Facilitate Energy Efficiency by Power Monitoring
Energy Management System Application

Solution for Telecom

Solution for Hotel

Solution for Hospital

Solution for product factory

Application Solution for metro

Application Solution for University

Energy Sub-billing and Management in Supermarket

Energy sub-billing and management in commercial buildings

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Energy Management System

With rapid development of electric system, continuous rising of power usage, the application of new devices and rigorous rule of government on energy saving, efficient power management solution is necessary to meet all the challenges to achieve power distribution system with high reliability, good efficiency and low consumption.

Energy Management System is an integrated solution of Schneider Electric with power monitoring and power quality improvement to help to realize the management optimization of electric installations and power system.

Energy management system can be divided into three parts:
- PowerLogic energy management system
- Power factor correction and active filter system
- Energy Sub-billing and management system

Facilitate Energy Efficiency

PowerLogic energy management system

With new technologies in the fields of electronics, computer, network communication and control, PowerLogic system can realize the data collection, analysis and management of power distribution system covering MV, LV, transformer, DC power, generators and EPS. PowerLogic system is an open system with easy communication and information sharing with other automation systems and intelligent devices, like DCS, BAS and fire alarming system.

PowerLogic system (ION Enterprise) supports:
- Power meter: PM800 series, PM700 series, PM200 series
- Multi-circuits monitoring unit: MC09, MC18, MC08
- Power quality meter: ION7650/7550
- BCPM (branch circuit power meter for PDU)
- PM9 – DIN rail mounted Power meter
- EN40/ME – Energy meter
- Sepam
- Power factor controller: Varlogic NRC12
- 3rd party devices

PowerLogic system helps:
- Improve the system reliability and continuity
- Improve the system efficiency to reduce the operation cost
- Optimize the power consumption to realize energy and cost saving
- Monitor power quality to decrease the fault risk
- An efficient diagnosis tool to minimize the downtime
Facilitate Energy Efficiency by Power Monitoring

Due to more and more application of non-linear loads in the power system, the generated harmonic is threatening the system operation, esp. for traditional capacitor banks. Our power factor correction and active filter system provides a total compensation and filtering solution for systems with different harmonic pollution.

Power factor correction and active filter system includes:
- Power factor correction products
  - Varplus2 capacitor
  - Varlogic NR power factor controller
  - DR detuned reactor
  - Fupact fuse
  - LC1-D.K contactor
- AccuSine active filter
  - AccuSine/3L series
  - AccuSine/4L series

Power factor correction and active filter system helps:
- Improve power factor to avoid the utility penalty
- Reduce the power consumption caused by reactive power and harmonic
- Eliminate or mitigate harmonic pollution in the system to avoid the impact to equipments
- Release the system capacity occupied by reactive power and harmonic to improve the system efficiency

Energy Sub-billing and management system

With the increasing electric cost and EE target, engineer, developer and end user make efforts together to find the space of energy saving and control energy consumption step by step. However, we can’t manage electric system without measuring. We must obtain detailed and accurate data to understand the use of electricity to optimize the energy consumption. Schneider electric provide you a series simple smart and accurate measurement total solution for your internal energy measuring and management.

Sub-billing and energy management system includes:
- Professional energy meter
- EN40 and ME series DIN mounted energy meter
- PM9 DIN mounted power meter (kilowatt-hour meter + multi-functional meter)
- EGX300 gateway server with embedded webpage generator

Sub-billing and energy management can help:
- Restrict unreasonable consumption
- Reduce energy waste
- Guide to rational energy consumption
- Help to facilitate continuous energy saving
Energy Management System Application Solution for Telecom

Energy management solution, optimize the power management in critical telecom buildings!

Power supply to communication machines is the “core” issue in telecom industry. Data center takes responsibility for data transmission and storage for all enterprises and government organizations. Ensuring safety, reliability and stability of the critical power is the foundation of communication.

Requirements
● How to design an optimized power monitoring and control system, to ensure the safety, reliability and stability of critical power.
● Improve power quality by all efficient means, to guarantee the continuous work of all communication machines.

Energy Management Solution

PowerLogic energy management system solution
Uninterrupted power supply is essential for IT rooms, data communication devices and cooling system. Any of the voltage disturbances, frequency spike and electromagnetic interference will impact the data exchange. So monitoring power quality and determine the potential failures is very important and helpful.

LV mains
ION7650 Power Quality Meter: Power quality monitoring and data log, Waveform capture and event log.

Category I loads
PM810 Power Meter Measure all electric parameters including harmonics. Monitor the status of circuit breaker (ON/OFF, Trip)

Category II loads
PM750 Power Meter to measure all electric parameters.
MC multi-circuit monitoring unit is optional to measure simply voltage/current and status of breakers.

ION-E Energy management system
Analyze power reliability based on power quality, captured waveforms and event logs, proposal of preventative maintenance plan. open system with good compatibility with 3rd party systems.
Support reliable power supply in telecom!

Benefits
- Monitoring the whole system, detecting potential faults timely to improve system reliability.
- Advanced power quality analysis to determine device defects and guarantee the reliability of power distribution system.
- Improve system power factor and system efficiency to decrease power consumption.
- Eliminate harmonics to ensure the device safety.
- Simplify power management.

Power factor correction and active filter recommended solution: Detuned Power factor correction + AccuSine active filter at load side

Detuned power factor correction solution
Installed for every busline, to compensate power factor and meanwhile significantly restrict harmonic damage to capacitors.

AccuSine active filter at load side
Each set of AccuSine can locally compensate all UPS or Switches in one system with real time response, eliminating harmonic current, avoiding any damage and interruption of critical devices caused by harmonics, improving system capacity and efficiency, also preventing overload risk of generator, and improving system safety and reliability.

Nonlinear loads analysis
There are a big amount of typical harmonic sources in IT buildings:
- Big capacity UPS, 6 pulses and 12 pulses UPS will result in very different harmonic.
- Switch power supply of different manufactures generate different harmonic.
- Inverter air conditioners and pumps are the most serious source of harmonic.

SPS -3P current waveform and THD I

UPS -3P current waveform and THD I
Energy Management System Application Solution for Hotel

Comfort, safety and economy of hotel highly depend on the reliability of power distribution system!

A safe and reliable power distribution system can ensure the normal operation of electrical apparatus and intelligent system. That can also guarantee the safety and comfortable condition of hotel, which will contribute to good profitability.

Requirements

- How to ensure the safe and uninterrupted power supply for air conditioning, heating, ventilation, lighting, elevator equipment in hotel
- How to improve power quality to ensure the stability of multimedia devices and electronic system
- How to reduce the power consumption to make cost saving

Energy Management Solution

PowerLogic energy management system solution

- Full measurement and power quality monitoring on the mains
- Real-time monitoring and analyzing the energy consumption of feeders like air conditioning, elevator...
- Monitoring the harmonic of the feeders for communication and multimedia units of conference center
- Monitoring the feeders for IT room and accounting center
Optimize the power quality management; Increase the power efficiency and reduce the consumption; Optimize operation cost.

**Benefits**
- Ensure the safety of power system
- Ensure reliable and safe operation of electrical devices
- Improve the management efficiency of power system
- Reduce power consumption to improve system efficiency and prolong device durability
- Reduce energy cost

**Nonlinear loads analysis**
Hotel building contains bulky air conditioning and lots of ventilation and elevators with VFD (Variable Frequency Drive) and control components which are typical nonlinear loads, so as to lighting and IT equipments. Generated harmonic will inject into and pollute power distribution system. They will also damage the capacitor, impact the safety of electrical devices, decrease the system efficiency and increase the cost of the installation.

**Power factor correction and active filter recommended solution:**
Standard capacitor + AccuSine active filter at source side
- Use standard capacitor (Varplus®) to improve the power factor
- AccuSine 4L active filter at source side to eliminate the harmonic, especially on the neutral line by the 3rd order harmonic to improve power quality.

**Performance**
Power factor is improved, while 3rd order and above harmonic is mitigated. Energy consumption caused by harmonic is decreased, thus system efficiency is improved.

![Graphs showing before and after using AccuSine](image-url)
Energy Management System Application solution for Hospital

To guarantee a safe healthcare environment for patients, it is necessary to have a reliable and high-performance power distribution system.

Modern hospitals are now developing rapidly in the scale and complexity, with applying lots of advanced medical equipments. The development evolution also requires more safety and reliability of power distribution system in the hospitals.

Requirements

- How to reinforce the reliability of complex distribution system
- How to ensure the continuity of power supply in the level II sites of hospital and predict potential faults
- How to guarantee the power quality for complex and expensive medical equipments
- How to improve power factor and eliminate potential risks caused by harmonic
- How to increase the efficiency of power usage, and optimize the cost

Energy Management Solution

PowerLogic energy management system solution

Most of loads in hospital are category I and II that require high continuity service and reliability.

- Air Conditioning System consumes more power energy and should be monitored on its power usage.
- Hospital category II sites are critical and need comprehensive monitoring.
- Some vital and advanced medical equipments are sensitive to power quality that should be analyzed.

![Diagram](Image)

Data will be collected and transmitted to ION Enterprise software through Modbus fieldbus and gateway. User interface of ION-E with 100% Chinese can be customized. It helps to realize the system management with system diagram, waveform graph, trend curve and reports, etc.
Help the hospital to get the most safe and reliable power supply and optimize the cost!

Nonlinear loads analysis

There are many nonlinear loads in hospital building, like VSD in air conditioning system and the lifts, rectifier in lighting, and some advanced medical equipments (CT, X-ray, B-ultrasound, NMR). With data analysis, features of nonlinear loads are as the following:

- scatted, and harmonic changes from time to time
- Harmonic characteristics (harmonic rate and frequency) of the loads are quite different
- Some equipments can generate a lot of harmonic

Harmonic waveform: CT Scanner

Harmonic waveform: X-Ray Machine

Benefits

- Entirely system monitoring to discover potential faults timely to avoid power cut and guarantee the safe operation of hospital.
- Advanced energy consumption analysis, providing detailed sub-billing and cost analysis report
- Improve power factor, and decrease harmonic loss
- Improve system reliability to avoid harmonic harms to critical equipments in category I and II sites.

Power factor correction and active filter recommended solution:
Standard capacitor + AccuSine active filter at source side

Standard capacitor
- Varplus² capacitor: Self-healing technology, HQ protection,
- Varlogic NRC12 PF controller, Automatic switching on/off capacitor banks

AccuSine active filter at source side
- Eliminate dynamically the harmonics caused by nonlinear loads with fast response
- Reduce the voltage harmonic distortion
- Mitigate the harm to transformer, capacitor and other sensitive devices, improve the system safety
The production facilities in any industry factory include automation lines which require safe, reliable and continuous power supply. That’s why pre-alarming of potential risks and timely alarming of the faults are very important to continuous production.

**Requirements**
- How to build up an optimal power monitoring system to ensure continuous operation of automation production lines.
- How to make a quick response to the faults, in order to solve the problems and resume the production in short time.
- How to control the electric cost of the main loads reasonably, and outline an energy saving plan
- How to improve power factor correction solution to improve power factor more effectively and mitigate harmonic pollution

**ION Enterprise Energy management software:**
- Alarming on potential faults which may result in power cut and equipment damage
- Easy reporting customization on energy, demand, power quality analysis…
- Easy integration of several energy data, e.g. water, gas… (WAGES)
- Open system to work with existing system in the factory

**PowerLogic energy management system solution**

The power supply of product factory is usually provided by two 35kV lines. The main substations are usually located in general power center, while the distribution substations in the joint workshops and office buildings. Different loads are equipped with different monitoring devices based on the actual function requirements, in order to achieve the best operation performance.
AccuSine active filter is the best choice to mitigate harmonic pollution.

**Benefits**
- Improve safety and reliability of power supply effectively
- Adjust energy consumption model to optimize electricity bills according to historical data
- Real-time monitoring of harmonic change for more reasonable system maintenance

**Power factor correction and active filter recommended solution:**
Standard power factor correction + Active filter at source side

**Standard power factor correction**
- Varplus² capacitor. Self-healing technology. HQ protection,
- Varlogic NRC12 PF controller. Automatic switching on/off capacitor banks

**AccuSine active filter at the source side**
- Real-time responses
- Eliminate the harmonics in high efficiency
- Improve the system reliability

**Nonlinear loads analysis**

- There are lots of devices with different features in product factories:
  - **Power center:**
    Boilers, cooling pumps, air compressor, circulating pumps, fans and etc. big capacity, lots of VSD (Variable Speed Drives) are used which result in severe harmonic pollution. That increases energy waste and affects the reliability
  - **Joint workshops:**
    Production lines motor a large number of VFD are also used which result in severe harmonic pollution. That reduces motor efficiency and safety.

**Harmonic treatment for cigarette factory production line**
Application Solution for metro

Monitoring the operation status of stations to detect the faults timely, fast response to ensure the safety and reliability of power supply.

The operation of the metro greatly depends on electric power. Indeed the large and complicated power distribution system, the frequent use of various new controlling and energy-saving equipments, increase the potential risk of power disconnection, complexity of maintenance and management. At the same time, electric bill and system maintenance cost will increase annually with the aging of equipments, which makes the task of energy saving more challenging.

Requirements

- How to ensure the safety and reliability of the complicated power distribution system, to achieve a fast response to malfunction;
- How to take effective measures to eliminate harmonic pollution to ensure high-quality power supply in a real-time manner;
- How to clearly understand the overall cost structure of power consumption at the station to apply energy saving plan and measures;
- How to effectively implement the intelligent management to improve the efficiency, lower the losses and achieve the optimization of operational cost.

Energy Management Solution

Powerlogic energy management system solution

- The lighting, elevator, HVAC and information board are the main power-consuming equipments at the metro station, whose energy consumption specially require monitoring;
- Monitoring of big loads such as fans, water pump, HVAC and elevator;
- In the station, energy consumption of rent stores need independent metering, small size kilowatt-hour meters are preferred.
- Data of mains, coupling and master switch of Category III loads can also be transferred into the central control system and power SCADA system of the metro station.

Solution for high voltage mains

ION7650 power quality monitoring meter can monitor and record in details power quality of system, conduct real-time pre-alarming and alarming in case of malfunctions, record time, accurately monitor the change of waveform and thereupon predict the trend.

Solution for low voltage mains

PM810 power monitoring meters can monitor all power parameters including harmonic, monitor and control the status of breakers.

Solution for feeders of Category I, II and III load

PM750 power meter can monitor various electric parameters and monitor ON/OFF and trip status of breakers.

Solution for sub-billing of independent rent stores

PM9C power meter + energy meter: accurate metering, DIN-rail mounted, can be installed in final low voltage box of each store for real-time energy consumption monitoring.
Benefits

- Continuous monitoring, detect any potential fault timely to avoid power cut accident;
- Continuous monitoring and control of power quality, to avoid the impact of harmonic and improve safety, reliability and efficiency of system;
- Master energy consumption of various operational sectors of metro station, easier to implement and evaluate energy-saving measures.

Nonlinear loads analysis

A large number of nonlinear loads are used at the metro station: VSD are used to improve the efficiency of fans and pumps; energy-saving lights are used to save energy at the crowded station; meanwhile there’re lots of IT equipments.

By analyzing measured data, we found the following features of nonlinear loads in metro station:

- The nonlinear loads are scattered. There is big variation of harmonic;
- The harmonic rate and frequency of different equipments are various;
  - VSD and HVAC mainly generate 5, 7, 11, 13… harmonic;
  - The lighting system and monitoring equipments mainly generate 3, 5, 7, 11… harmonic.

Power factor correction and active filter recommended solution:

**Standard capacitor + AccuSine active filter at source side**

- Power factor correction and harmonic filtering are both considered;
- Suggest to add harmonic filter at source side, since there are many scattered non-linear loads;
- Detuned capacitor (Varplus²) to mitigate harmonic and protect capacitor;
- To use active filter with neutral harmonic elimination (AccuSine 4L);
- Selection of capacitor and active filter according to the actual capacity of the transformer.

Safety, reliability and optimization of energy cost is guaranteed
Application Solution for University

The establishment of an intelligent power supply and distribution system in the university campus is the core foundation to realize a scientific and efficient management.

The university campus usually has a large area with high demand for safe electric utilization. The requirements of power availability and quality are diversified in different functional buildings. As a result, in the logistics management of the university campus, the establishment of an efficient power monitoring and energy management system with intelligence, digital and network as the core and foundation, has become more and more important.

Requirements

- How to ensure a safe and reliable power supply in such a large area;
- How to improve the management efficiency for numerous substations, realize failure forecast and fast response;
- How to ensure the continuity and high quality of power supply for important functional buildings such as laboratory buildings and the IT centre;
- How to monitor energy consumption of different departments and sectors of the university to realize independent sub-billing;
- How to plan the energy consumption to lower the cost continuously and effectively by monitoring and management.

Energy Management Solution

Powerlogic energy management system solution

- Intelligent monitoring of those distributed area substations in the campus
- Separately measuring energy consumption of various independently accounted districts or individual building
- High demand for the reliability of power supply in the key laboratories and the IT centres which need special attention.
- Energy management system transfers data via the campus network or a self-built fiber network.

ION-E Enterprise is absolutely one power monitoring software, which is based on Modbus protocol connected with gateway and design flexible customized frontpage (Chinese version), brings you innovative usual power mangagement software features such as power system diagram, waveform capture and load trend analysis in a specific report.
The accurate measurement and management of energy consumption at final low voltage level is an active and effective action of energy efficiency.

**Benefits**

- Remarkably improve the management efficiency and quality via separate monitoring and concentrated management;
- Timely detect any potential malfunctions, scientifically arrange maintenance of equipments, lower the cost of maintenance;
- Fine management with fine billing;
- Reduce the waste, limit unreasonable consumption to facilitate a continuous energy saving

**Energy sub-billing and management solution**

Due to the large area served by the power supply in the university campus, the large number of individual buildings and electrical equipments, and many uncontrollable waste result in an especially difficult management of energy consumption and high electrical bills, which potentially affects the safety and reliability of the power system. That’s why it is very important to master the energy consumption of individual sectors, improve the sub-billing and management, reduce and control energy consumption.

**Target of management**

- Monitoring energy consumption at final low voltage
- Monitoring and sub-billing of power consumption of students’ dormitories;
- Monitoring power consumption of each building and loads;
- Calculating, analyzing, monitoring and evaluating energy consumption level and abnormality of different kinds of equipments in the university;
- Finding energy saving opportunity and lower energy cost;

**Recommended solution**

1. Monitoring and sub-billing of energy consumption of dormitories and offices

DIN rail mounted single phase kilowatt-hour meters (EN40) are collectively installed in the sub-distribution panel, metering each dormitory and office one-to-one. Though remote statistics to account, charge the cost and the over cost. Such kilowatt-hour meters feature accurate measurement, small size and convenient installation.

2. Monitoring energy consumption of different loads in buildings

DIN rail mounted kilowatt-hour meters series are installed in sub-distribution box to measure energy consumption of different loads. With the gateway server (integrated management software), you can check energy consumption very conveniently with Internet explorer without any additional software.
**Energy Sub-billing and Management in Supermarket**

**Requirements**
- Data collection, analysis and storage of energy consumption
  - Energy consumption metering by categories, such as lighting, refrigerator etc.
  - Energy consumption metering by areas, especially for those with different cost allocation
- Energy consumption management
  - Data logging and analysis
  - Generation of various reports, curves and graphs
- Energy consumption trend forecast and analysis to find energy saving opportunities

**Benefits**
- Easy installation, no energy meter box needed
- Space saving, better aesthetic
- More economic
- Energy consumption analysis, efficiency control
- Energy consumption trend forecast, scientific management of energy consumption

**Sub-billing solution**

**Meters in the solution**
- For mains
  - ME4zrt energy meter, 3P + N metering
- For three phase devices
  - ME3zr energy meter, maximum current - 63A
- For single phase devices
  - ME1zr energy meter, maximum current - 63A
  - EN40P energy meter, maximum current - 40A

**Network solution**
- Pulse output for energy meter (pulse)
- Collecting the pulse (pulse-Modbus)
- Protocol conversion by gateway (Modbus-TCP/IP)

**Energy management system**
- For small system, EGX300 – the gateway server with embedded software is your best choice
- For medium-large system, ION Enterprise is your best platform for energy management
Energy sub-billing and management in commercial buildings (office building and shopping center)

Requirements

- Clear understanding of energy consumption in the building
- Energy consumption metering by categories, such as lighting, pump, HVAC etc.
- Energy consumption metering by areas, such as independent shops, rented offices ect.
- Energy consumption data logging, analysis and management
- Generation of various reports, curves and graphs
- Monitoring and analysis, evaluate energy consumption level per area
- Energy consumption trend forecast and analysis

Benefits

- Compact size, easy installation
- Detailed reporting management functions
- Support OPC, share data with other system

Sub-billing solution

Meters in the solution

- For mains
  ME4zrt energy meter, 3P + N metering
- For three phase devices
  ME3zr energy meter, maximum current - 63A
- For single phase devices
  ME1zr energy meter, maximum current - 63A
  EN40P energy meter, maximum current - 40A
- Metering for areas with independent cost allocation
  ME3zr energy meter, maximum current - 63A
  ME1zr energy meter, maximum current - 63A
  EN40P energy meter, maximum current - 40A

Network solution

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