

Comprehensive solution for power quality management

——Constructing a reactive power optimization system for 10kV distribution network with "three-level collaboration and on-site balance"

I. Pain point: Does your distribution network face these challenges?

- The line loss remains high, with over 8% loss in rural/mountainous power lines, making it difficult to control electricity costs;
- The terminal voltage is low, and the input voltage of the terminal transformer is often below 9.3kV, leading to frequent complaints;
- If the power factor does not meet the standard, the power supply department will assess or impose fines on electricity fees;
- Low equipment utilization, with the main transformer and line capacity being "wasted" by reactive current;
- The pressure of operation and maintenance is high, compensation device failures occur frequently, lightning strikes, bulges, and fuse burns continue

The root cause of these problems is often the long-distance transmission of reactive power and the lack of layered on-site compensation.

II. Our philosophy: three-level collaboration, precise compensation

The national "Technical Guidelines for Distribution Networks" clearly require that "reactive power compensation should be graded and divided into zones, and balanced on site".

Based on this principle, we have developed a comprehensive reactive power optimization solution covering substations, distribution lines, and user sides, which integrates three elements and enhances efficiency

Compensation Level	Device Name	Core Function	Key Problems Solved
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Level 1	Intelligent High-Voltage Centralized Compensation Device	Global reactive power regulation, voltage stabilization and power supply guarantee	Power factor assessment, loss reduction of main transformers
Level 2	Overhead Line Pole-Mounted Compensation Package	On-site loss reduction, elevation of terminal voltage	High line loss, low terminal voltage
Level 3	Distribution Transformer Area Device / Intelligent Low-Voltage Compensation	Source governance, precise load matching	Customer-side reactive power feedback, harmonic interference

III. Detailed explanation of tertiary device

✓ Level 1: Intelligent High Voltage Centralized Compensation Device (Substation Level)

- Installation location: 10kV busbar side
- Core functions:
 - Automatic tracking system reactive power demand, second level switching;
 - Support VQC/AVC system linkage to achieve voltage reactive power coordinated optimization;
 - Flexible capacity configuration (100~3000kvar) to meet the compensation needs of the entire station.

✓ Second level: Complete set of compensation equipment on overhead line poles (line level)

- Installation location: middle and rear section of 10kV overhead line (such as at 2/3)
- Core functions:

- Adopting full film dry-type self-healing capacitors, IP54 protection, maintenance free;
 - Standard lightning arrester+fast fuse, lightning resistant and explosion-proof safety;
 - Fixed/simple automatic switching options are available, suitable for complex environments in rural power grids.
- ✔ Level 3: Intelligent low-voltage transformer compensation device (user level)
- Installation location: JP cabinet of distribution transformer or next to large motor
 - Core functions:
 - Follower compensation: offsetting the no-load reactive power (iron loss) of the distribution transformer;
 - Random compensation: dynamically tracking the operating status of the motor;
 - Optional 7% reactance rate to suppress 3/5th harmonic.

IV. Why choose our three-level collaborative solution?

Advantages	Description
Full-scenario Coverage	Mature deployment from urban substations to rural lines.
High Reliability	Dry-type capacitor + hermetic seal + lightning protection; failure rate <1%.
Standard Compliance	Certified by CEPRI, meets GB/T 15576, DL/T 597, etc.
Clear ROI	Line loss calculation + voltage simulation to quantify energy savings.
One-stop Service	Solution design → supply → installation → O&M support.

V. Applicable to customers

- County level power supply company (rural power grid renovation, line loss control project)

- Electric Power Design Institute (Distribution Network Optimization Design Scheme)
- Industrial parks/large factories and mines (energy-saving requirements for self built distribution networks)
- Power engineering general contractor (EPC project supporting)

VI. Value embodiment

- Ensure that the power factor of the entire station is ≥ 0.95 and pass the grid assessment; Reduce copper and iron losses in the main transformer and extend equipment lifespan.
- Single point compensation can reduce the line loss of this section by 15% to 30%, and increase the terminal voltage by 0.3 to 0.6 kV. A set of 50kvar equipment can recoup the cost in 1.5 years!
- Reduce reactive power transmission from the source, allowing 10kV lines to be 'lightly loaded'. The comprehensive line loss in Taiwan has been further reduced by 1-2 percentage points.

Refer to our existing cases:

10kV Changling Line (12km) of a provincial rural power grid in Chinese Mainland

- Original state: Line loss 8.7%, terminal voltage 9.0kV
- Plan: Substation to supplement 200kvar+pole to supplement 2 × 50kvar+substation to supplement with equipment
- Result: The line loss has decreased to 6.2%, the terminal voltage is 9.5kV, and the annual electricity cost savings exceed 40000 yuan!

 Welcome to contact us and get free access to:

- Preliminary scheme for reactive power compensation of the affiliated line
- Calculation Table of Energy saving Benefits for Similar Projects
- National standards and network access certification documents

Let reactive power no longer run in vain, let voltage always be online!

—Your trusted partner for power quality in distribution networks

Power by RW Energy, Our company has been focusing on reactive power compensation for 10 years, serving the power grids of over 300 districts/counties in 26 countries worldwide

Results Presentation:

Installed on utility poles



Installed on Substation

