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GEYA®

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# 电能质量

Power Quality Management

Product Manual

浙江格亚电气有限公司  
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Using Our Technology to Assist Green Earth and Create a Better Future Together

## ABOUT US

浙江格亚电气有限公司成立于2007年2月，地处浙江温州，是一家专业从事新能源电气与自动化控制产品自主研发、生产、销售及配套服务的高新技术企业。公司具备完整全产业链运营能力，依托规范经营管理与持续技术创新，综合实力稳步提升，年营业额已突破2亿元人民币，综合产能及行业综合实力位居区域行业前列。

公司主营低压电器元件、工业自动化控制元件全系列核心品类，可同步提供低压配电系统、自动化控制系统、新型智能电力系统定制化成套解决方案，可对接各类政企工程、工贸企业、跨境项目，交付一站式全流程配套服务。产品适配多类工业、基建、新能源全域应用场景，性能稳定、合规达标率高，收获海内外客户一致认可与长效好评。公司深耕全球化市场布局，销售网络覆盖全球六大洲，累计服务一万余家海外合作企业，渠道体系成熟完善。现面向全球开放区域代理、批量集采、专项项目共建等多元合作模式，携手共建电气产业共赢生态。

自成立以来，公司秉持“格物知致，亚行天下”企业理念，坚守品质为先、创新赋能核心发展原则，严控产品高标准、高性价比、高品质三道核心关口。目前已斩获多项国家发明专利，完成GEYA品牌多国全域合规布局。全系产品严格对标国际行业准入标准，顺利取得CCC、CE、SAA、SEMKO、TUV、EN等国内外权威全套资质认证，全面符合欧洲、中东等多国属地质量核检标准，跨境供货合规无壁垒。公司可正规承接全球客户OEM、ODM定制化代工研发服务，已与多家国际知名电气品牌达成长期稳定战略合作。专业实战型营销服务团队全域联动，稳步拓宽海内外品牌市场版图，持续强化品牌核心竞争力。

格亚电气诚邀海内外优质代理商、渠道商及工程合作伙伴携手拓市，共享行业发展红利。我们将以过硬原装全系产品、高效全天候专属配套服务、极具市场竞争力的合作扶持政策，全方位护航合作伙伴稳定创收、长效经营。

格亚电气匠心做品质、专心做科创、诚心做合作，期待与全球客商同心同行，共创电气行业高质量发展新未来！

# 静止无功发生装置

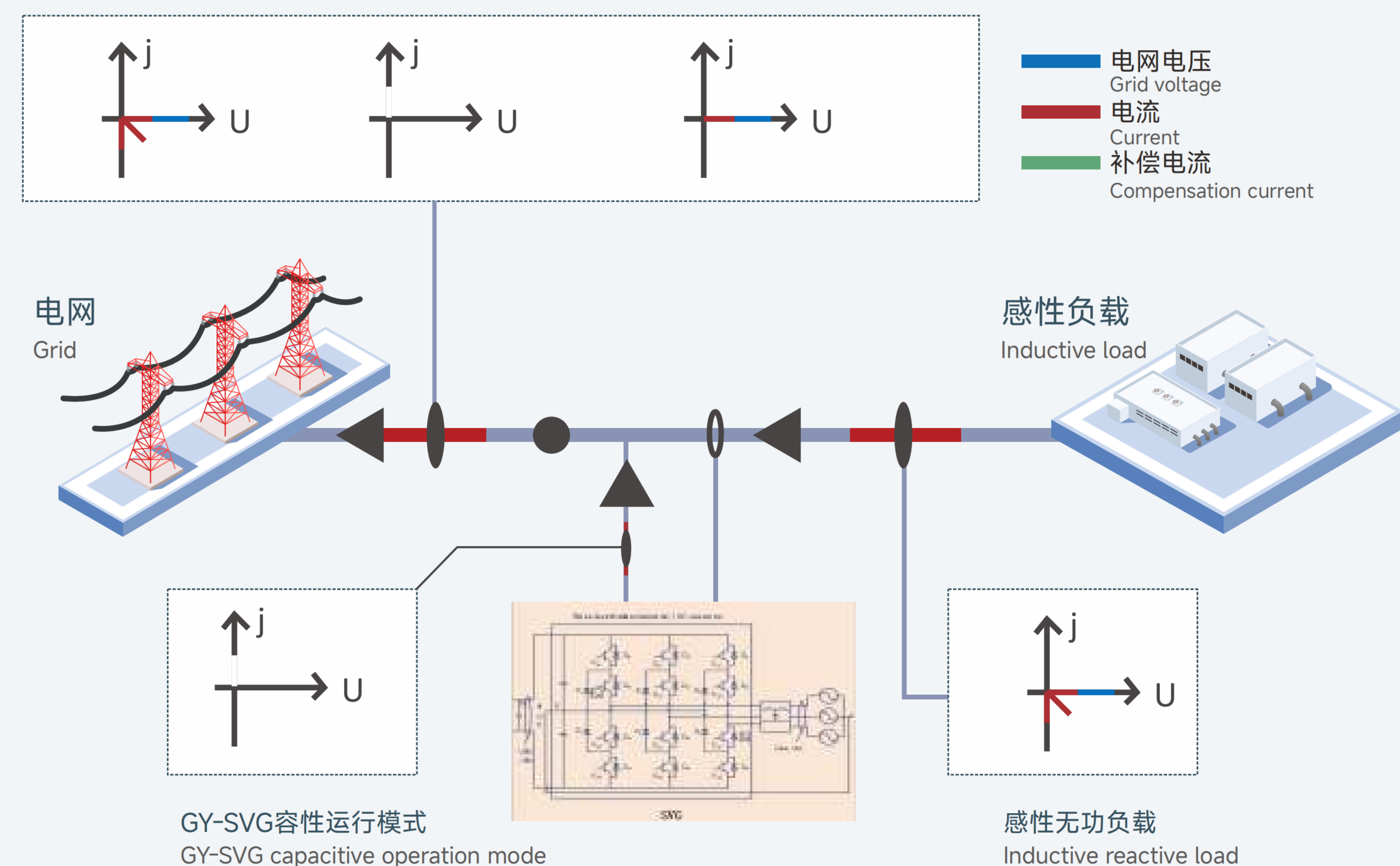
Static Var Generator

GY-SVG-SiC

碳化硅静止无功发生装置 (GY-SVG-SiC) 以碳化硅功率器件为核心, 将电压源变流器通过滤波器并联在电网上, 其工作原理是通过调节变流器交流侧输出电压的幅值和相位, 针对电网系统中无功功率进行动态精准补偿, 瞬态响应时间小于50 $\mu$ s, 全响应时间小于10ms, 避免过补欠补偿的发生。同时, 装置峰值效率达98.5%以上, 单柜可容纳8台模块, 最大容量可达800kvar, 安装维护方便。

Silicon Carbide Static Var Generator (GY-SVG-SiC)

Using silicon carbide (SiC) power devices as the core, the GY-SVG-SiC connects a voltage source converter (VSC) to the power grid via a filter in parallel. Its working principle is to dynamically and accurately compensate for reactive power in the grid system by adjusting the amplitude and phase of the output voltage on the AC side of the converter. The transient response time is less than 50  $\mu$ s, and the full response time is less than 10 ms, thereby avoiding over-compensation and under-compensation. In addition, the device achieves a peak efficiency of over 98.5%. A single cabinet can accommodate up to 8 modules, with a maximum capacity of 800 kvar, offering easy installation and maintenance.



## 性能特点:

- 1) DSP+CPLD全数字控制核心, 三电平拓扑技术, 先进的无功检测算法和PWM控制策略。
- 2) 降低模块损耗, 提升模块效率, 峰值效率达98.5%以上。
- 3) 高功率密度模块化设计, 单柜可容纳8台模块, 最大容量可达800kvar, 安装维护方便。
- 4) 具有两路外部电流采样通道, 可支持低压侧采样低压侧补偿、高压侧采样低压侧补偿、无功分量补偿等多种补偿方式。
- 5) 通过更高开关频率控制算法, 减小输出纹波电流, 提升动态响应速度。
- 6) 利用SiC功率器件的更高耐压能力, 同时简化热设计和电磁兼容设计, 提升产品的可靠性。
- 7) 无功补偿能力: 补偿率 $\geq 99\%$ 。
- 8) 不平衡补偿能力: 补偿后不平衡度 $\leq 5\%$ 。
- 9) 对负载的动态响应速度为毫秒级, 能实现对冲击性无功功率负荷的动态精准补偿。
- 10) 中性线零序电流滤波能力为相线三倍。
- 11) 可设定100%限流输出, 保证设备长期稳定运行。
- 12) 支持无功补偿、无功补偿+三相不平衡补偿模式可选。

## 技术参数:

机型 Model	220V	380V
海拔高度 Altitude	<2000m, 2000米以上按照GB/T3859.2降额使用 <2000 m; above 2000 m, derate according to GB/T 3859.2	
环境温度 Ambient temperature	-10~+50°C(40°C以上降容不超过30%) -10 to +50 °C (above 40 °C, capacity derating $\leq 30\%$ )	
相对湿度 Relative humidity	$\leq 90\%$ , 月最低温度25°C表面无凝露 $\leq 90\%$ relative humidity, no condensation on the surface at a monthly minimum temperature of 25 °C	
污秽等级 Pollution degree	III级以下 Pollution degree $\leq$ Class III	
工作电压 Operating voltage	AC220V (-20%~+20%)	380V (-20%~+20%)
工作频率 Operating frequency	50Hz/60Hz (45Hz~63Hz)	
额定补偿容量 Rated compensation capacity	37kvar、50kvar	75kvar、100kvar
电网结构 Grid configuration	三相三线, 三相四线 Three-phase three-wire, three-phase four-wire	
并联台数 Number of parallel units	不限 unlimited	
整机效率 Overall efficiency	$\geq 97\%$	
开关频率 Switching frequency	30kHz	
功能选择 Function selection	无功补偿、无功补偿+三相不平衡补偿 Reactive power compensation / Reactive power compensation + three-phase unbalance compensation	
无功补偿率 Reactive compensation rate	无功补偿 $\geq 99\%$ Reactive power compensation $\geq 99\%$	
不平衡补偿能力 Unbalance compensation capability	补偿后不平衡度 $\leq 5\%$ Unbalance degree after compensation $\leq 5\%$	
全响应时间 Full response time	< 10ms	
噪音 Noise level	$\leq 65$ dB	
通讯方式 Communication method	2路RS485通信接口 (支持Wi-Fi) 2 RS485 communication ports (Wi-Fi supported)	
保护功能 Protection functions	过载、软/硬件过流、电网过欠压、电源故障、过温、频率异常、短路保护、谐振保护等 Overload, software/hardware overcurrent, grid overvoltage/undervoltage, grid voltage unbalance, power supply failure, overtemperature, frequency anomaly, short circuit protection, resonance protection, etc.	
过载能力 Overload capability	额定1.2倍过载60秒 Rated 1.2 times overload for 60 seconds	
安装方式 Installation method	机架/壁挂 Rack / wall-mounted	
进线方式 Cable entry	后进线(机架式)、上进线(壁挂式) Rear cable entry (rack-mount), top cable entry (wall-mounted)	
防护等级 Protection rating	IP20(IP54可定制) IP20 (IP54 customizable)	
中性线滤波能力 Neutral line filtering capability	中性线滤波能力为相滤波能力的3倍 Neutral line filtering capacity is 3 times that of phase filtering capacity	
冷却方式 Cooling method	强制风冷 Forced air cooling	
电磁兼容 Electromagnetic compatibility	EMC电磁兼容RE、CE项目满足Class A测试标准 EMC (Electromagnetic Compatibility) - Radiated Emission (RE) and Conducted Emission (CE) meet Class A test standard	

## 智能制造业

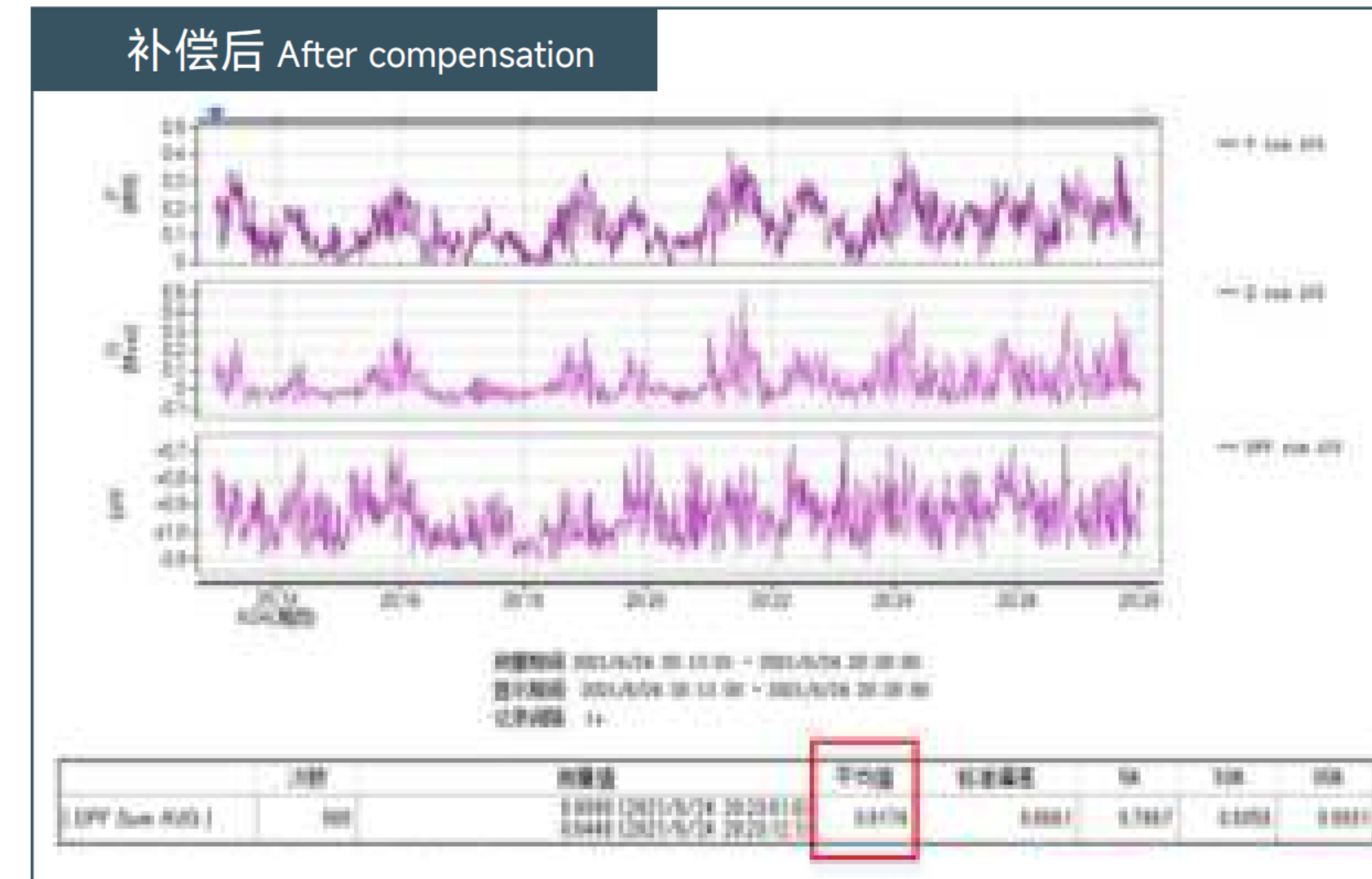
Intelligent manufacturing industry

提升功率因数、抑制谐波、稳压  
Improve power factor, suppress harmonics, stabilize voltage

**案例背景:** 湖北某商用车制造公司车身装焊车间, 冲击性负荷导致功率因数较低。  
**治理方案:** 投入总容量800kvar的静止无功发生装置 (SVG), 将功率因数由0.63提升至0.917, 避免力调电费罚款。

**Case Background:** In the body welding workshop of a commercial vehicle manufacturing company in Hubei, impact loads resulted in a low power factor.  
**Solution:** An 800kvar Static Var Generator (SVG) was installed, increasing the power factor from 0.63 to 0.917, thereby avoiding penalty charges for low power factor.

项目 Project	补偿前 Before compensation	补偿后 After compensation
平均功率因数 Average power factor	0.63	0.917
	增收力调电费 Power factor penalty charge	免收力调电费 Exemption from power factor penalty charge



## 半导体行业

Semiconductor industry

抑制谐波、提升供电质量  
harmonic suppression and power quality improvement

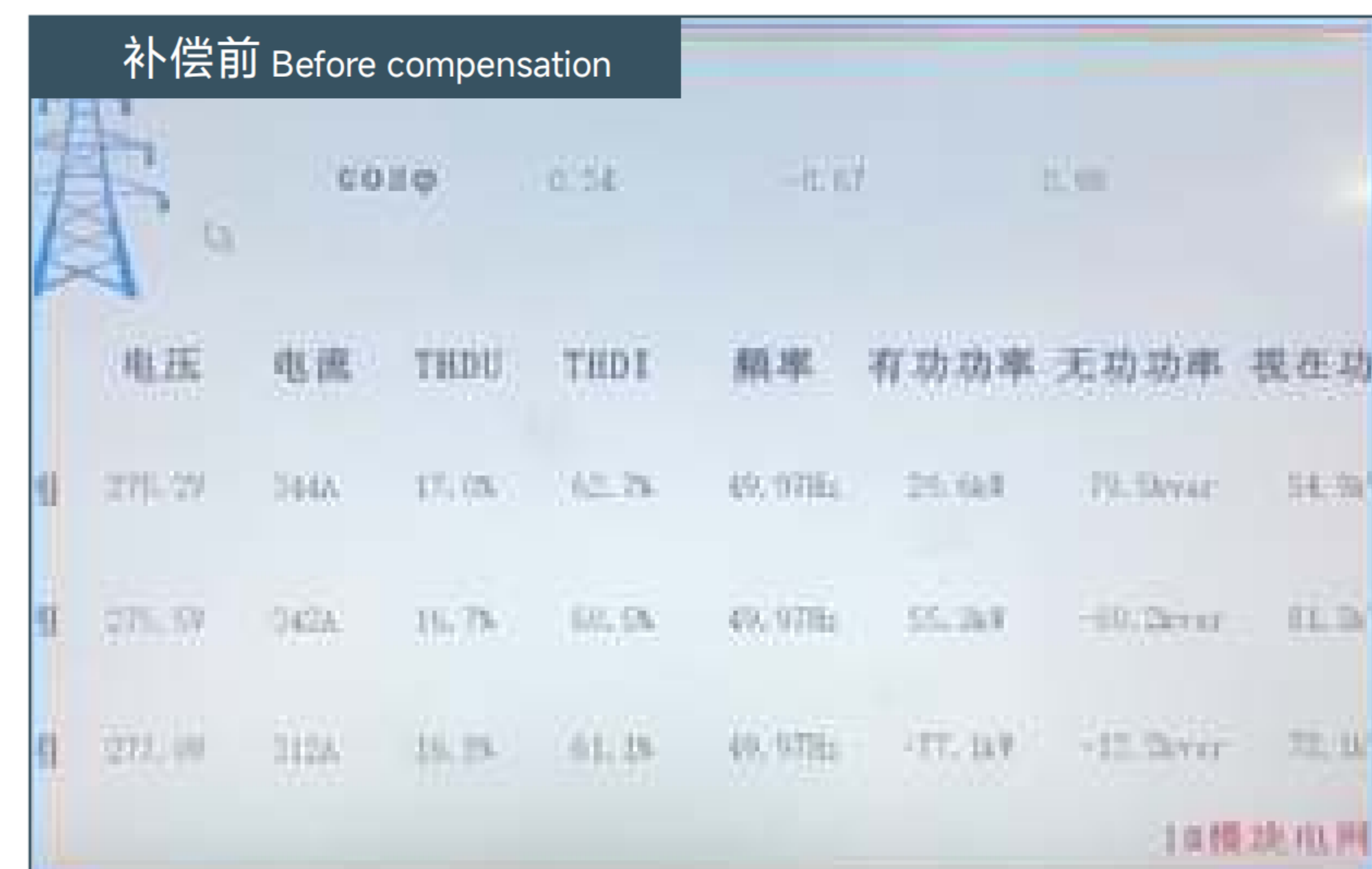
**案例背景:** 某半导体生产车间机台负载产生的电流谐波, 导致UPS供电电源输出电压谐波畸变率严重增加, 影响机台负载正常运行, 甚至造成机台负载宕机。

**治理方案:** 利用高性能APF, 将THDu由17%降至3%, 避免机台负载宕机。

**Case Background:** In a semiconductor manufacturing workshop, current harmonics generated by the equipment loads caused a severe increase in the output voltage harmonic distortion (THDu) of the UPS power supply, affecting the normal operation of the equipment and even leading to equipment shutdown.

**Solution:** A high-performance Active Power Filter (APF) was deployed, reducing THDu from 17% to 3%, thereby preventing equipment shutdown.

相位 Phase	补偿前 Before compensation	补偿后 After compensation	改善幅度 Improvement margin
A相	17.0	2.8	83.5%
B相	16.7	3.3	80.2%
C相	16.8	3.0	82.1%



## 数据中心

Data center

提升功率因数和供电质量、抑制谐波  
Improve power factor and power quality, suppress harmonics

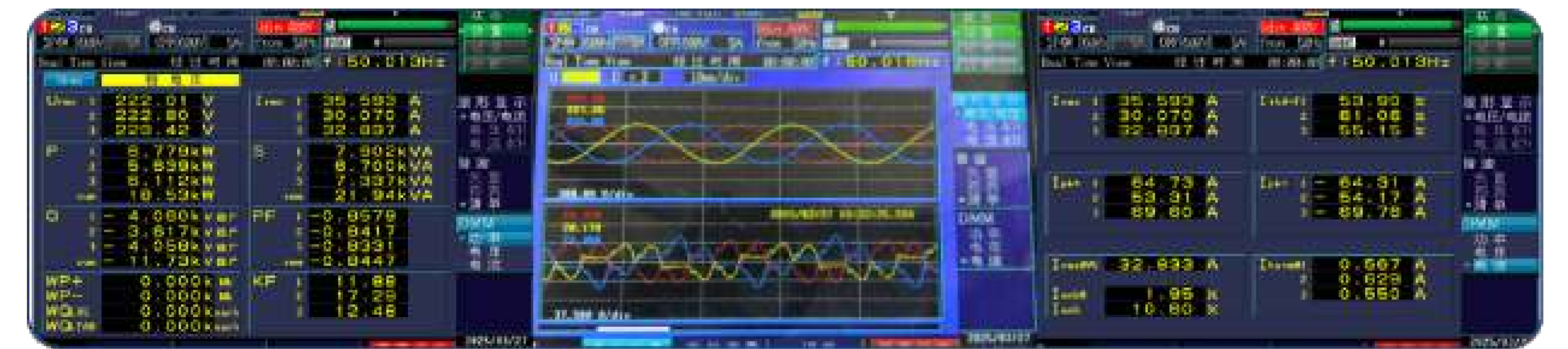
**案例背景:** 某数据机房末端精密空调变频压缩机产生的谐波, 给配电系统造成非必要损耗, 影响电气设备正常运行、降低配电系统使用效率以及增加用电成本。

**治理方案:** 利用高性能APF, 将THDi由60%降至5%, 用电效率显著提升。

**Case Background:** Harmonics generated by the variable-frequency compressor of precision air conditioners at the load end of a data center computer room caused unnecessary losses to the power distribution system, affected the normal operation of electrical equipment, reduced the efficiency of the power distribution system, and increased electricity costs.

**Solution:** A high-performance Active Power Filter (APF) was deployed, reducing THDi from 60% to 5%, significantly improving power efficiency.

项目 Project	补偿前 Before compensation	补偿后 After compensation
平均功率因数 Average power factor	0.84	0.96
电流谐波畸变率 Current harmonic distortion rate	60%	5%



## 新能源并网

New energy grid connection

避免力调电费罚款、抑制谐波  
Avoid power factor penalty charges and suppress harmonics

**案例背景:** 浙江湖州某309.69kWp光伏并网发电项目, 计量点在400V低压侧与光伏接入点间, 功率因数不达标, 面临大额力调电费罚款。

**治理方案:** 在计量点上端安装150ATPQC, 通过高采低补方式, 改善功率因数。

**Case Background:** A 309.69 kWp photovoltaic grid-connected power generation project in Huzhou, Zhejiang. The metering point is located between the 400V low-voltage side and the PV grid-connection point. The power factor was below the required standard, facing substantial penalty charges for low power factor.

**Solution:** A 150 A TPQC (Three-phase Power Quality Conditioner) was installed upstream of the metering point, using a high-side sampling / low-side compensation method to improve the power factor.

相位 Phase	治理前 Before compensation	治理后 After compensation	改善幅度 Improvement margin
平均功率因数 Average power factor	0.67	0.95	41.8%
电路电流降低: $1 - 0.67 / 0.95 = 29.47\%$ Circuit current reduction			
电路损耗降低: $1 - (0.67 / 0.95)^2 = 29.47\%$ Circuit loss reduction			

**行业痛点:** 新能源发电出力受自然条件影响间歇性、波动性, 易引发电网电压与频率波动, 且并网逆变器会产生谐波, 污染电网电能质量; 这类问题既冲击电网调度与稳定运行, 还会损害变电设备寿命, 降低新能源消纳能力。

**Industry Pain Points:** The output of renewable energy generation is intermittent and fluctuating due to natural conditions, which can easily cause grid voltage and frequency fluctuations. Additionally, grid-connected inverters generate harmonics, polluting the power quality of the grid. These issues not only impact grid dispatch and stable operation, but also shorten the lifespan of substation equipment and reduce the grid's capacity to absorb renewable energy.



## 农网台区1

Rural Grid Distribution Area 1

高低电压治理、节能降耗  
High/low voltage regulation, energy saving and  
consumption reduction

**案例背景:** 浙江温州某台区, 大规模光伏接入台区, 高电压、三相电压不平衡问题接连产生, 导致光伏脱网, 甚至严重影响用户及企业用电情况。

**治理方案:** 利用TPQR治理高电压/三相电压不平衡, 将电压调整至230V, 满足考核要求。

**Case Background:** In a distribution area in Wenzhou, Zhejiang, large-scale photovoltaic integration led to successive issues of high voltage and three-phase voltage unbalance, causing PV disconnection and even seriously affecting power consumption for both residential and industrial users.

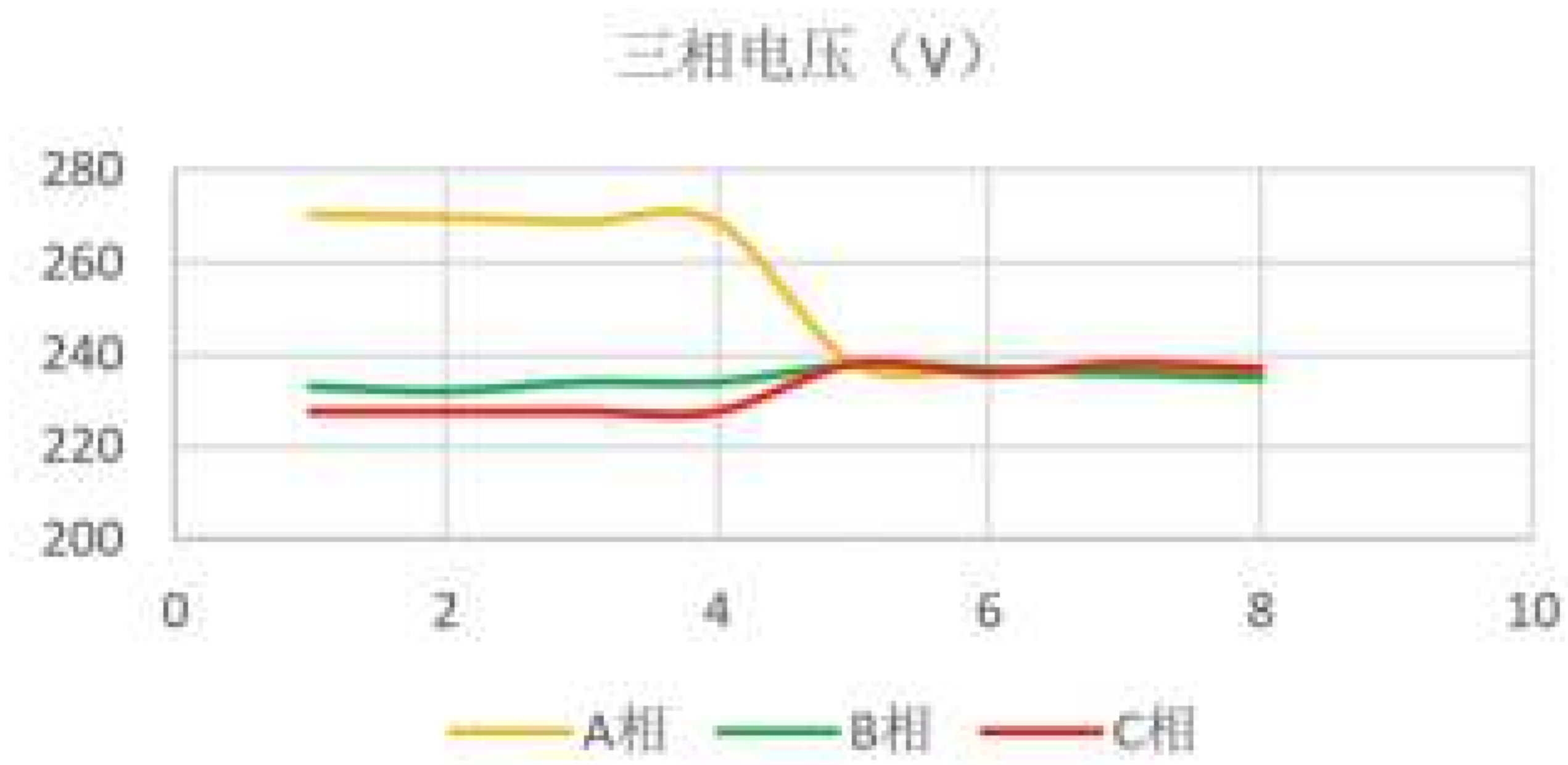
**Solution:** A TPQR was used to regulate the high voltage and three-phase voltage unbalance, adjusting the voltage to 230V and meeting the required compliance standards.

**行业痛点:** 因单相负荷分布不均、线路径细且供电半径长、季节性负荷波动, 普遍存在三相严重不平衡、电压偏低或偏高的问题; 叠加非线性设备普及带来的谐波污染, 加剧线路损耗与设备故障, 影响乡村生产生活用电安全。

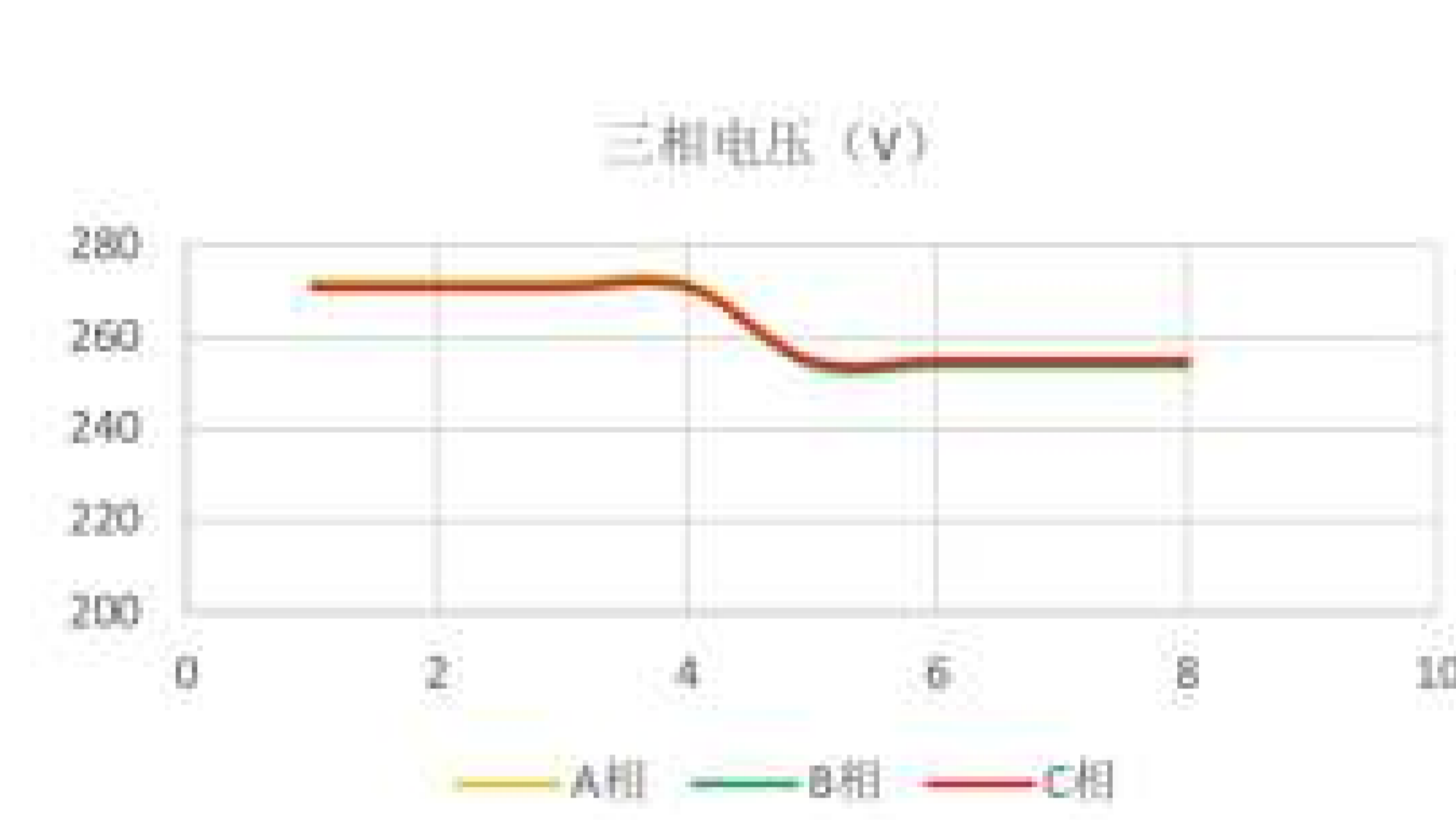
**Industry Pain Points:** Due to uneven distribution of single-phase loads, thin line diameters with long power supply radii, and seasonal load fluctuations, issues such as severe three-phase unbalance and voltage deviation (either too low or too high) are common. Coupled with harmonic pollution caused by the widespread use of nonlinear equipment, these problems aggravate line losses and equipment failures, affecting the safety of electricity consumption for rural production and daily life.



补偿前 Before compensation



补偿后 After compensation



## 农网台区2

Rural Grid Distribution Area 2

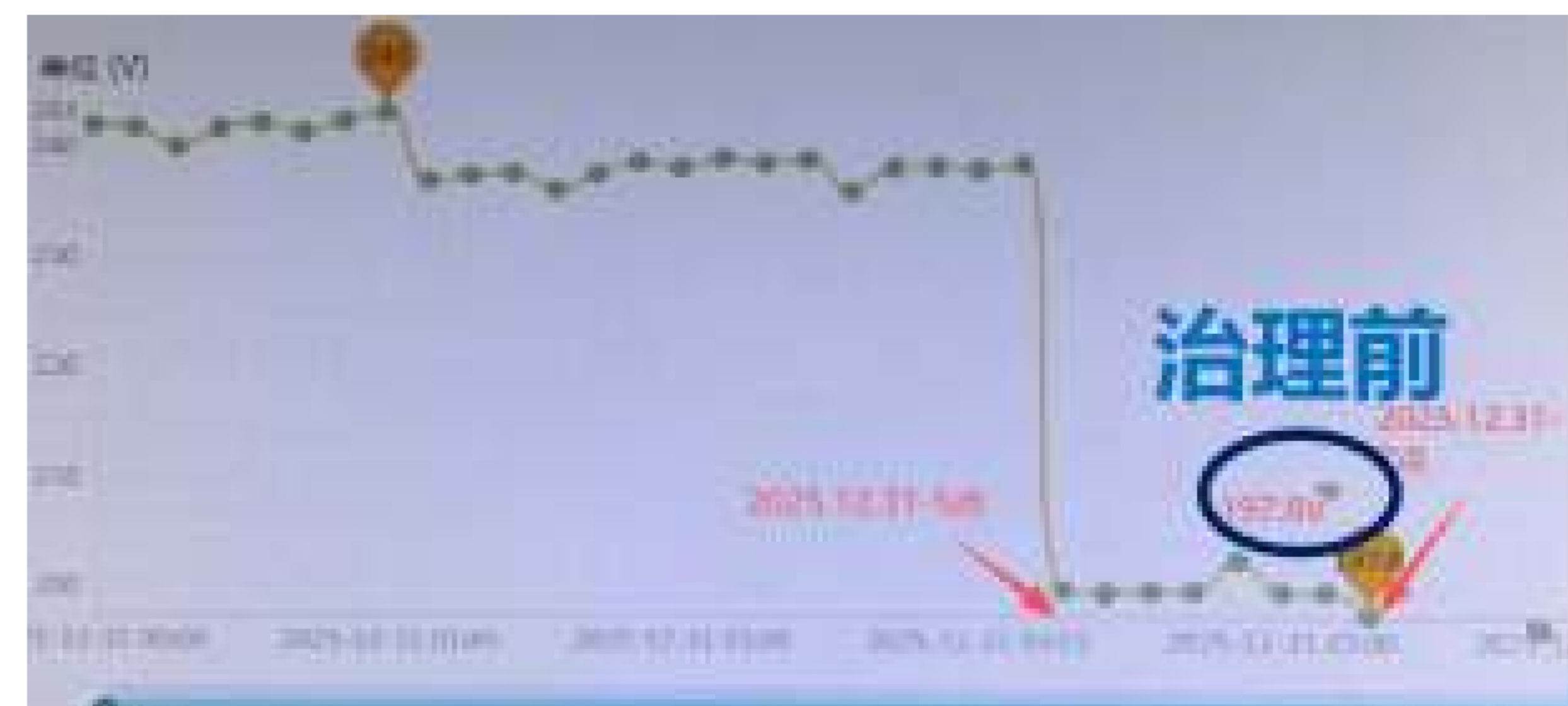
末端稳压  
End-point voltage regulation

**案例背景:** 安徽某台区, 供电台区至线路末端线路长度约1km, 供电线路过长, 线路末端有4台单相7kw的充电桩, 当充电桩运行时, 导致末端低电压, 有时电压会低至190V左右, 严重影响末端用户的用电质量。

**治理方案:** 利用TPQR治理高电压/三相电压不平衡, 将电压调整至230V, 满足考核要求。

**Case Background:** In a distribution area in Wenzhou, Zhejiang, large-scale photovoltaic integration led to successive issues of high voltage and three-phase voltage unbalance, causing PV disconnection and even seriously affecting power consumption for both residential and industrial users.

**Solution:** A TPQR was used to regulate the high voltage and three-phase voltage unbalance, adjusting the voltage to 230V and meeting the required compliance standards.



## 石油开采

Oil extraction

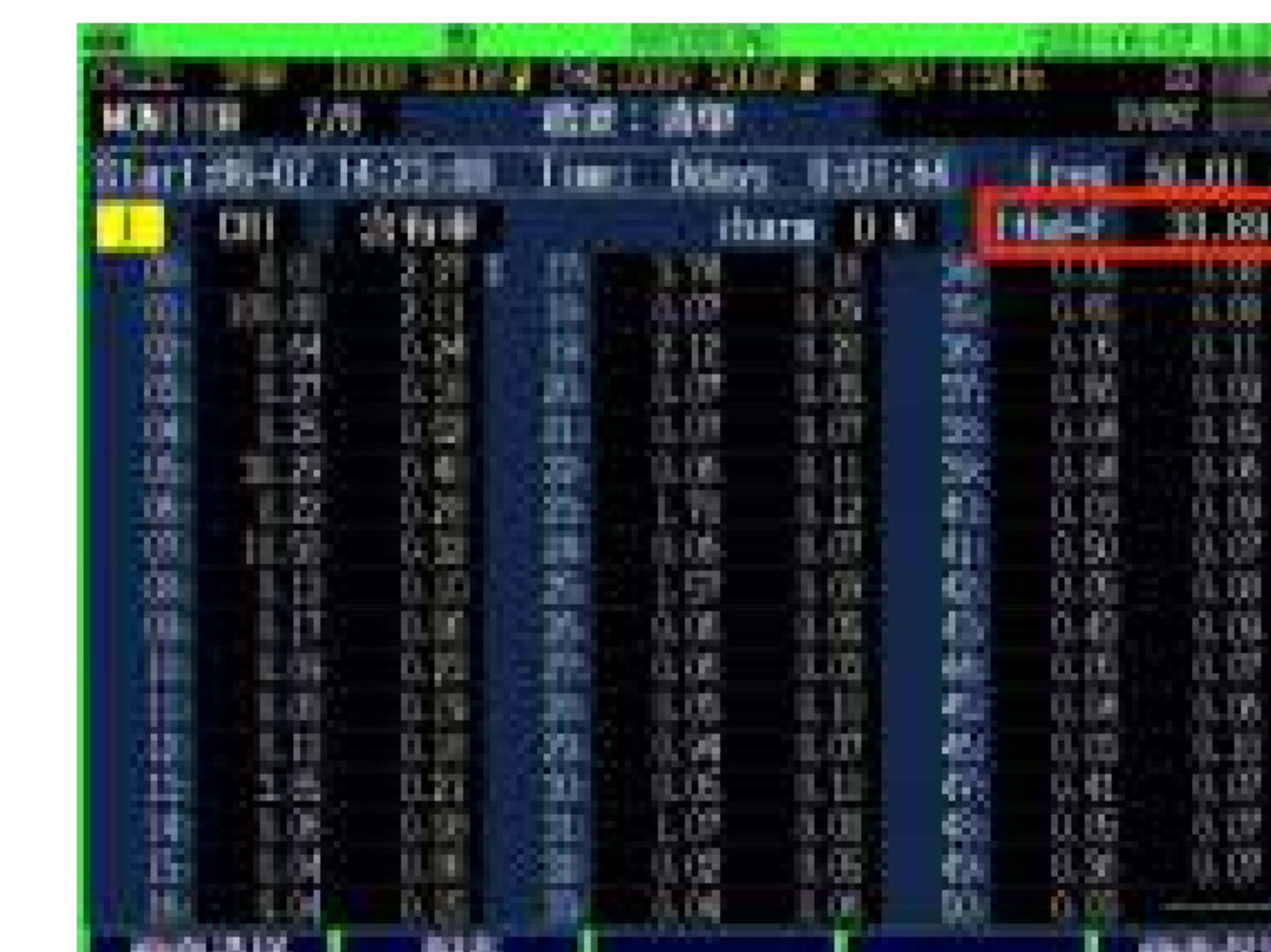
提升功率因数和供电质量、抑制谐波  
Improve power factor and power quality,  
suppress harmonics

**案例背景:** 石化某石油开采项目, 设备作业期间产生大量谐波电流, 给系统带来严重的谐波污染, 导致抽油机误动作甚至停机。

**治理方案:** 在低压配电室安装690V APF进行谐波治理, 装完后此系统的电流畸变率降低至GB/T 14549标准要求, 治理效果显著。抽油机运行状态良好, 无误动作及停机事件发生。

**Case Background:** In a petrochemical oil extraction project, large amounts of harmonic current were generated during equipment operation, causing serious harmonic pollution to the power system, which led to malfunction or even shutdown of the pumping units.

**Solution:** A 690V Active Power Filter (APF) was installed in the low-voltage distribution room for harmonic mitigation. After installation, the current distortion rate of the system was reduced to meet the requirements of the GB/T 14549 standard, achieving significant improvement. The pumping units have been operating in good condition, with no malfunctions or shutdowns.



电流畸变率对比  
Current distortion rate comparison

治理前  
Before treatment 33.69%

整理后  
After treatment 11.92%

