Insulation Safety Analysis System

System Principle

The TSNL-2000 online insulation safety analysis system adopts the DC superposition method. First a DC voltage is injected to the operating power supply system, which will generate a corresponding DC current leaking through the system insulation to ground, then the measured data is converted to the insulation value of the system through algorithm. The TSNL-2000 online insulation safety analysis system features intelligent data analysis using big data technology to enable accurate defect detection. It provides customized insulation data analysis reports of the power supply system based on different customers' needs. The TSNL-2000 provides the necessary data to support decision making, in management to ensure a safe operation and long-term reliability in production.

System Cotmposition





System Function

- Monitors the real-time insulation value (relative to ground) of the entire system and that of each individual branch circuit. The insulation values are displayed in the formats of real-time values, tables, and curves.
- Save and export measurement data.
- When the insulation value drops below a preset threshold value, the system triggers alarm locally and remotely, and sends the real-time insulation data to designated personnel through text messages and print out the alarm information.
- Save the alarm information and alarm release information automatically.
- Supports RS-485 MODBUS, Ethernet lEC-104 Communication protocols, as well as ZIGBEE wireless communication protocol.

Technical Innovation and Advantages

- Solved the technical problem of "measuring system insulation under normal running condition in medium and high-voltage electrical system (6KV, 10KV, 35KV)", and detected the real-time and accurate system-to-ground insulation resistance value for the first time in the running electrical system. Passed the inspection of the National Electricity Academy of Sciences, and was the first to be installed and applied in CNPC' s refining and chemical enterprises.

- Solved the technical problem of "safety decoupling of AC current circuit", pioneered "online safety decoupling technology", developed "DC decoupling grounding device" with independent intellectual property rights and successfully passed the inspection of National Electricity Academy of Sciences

- Solved the technical challenge of "measuring DC leakage in AC current circuits at the microampere level", we have successfully developed an ultra-micro high-precision current sensing coil, with a DC leakage measurement accuracy of 5 microamps, which is the first time to accurately measure the insulation data distribution of a electrical system under operating conditions.

- Provide timely and accurate analysis reports of insulation data enabled by big data and cloud computing.

- Detect insulation defects and trigger alarm in advance to eliminate potential hazards and ensure safe operation.

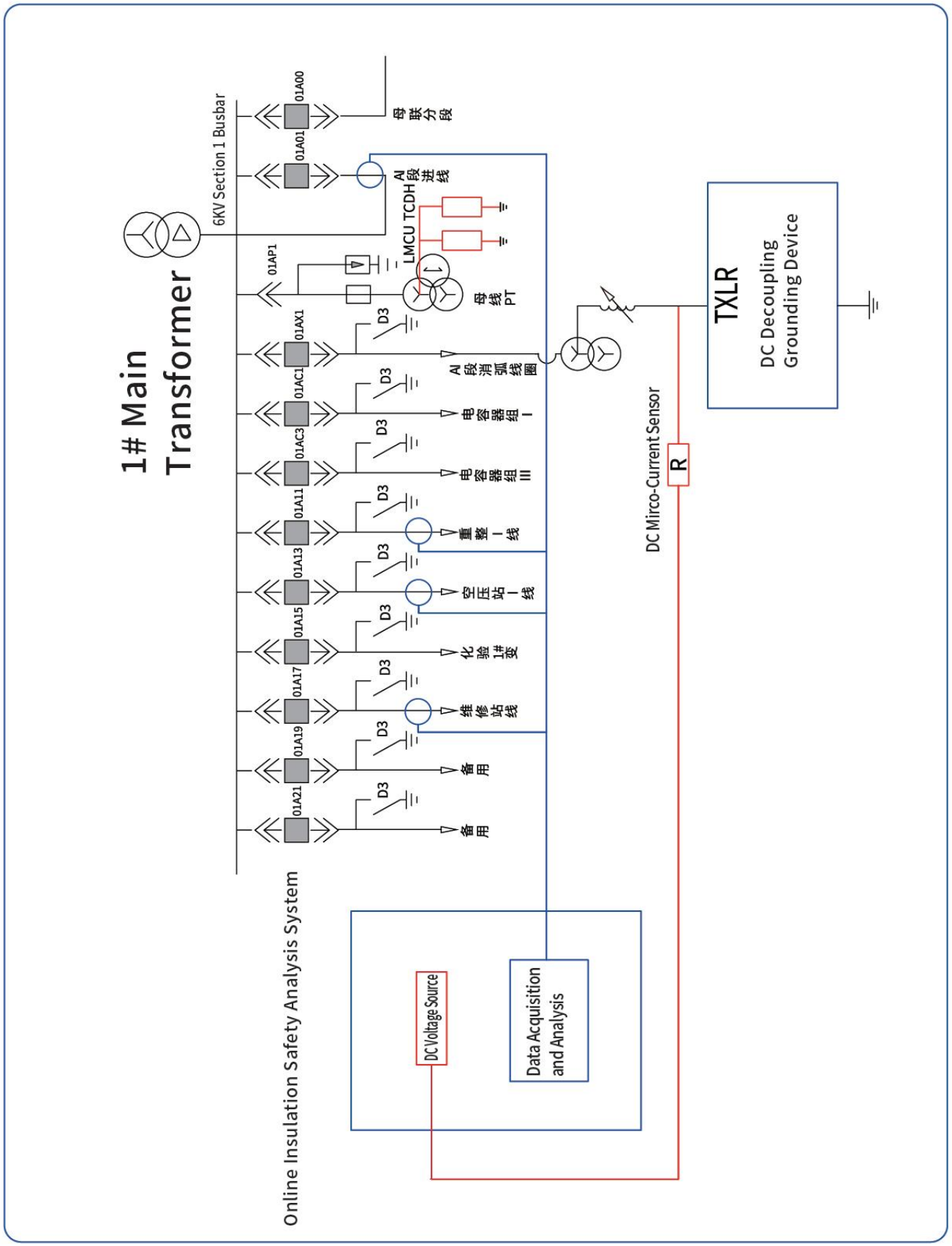
Applicable Systems

- 6kV, 10kV, and 35kV neutral point grounded through the arc suppression coil system
- 6kV, 10kV, and 35kV neutral point grounded through small resistance system
- 6kV, 10kV, and 35kV neutral point ungrounded system

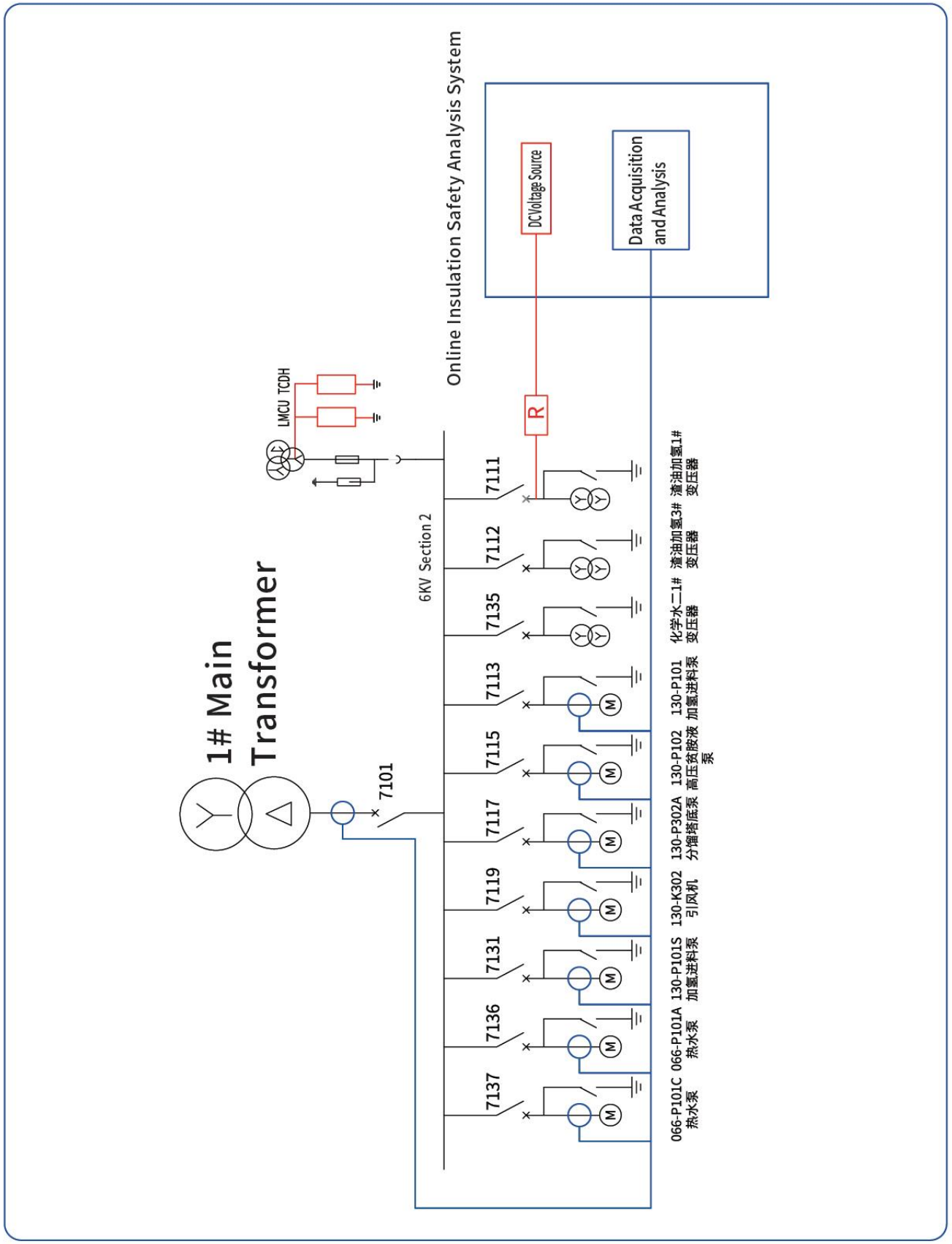
System Parameter

Item	parameter
Power Supply	AC 220V-10%, +15%; DC 220V-5%, +7%
Rated Power	DC600W, AC600W
Ambient Temperature	-10°C~50°C
Ambient Relative humility	⩽95%
MeasuRement Voltage	DC1500V
Insulation Measurement Range	0~200(MΩ)
Number of Circuit Branches	4 Circuit~~32 Circuit/side
Resolution	5uA~1mA
Resistance Resolution	0.1MΩ
Measurement Error	Level 5
Alarm Threshold Resistance Setting	1~99(MΩ)Panel Setting
Alarm Output	Sound and light alam, switching,node output, communication network output
Communication Protocols	Modbus protocol.IECl04 stipulation
The Inner Diameter of the High-precision Sensing Coils	130mm, 200mm, 300mm, etc. Selected according to the outer diameter of the cable, cable should all pass through

6kV, 10kV, and 35kV neutral point grounded through the arc suppression coil system

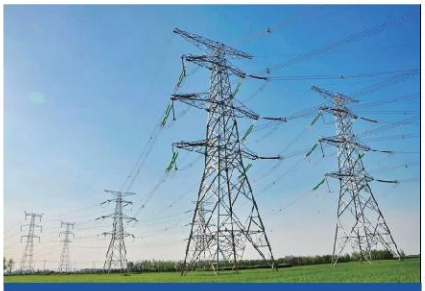


6kV,10kV,and 35kV neutral point ungrounded system



Application Scenarios

Petrochemical Industry



Power Industry

Iron and Steel Metallurgy Industry

Railway Industry

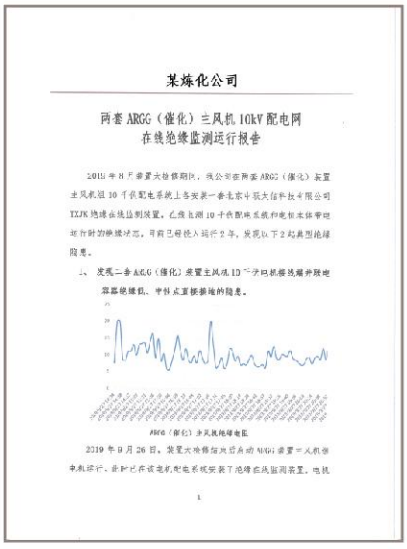
Power Generation Industry

New Energy Industry

Range of Application:

Power cables and overhead lines, GIS, transformers, PT, CT, lightening arresters, insulating sleeves, electric motors, etc.

User Application Evaluation Reports



某炼化公司

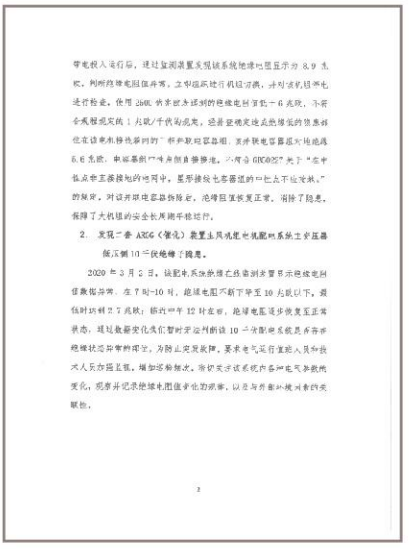
两套 ARGG（催化）三风机 10kV 配电网
在线绝缘监测运行报告

2019 年 8 月装置大检修期间，我公司在两套 ARGG（催化）装置主风机组 10 千伏配电系统上各安装一套北京中联太信科技有限公司 TXJK 绝缘在线监测装置。在线监测 10 千伏配电系统和电机本体带电运行时的绝缘状态。目前已经投入运行 2 年，发现以下 2 起典型绝缘隐患。

1、发现二套 ARGG（催化）装置主风机 10 千伏电机接线端并联电容器绝缘低、中性点直接接地的隐患。

ARGG（催化）主风机绝缘电压

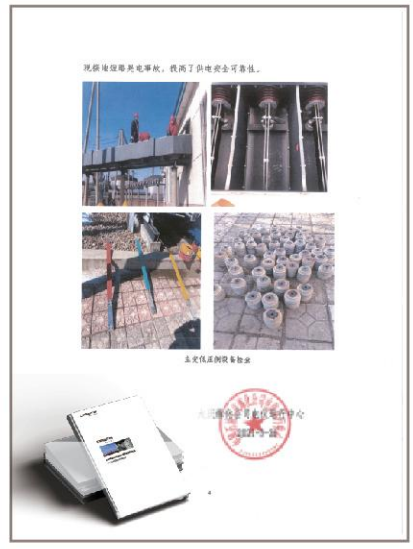
2019 年 8 月 26 日，装置大检修结束后启动 ARGG 装置三风机组电机运行，我们已在该电机配电系统安装了绝缘在线监测装置。电机



带电投入运行后，通过监测装置实现该系统绝缘电阻显示为 8.9 兆欧，判断绝缘电阻值异常，立即组织进行机组切换，并对该机组停电进行检查。停电 2500V 绝缘表检测的绝缘电阻下降一半左右，下降合理原因为 1 兆欧/千伏为规范，运营管理规定该类绝缘低的信息将信息通知检修班到下一检修期间更换。并联电容器退出后绝缘为 5.6 兆欧。申报基础产品自修修理。六氟合 GIC0257 关于“在中性点非直接接地的电网中，星形接线电容器组的中性点不应接地。”的解释，对该并联电容器拆除后，绝缘恢复正常。消除了隐患，保障了大机组的安全长周期平稳运行。

2、发现一套 ARGG（催化）装置主风机组电机配电系统主变压器低压侧 10 千伏绝缘下降隐患。

2020 年 3 月 2 日，该配电系统绝缘在线监测装置显示电缆电阻值数据异常，在 7 时-10 时，绝缘电阻不断下降至 10 兆欧以下，最低时达到 2.7 兆欧，断开四个 12 时左右，绝缘电阻逐步恢复至正常状态，通过数据变化情况暂时不运行断该 10 千伏配电系统具备带绝缘状态异常的部分，为防止突发故障，要求电气运行值班人员和技术人员加强监视，增加巡检频次，密切关注该系统中各回电气参数的变化，观察并记录绝缘电阻值变化趋势，以及与历史数据对比的关联性。



现场检查电机本体，发现下侧电缆头有放电痕迹。

主变低压侧设备检查

某炼油化工有限公司
CS20 区域变电所 6kV 系统 02B 段
在线绝缘监测报告

某炼化 CS20 区域变电所 6kV 系统安装北京中联太信科技有限公司研发生产的在线绝缘检测装置 4 套，2022 年 5 月 15 日全部投入运行，对 6kV I、II、III、IV 段总的绝缘情况进行在线监测。

由于在线绝缘监控后台光纤未通，10 月 6 日上午运检人员到 CS20 区域变电所巡检时发现 6kV 02B 段在线监测装置显示绝缘阻值跌落至 5.1 MΩ，低值报警，相比前一次运检时记录的在线绝缘阻值下降较为明显，低于规定值，结合业主电力后台精查发现 CS20 区域变电所 6kV 02B 段下级柴油加氢 N3 变电所 6kV B 段柴油泵 902-P-202B 电机启动运行，分析判断 CS20 区域变电所 6kV 02B 段绝缘突降与该电机关联性强，立即联系生产调度安排专业岗位停机检查。停机后系统在线绝缘数据逐渐升高并恢复至下降前水平。

柴油加氢 N3 变电所柴油泵 902-P-202B 电机停机后，使用 2500V 兆欧表检测绝缘电阻值为 5MΩ，不合格，与在线绝缘监测装置一致。打开电机接线盒检查发现，为接线盒内绝缘子受潮凝水所致，潮南地处沿海多雨潮湿环境，根据以往运行经验，将该电机复合材料绝缘子更换为陶瓷材料绝缘子。

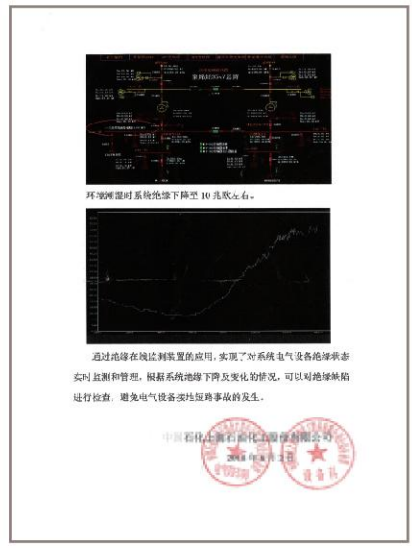
某石油化工公司
绝缘在线监测系统运行报告

某石油化工公司聚烯烃总降 10kV 一、三段母线中压开关柜 1U 上安装 1 套北京中联太信科技有限公司 TXJK-I 型绝缘在线监测装置，2017 年 11 月投入运行。

TXJK-I 型绝缘在线监测装置，在线测量 10kV 一、三段母线点母线压带 PT、避雷器及 4PE 挤出机电机，后于等对地的绝缘电阻，当绝缘电阻低于报警设定值时，产生自动报警。

2017 年 11 月 14 日 TXJK-I 型绝缘在线监测装置受入运行时系统绝缘电阻较 1 系统，经查询，原因为上变低压侧（10kV）绝缘受潮，有凝露及粉尘，清扫后绝缘上升。

聚烯烃总降 4PE 挤出机电机投入运行时，TXJK-I 型绝缘在线监测装置检测系统绝缘值在 75 兆欧左右。



环境潮湿时系统绝缘下降至 10 兆欧左右。

通过绝缘在线监测装置的应用，实现了对系统电气设备绝缘状态实时监测和管理，根据系统绝缘下降及变化的情况，可以对绝缘缺陷进行检查，避免电气设备发生短路事故的发生。

大庆炼化公司

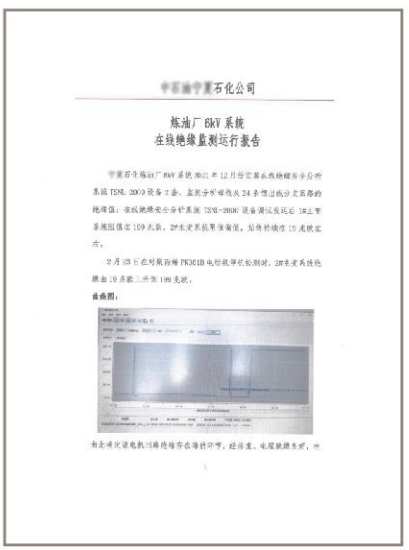
110 千伏炼化变电所 6 千伏配电网
在线绝缘监测运行报告

2021 年 3 月在 110 千伏炼化变电所 6 千伏系统上安装 4 套北京中联太信科技有限公司 TXJK 绝缘在线监测系统，投入运行 6 个多月来，为公司生产设备的运维提高了水，以下是其中典型案例说明。

1、发现三循环（循环水站）6 千伏 P305 冷却塔风机电机接线盒内绝缘子受潮的隐患。

2021 年 04 月 30 日 13 时，110 千伏炼化变 6kVII 段系统绝缘电阻值由正常时的 147 兆欧直接下降至 101 兆欧，在持续观察 20 分钟后，电阻值未能下降至 22 兆欧（此时室外环境无特行变化），固为绝缘值在短时间内由不受外部环境干扰的情况下，下降较为明显，经与各生产作业区落实后，得知三循环 P305 冷却塔风机电机于 14 时 50 分启机运行，会诊判断绝缘降低与该电机失联过程。立即联系装置再次停运该电机后，6kV II 段系统绝缘电阻值恢复并恢复正常绝缘水平。

停机后使用 2500 伏兆欧表测得该电机绝缘电阻值为 3.5 兆欧，不合格，打开电机接线盒检查发现，为接线盒内绝缘子受潮所致，将受潮的绝缘子更换完毕后试验合格，再次启机运行时，该系统绝缘电



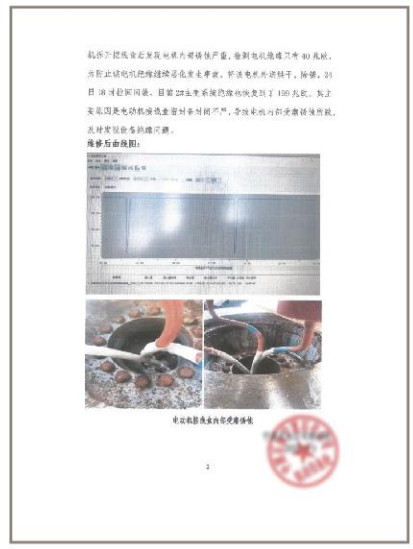
中石油宁夏石化公司

炼油厂 6kV 系统
在线绝缘监测运行报告

宁夏石化炼油厂 6kV 系统 2021 年 12 月份安装在线绝缘综合分析系统 TSM-2003 设备 2 套，监测分析母线及 24 条馈出线分支回路的绝缘值，在线绝缘安全分析系统 TSM-2006 设备调试发现近 18 条馈线阻值在 150 兆欧，20 条更新机组准备值位，短路检测在 15 兆欧左右。

2 月 25 日在对聚丙烯 PK301B 电动机停机检测时，28 条更新线绝缘值 10 兆欧二分 10M 兆欧，

自主研究该电机引线绝缘带在海洋环境，经注重，电缆缺陷未研，对

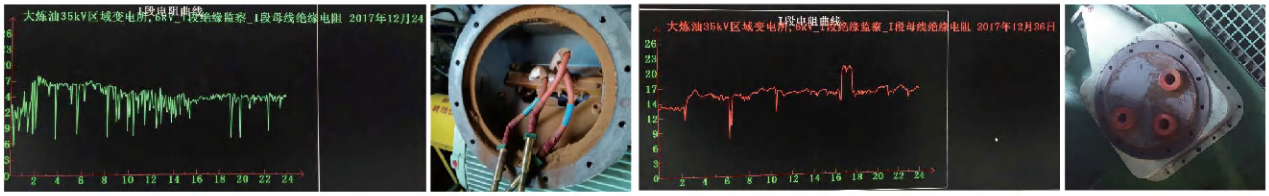


电动机接线盒内部受潮情况

TSNL-2000 Application Cases

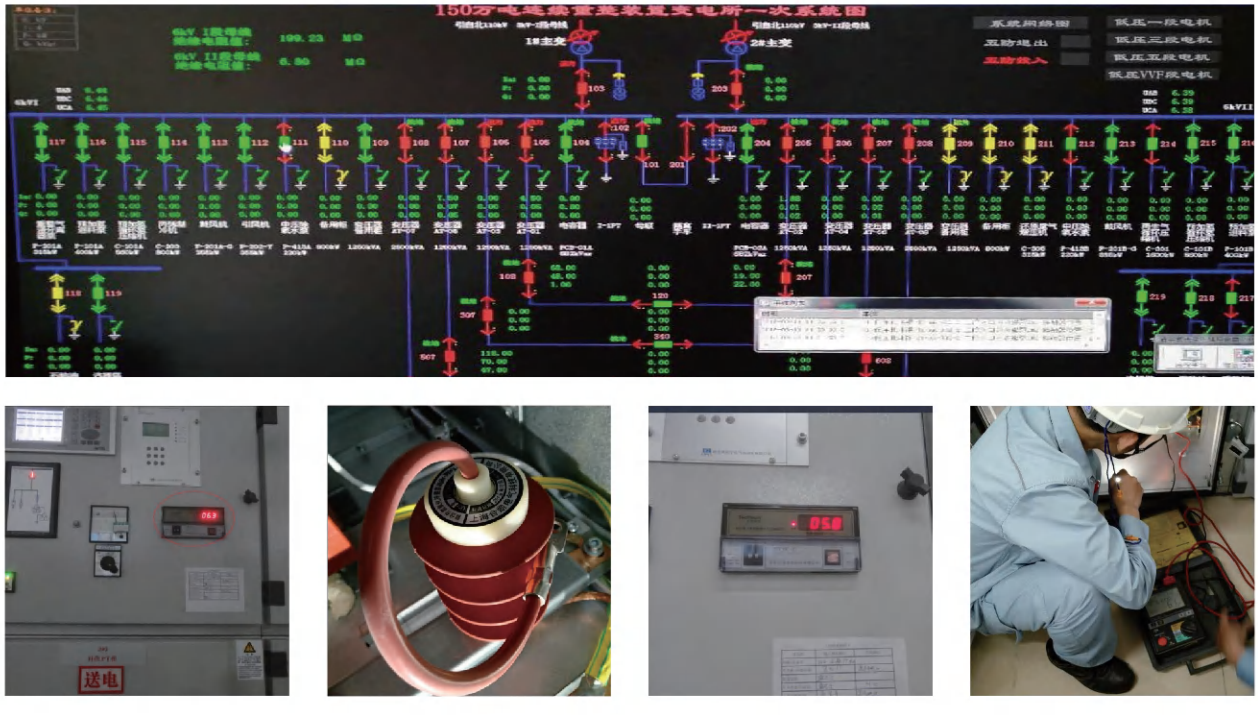
1 6 Million Tons/Year Petrochemical Refinery Motor Insulation Hazard

On December 24, 2017, the system insulation value of the 6 million t/a refinery was continuously dropping from 18 megaohms to below the preset alarm threshold value, which is 6 megaohms, for more than 200 times. On-site inspection found that the problem was caused by the insulation deterioration of the K10lA motor in the lower distribution room of the oil refining substation. After cleaning and maintenance, the motor was put back into operation, and the insulation value was back to normal. in this event, the triggered alarm and maintenance action avoided a potentially more severe accident, such as a motor burnout and voltage fluctuation of the system.



2 1.5 Million Tons/Year Petrochemical Refinery Lightening Arrester Insulation Hazard

On March 19, 2018, insulation online monitoring device of the power system triggered alarm, measured data showed that the insulation resistance of the 6kV system section ll was reduced from 199.23 megaohms to 6.3 megaohms. After inspection, it was found that the insulation of the 6kV section ll cabinet 207 was abnormal. With cabinet 207 disconnected from the system, the system insulation value returned to normal. After inspection, it was found that the phase C lightning arrester of cabinet 207 had a broken insulation of 6.1megaohm, After replacing the phase C lightning arrester, the system insulation recovered back to normal level. This course of action avoided a potential system power failure caused by the breakdown of that lightning arrester.

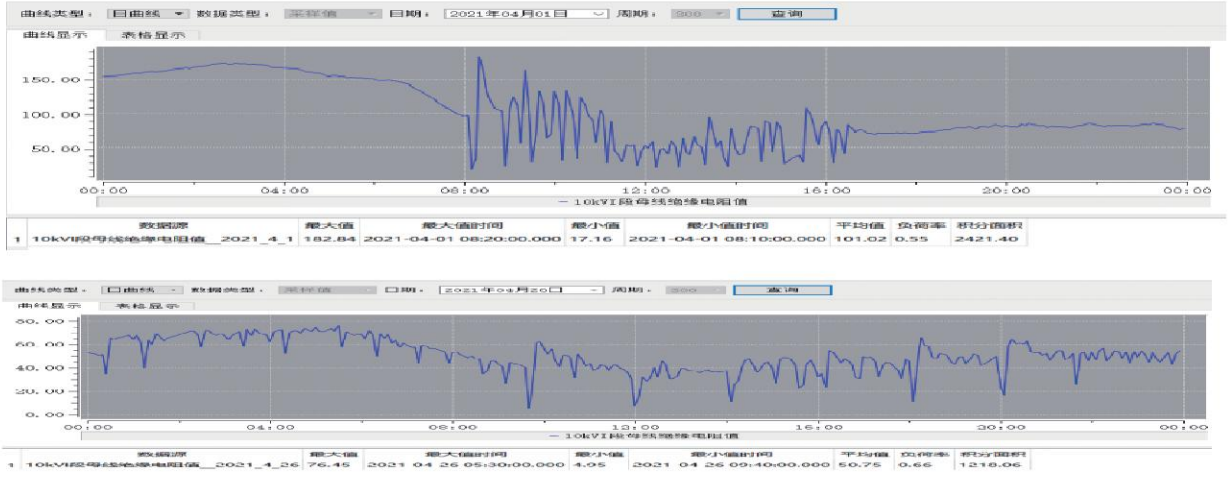


3 State Grid Power Station Insulator Insulation Hazard

In November 2019, insulation data measured by the TSNL-2000 online insulation safety analysis system of a power station of the STATE GRID showed that the insulation resistance value of the bus line of the No.2 transformer was 3.7 megaohms, causing the alarm triggered. Through inspection, there were many insulators showed abnormal insulation values(The batch of insulators was newly purchased and recently installed at the time). The batchof insulators were tested and turned out to be defective products. The system recovered tonormal operation after replacing those insulators. The abnormality in system insulationwas discovered in time which ensured the safe operation of the system.

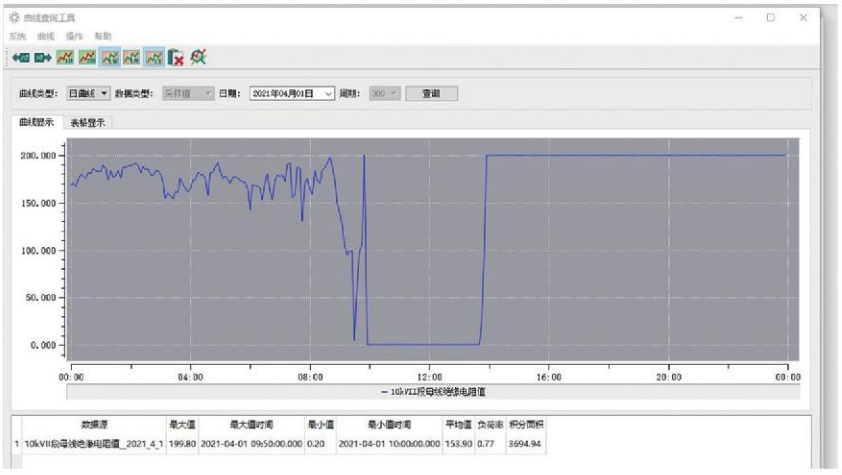
4 Cable Connection Point Insulation Hazard

On April 1st, 2021, the insulation data of the Granulation Extruder fluctuated abnormally, and the subsequent insulation value dropped to a minimum of 4.95 megohms, with a low-positive alarm. Upon inspection, traces of corrosion and single-phase discharge burns had appeared at the intermediate head of the cables, and after quitting the alarmed cable, the insulation value returned to normal.



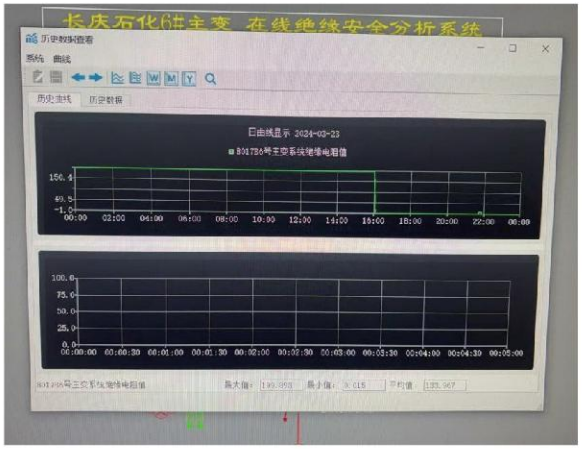
5 A 10kV Power Distribution Network Granulation Extruder Unit Motor Stator Winding Insulation Hazards

On April 1st, 2021, the insulation value of the Granulation Extruder Unit appeared a large sawtooth waveform change, and the lowest value was close to zero, the system insulation was shown abnormal. It was found after on-site inspection that water leakage from the upper part of the motor, which caused moisture in the stator winding of the motor, resulting in the lowering of the insulation. The insulation was restored to normal after the water leakage part was dealt with and the stator winding was dried.



6 Refinery Main Air Blower Insulation Hazard on Cable Terminals

On March 23rd 2024, 6kV system main air blower circuit insulation resistance value had a low-positive alarm, insulation value dropped to "0", the on-site inspection of the switch 1002 cabinet A phase cable terminal has obvious insulation defects, and affect the cable next to it, the on-site personnel switched it to the emergency standby power supply to eliminate major insulation safety hazards, which eliminated the risk of further safety accident.



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