

Water Wastewater Application Guide

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Water Wastewater Competency Center

Drawing the complete package starts with the right partner

Outdated facilities. New environmental standards. Growing demand. Rising costs. Limited budgets. Just a few of the daunting challenges you're up against in the water wastewater industry.

What you really need is a partner you can count on. A single source you can turn to for all your power, control and automation needs. A team of experts who truly understand the unique demands you face every day. A complete solution designed to address the issues that matter most to you.

Complete Solutions

Our customers look to us for complete solutions, starting with end-to-end planning and design capabilities, and integrating a full range of high-performance power and control products, backed by unsurpassed 24/7 service and proven in treatment plants across the country.

That's why we created the Water Wastewater Competency Center. It brings together a dedicated team of water wastewater experts from all disciplines – including application and quotation specialists, design engineers, project managers and more – to improve nearly every aspect of your operation.

With the Square D® and Telemecanique® brands, we offer an all-encompassing range of innovative products and services built to take on your toughest projects. And they're guaranteed to work together, from concept to commissioning.

The results: seamless integration and operation, greater reliability and safety, more accurate bids, centralized product coordination and comprehensive documentation. Performance. Expertise. Integration. Support. Only from Schneider Electric.

For more information, contact the local sales office or visit www.SquareD-Water.com.



Our application engineers work with your specifications and drawings to create a solution of proven products, guaranteed to work. Together.



Good water quality starts with reliable power. We've been meeting that demand for more than 100 years.

With Schneider Electric, you get total and seamless electrification:

- PLCs
- Pump controllers
- Soft starts
- Safety switches
- AC drives
- Active filters
- MCCs
- MetalClad switchgear
- Combo starters
- Circuit monitors
- SCADA systems
- Substations



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Who We Are

We Are Schneider Electric

After more than 160 years in business in 130 countries, Schneider Electric is the world leader for a unique blend of power distribution, automation and control products, and services—perfectly suited to the demanding world of water and wastewater applications. Led in North America by the Square D® brand, Schneider Electric offers end users, consultants, integrators, original equipment manufacturers (OEMs), and contractors a complete selection of automation, power, service, and maintenance repair order (MRO) offerings. Then, we add this expertise into a total solution with our Telemecanique® automation and control products, including our world famous Modicon® programmable logic controllers (PLCs).

Our products are designed and manufactured to the highest standards and are guaranteed to work together: from power to process and from concept to commissioning, ensuring flawless integration and operation. We can even retrofit and upgrade your existing installations, giving new life to old equipment and meeting the latest regulatory requirements with the latest technology—all at a fraction of the cost of new equipment.

Choosing Schneider Electric ensures our customers unrivaled benefits. Because our power components are guaranteed to be compatible with our automation and control components, projects that incorporate both benefit from reduced risk, unexpected delays, and integration hassles. Our in-house execution specialists deliver another benefit: reduced cycle times from order to shipment, allowing even fast-track projects to proceed on time and on budget.

Our power and control solutions, including workhorses such as switchgear and intelligent motor control centers, are famous for delivering unsurpassed reliability and cost-efficient operation. Today, they are available web-enabled, delivering power system information through your existing Ethernet environment. With Transparent Ready® web-enabled equipment, you can extend your reach to your most remote facilities.

We Are the Water Wastewater Competency Center (WWCC)

The experts at the Water Wastewater Competency Center offer unmatched insight on the industry, gained at leading treatment facilities around the world.

From the outset, we work closely with you to design systems that fit your specific requirements. Our quotation specialists have the training and background to understand the unique challenges of your operation. Together with our power engineering consultants and application engineers, we'll perform an in-depth assessment that identifies ways to improve efficiency and safety while reducing costs.

There is no reason why the shop drawing approval process has to be so difficult. Our order and application engineers understand the information consulting engineers require on approval drawings. This is why we have great success on first pass shop drawing approvals. This also helps speed up the construction time on projects.

As construction begins, our project managers step in. They make sure all equipment is properly installed and ready to perform. You can count on our factory-trained technicians to be there for every step along the way, from start to finish—including providing diagnostics, testing, and training.

We can also retrofit and upgrade your installation to optimize existing equipment. Our application experts can show you how to reduce downtime, minimize costs, comply with emerging industry best practices, and meet the latest regulatory requirements with the latest technology. This systematic approach to upgrades and retrofits is the key to extending the life of your equipment—at a fraction of the cost of replacement.

We engineer our processes with the same precision as we engineer our products. Plus, we provide you with full documentation, a detailed plan for maintaining and upgrading your systems, and a strong local service and support team. All work together to make sure you're completely satisfied.

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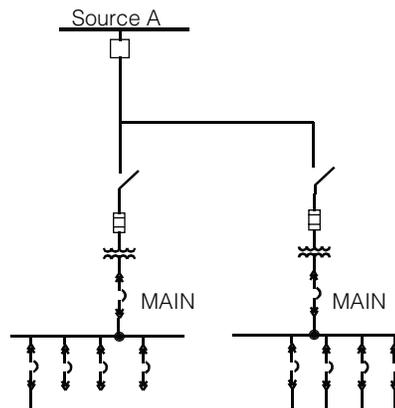
Power System Types

Power System Types

It is most important to determine the type of power system that will work for your facility before choosing the power products for your facility. Several different power system types can be found in water and wastewater treatment plants. We have included advantages and disadvantages of these system types based on what is important over the life of a power system. Water and wastewater facilities may have the exact or a combination of these systems types from medium voltage (27 kV, 15 kV, and 5 kV) down to the 480 V level. While cost can be a primary concern, reliability, expandability, operation, and maintenance should be high on the priority list as indicated in these system types.

Radial System

This is the simplest system to operate and has the lowest first cost. It is also very easy for maintenance personnel to understand. The primary switchgear can either be metal-clad circuit breakers or metal-enclosed load interrupters with fuses. The system has downtime for faults and maintenance. Source A is considered a single-point-of-failure. If source A is lost, the entire system is lost.



Advantages

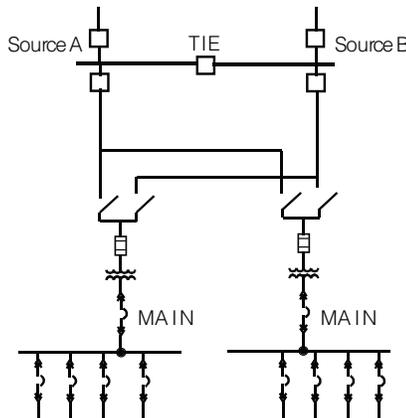
- ❑ Low first cost
- ❑ Simple operation and easy for personnel to understand
- ❑ Easily expanded

Disadvantages

- Reliability
- Maintenance
- Downtime

Primary Selective

Feeder cable failures to the primary of a substation are a source of operation downtime. To increase reliability, two cable sources to each substation are used. A duplex medium voltage switch utilizes two load interrupter switches with a common loadside connection feeding a single set of fuses to the transformer. Switches are usually key interlocked to prevent closing both switches at the same time.



Advantages

- ❑ Protection against loss of primary source
- ❑ Possible paralleling of sources

Disadvantages

- Additional cost of cable and equipment
- Downtime during switchover to other sources

Secondary Selective

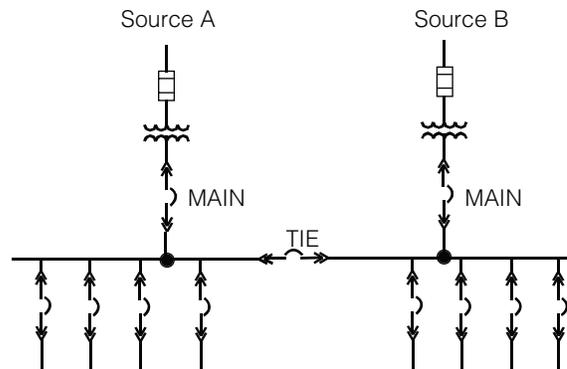
Transformer failure can cause extended downtime. The secondary selective system allows the transfer of load from one transformer to the other with the use of the tie circuit breaker. This is important if one transformer fails or needs maintenance. Transfers are usually performed manually with key interlocks so that the switchgear cannot be paralleled to both sources. Automatic transfer schemes can be used to limit downtime. Transformer sizing is critical if all secondary loads are to be serviced from one transformer. This is usually accomplished by either loading the transformers to 50% or by using the transformer forced air (fan) rating with temperature controllers.

Advantages

- ❑ Normal operation as radial system
- ❑ Isolation of cable or transformer for faults or normal maintenance
- ❑ Feed other side with use of the tie circuit breaker
- ❑ Main and tie circuit breakers can be interchanged for maintenance

Disadvantages

- Additional cost
- Transformer load monitoring



Primary and Secondary Selective

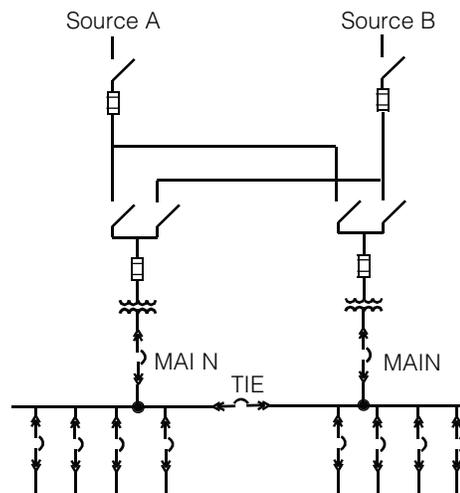
This system combines the advantages of both primary and secondary selective. It not only provides the most reliable system, but also the most costly system. Evaluation of total downtime costs will be necessary to justify the additional first cost.

Advantages

- ❑ High reliability
- ❑ Combined advantages of both systems

Disadvantages

- Higher initial cost



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One-Line Diagram of a Wastewater Treatment Plant

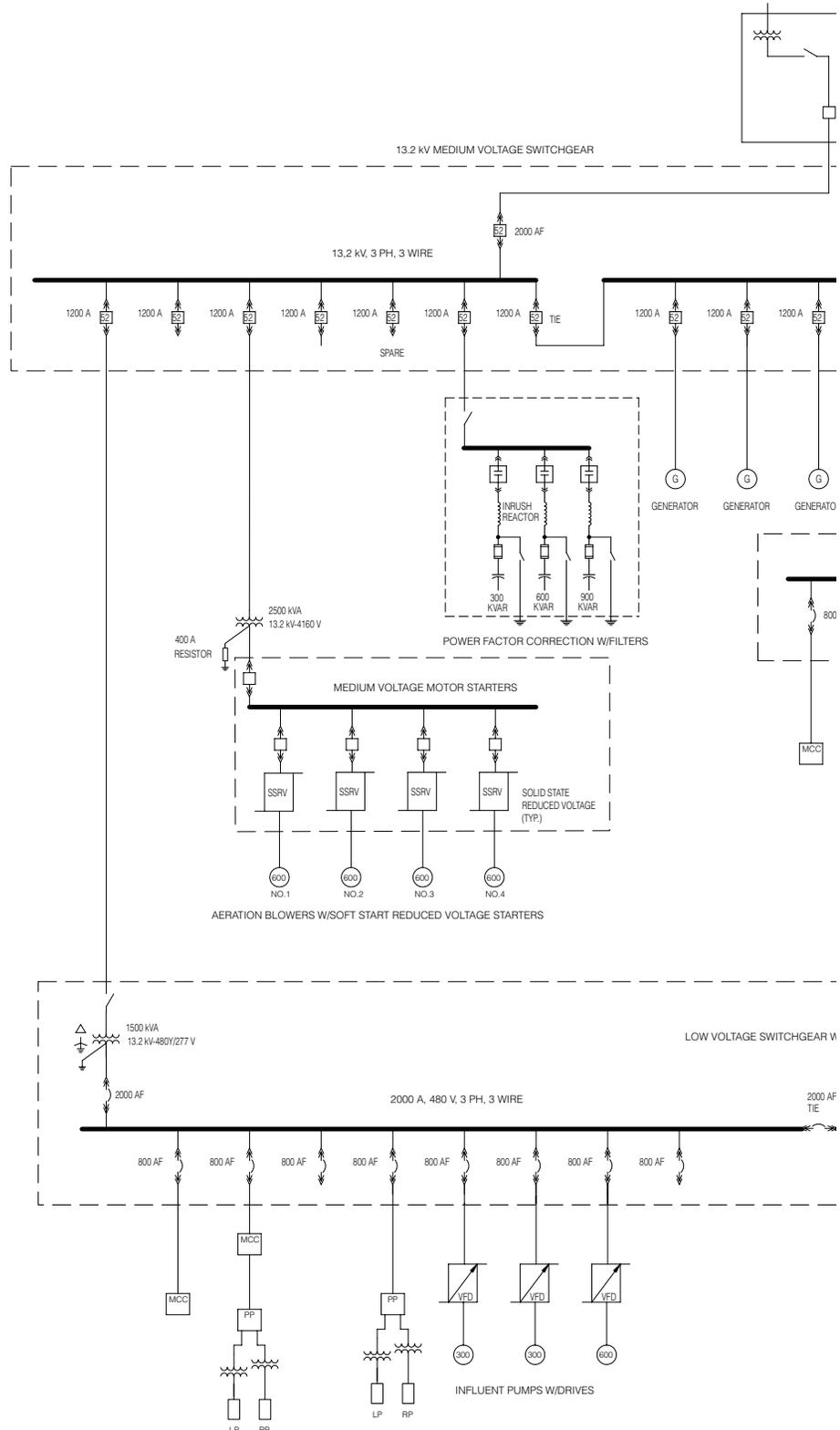
One-Line Diagram of a Wastewater Treatment Plant

Advantages

- ❑ Generator backup to service the entire facility in case of natural disasters such as high winds or ice storms
- ❑ Power factor correction capacitor with filters to reduce electric bill from penalties and to eliminate capacitor failures from switching in parallel
- ❑ Low resistance grounding of 2500 kVA transformer for 5 kV motor control center (MCC) starters reduces fault current to minimize equipment damage
- ❑ 480 V, 3-phase, 3-wire, switchgear to service loads. The neutral is not carried throughout the system because 277 V line-neutral loads do not exist. This saves on equipment cost and helps with coordination of ground fault systems

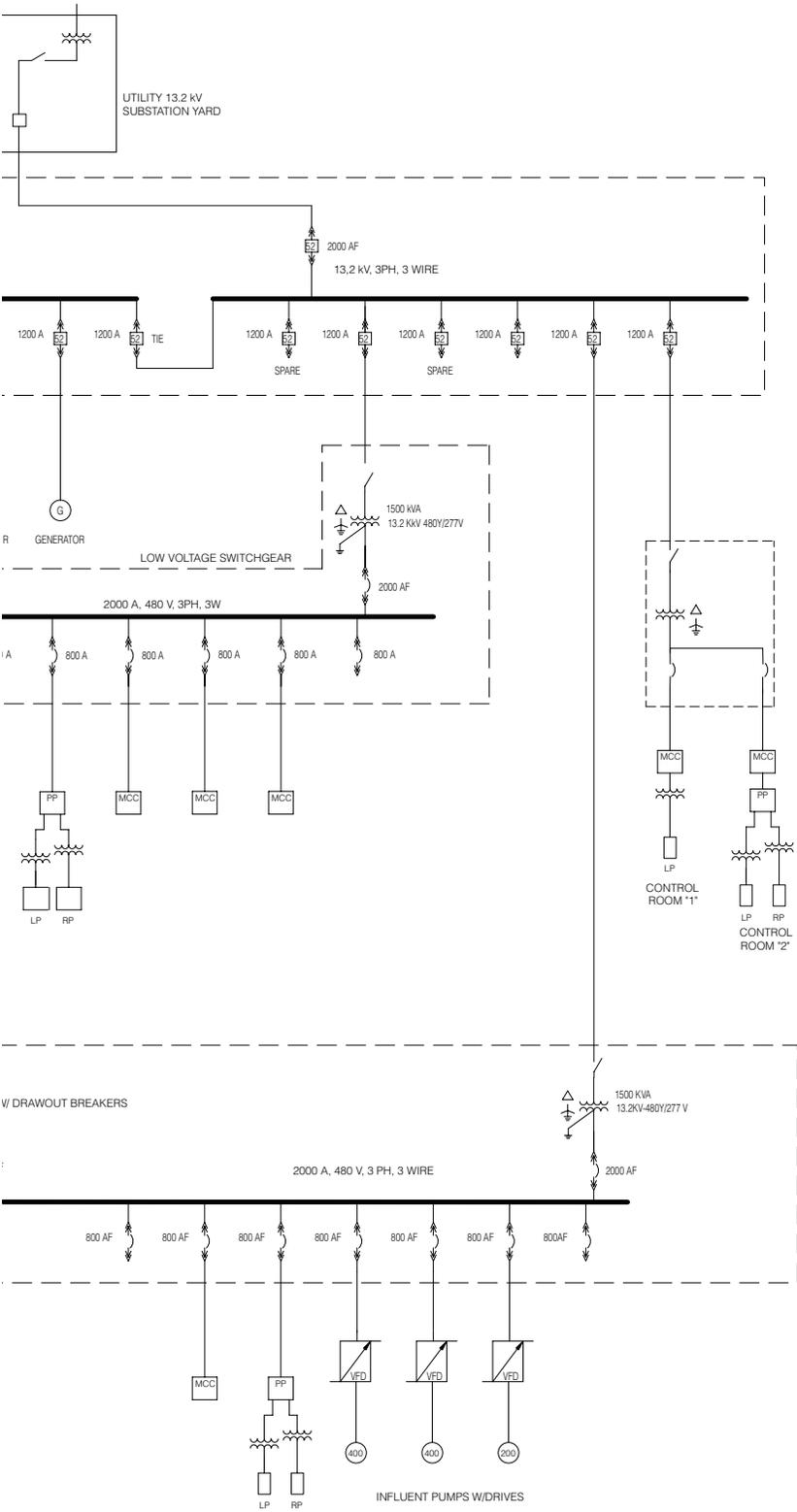
Disadvantages

- All generators are connected to same medium voltage (MV) bus. A fault on this medium voltage bus renders them all useless until repairs are completed
- The MV MCC has to be shut down to perform maintenance on the 2500 kVA transformer



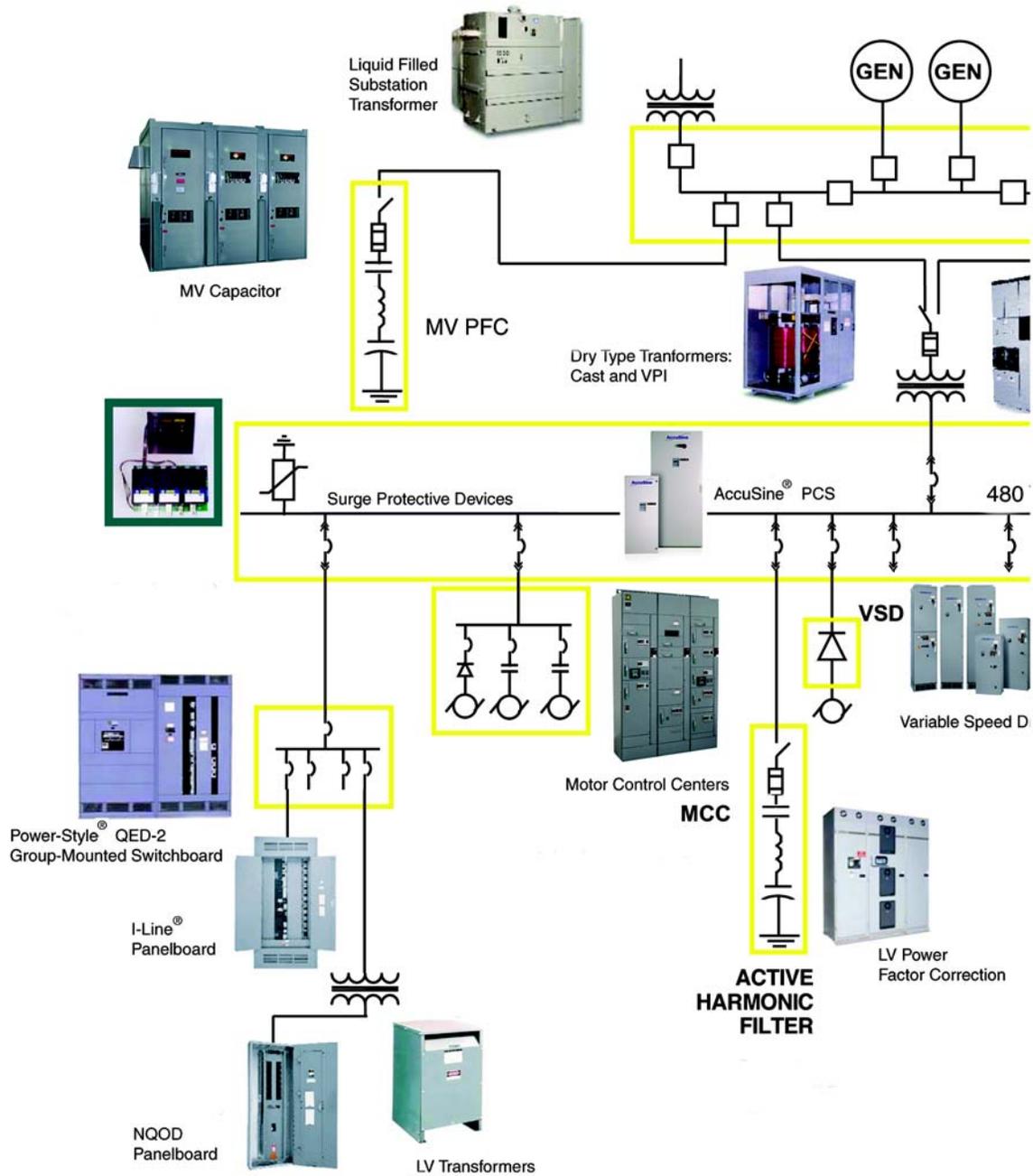
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One-Line Diagram of a Wastewater Treatment Plant



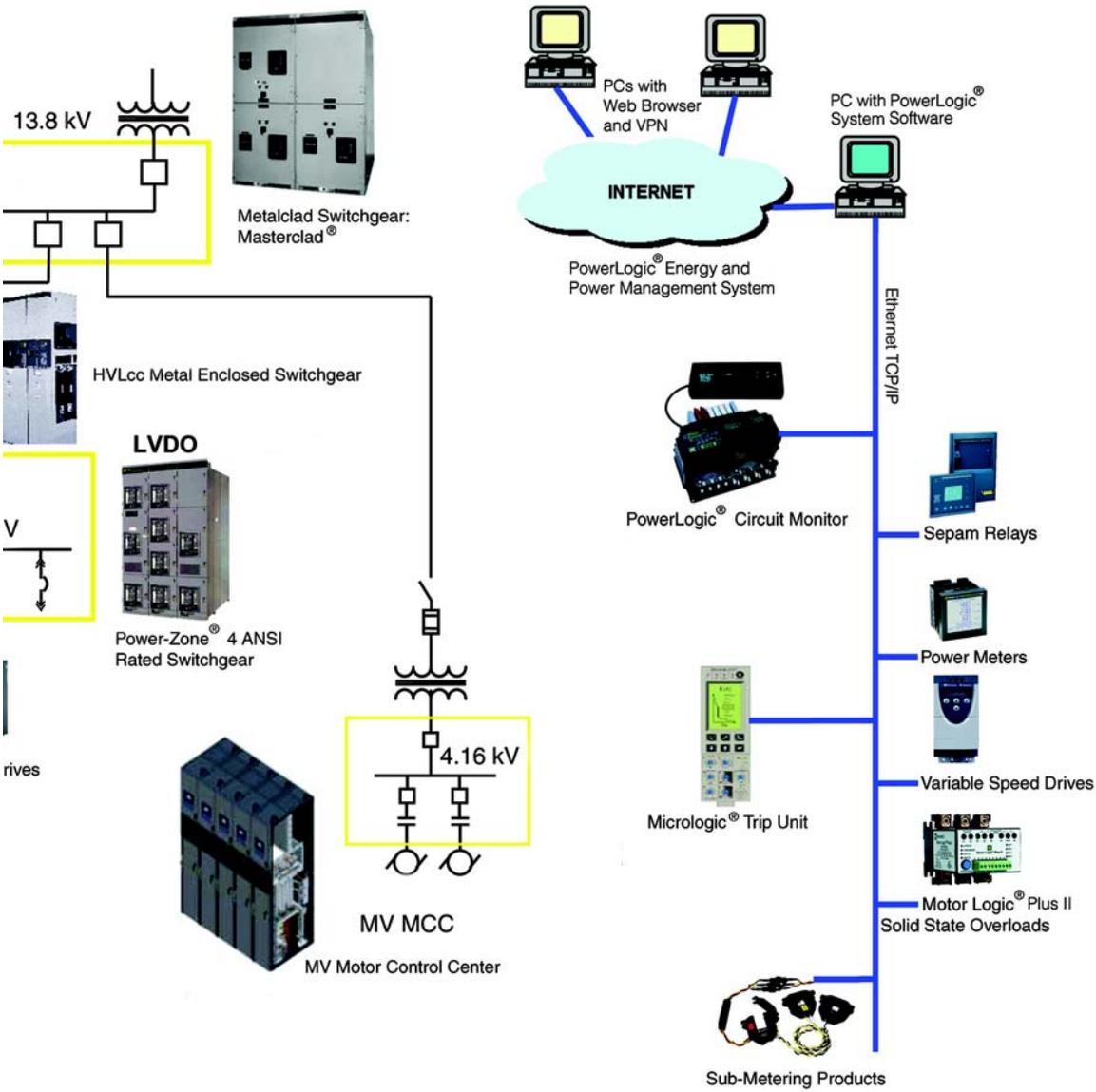
This system design includes radial, primary, and secondary selective systems. The power system is very reliable with two utility sources, generators on the medium voltage bus, and secondary selective 480 V switchgear at the bottom. With the use of the tie circuit breaker, the 13.2 kV and 480 V switchgear can be serviced from either utility source or transformers if a transformer or incoming cable failed. This same scenario can be used if maintenance has to be performed on the equipment.

Typical Product One Line Diagram



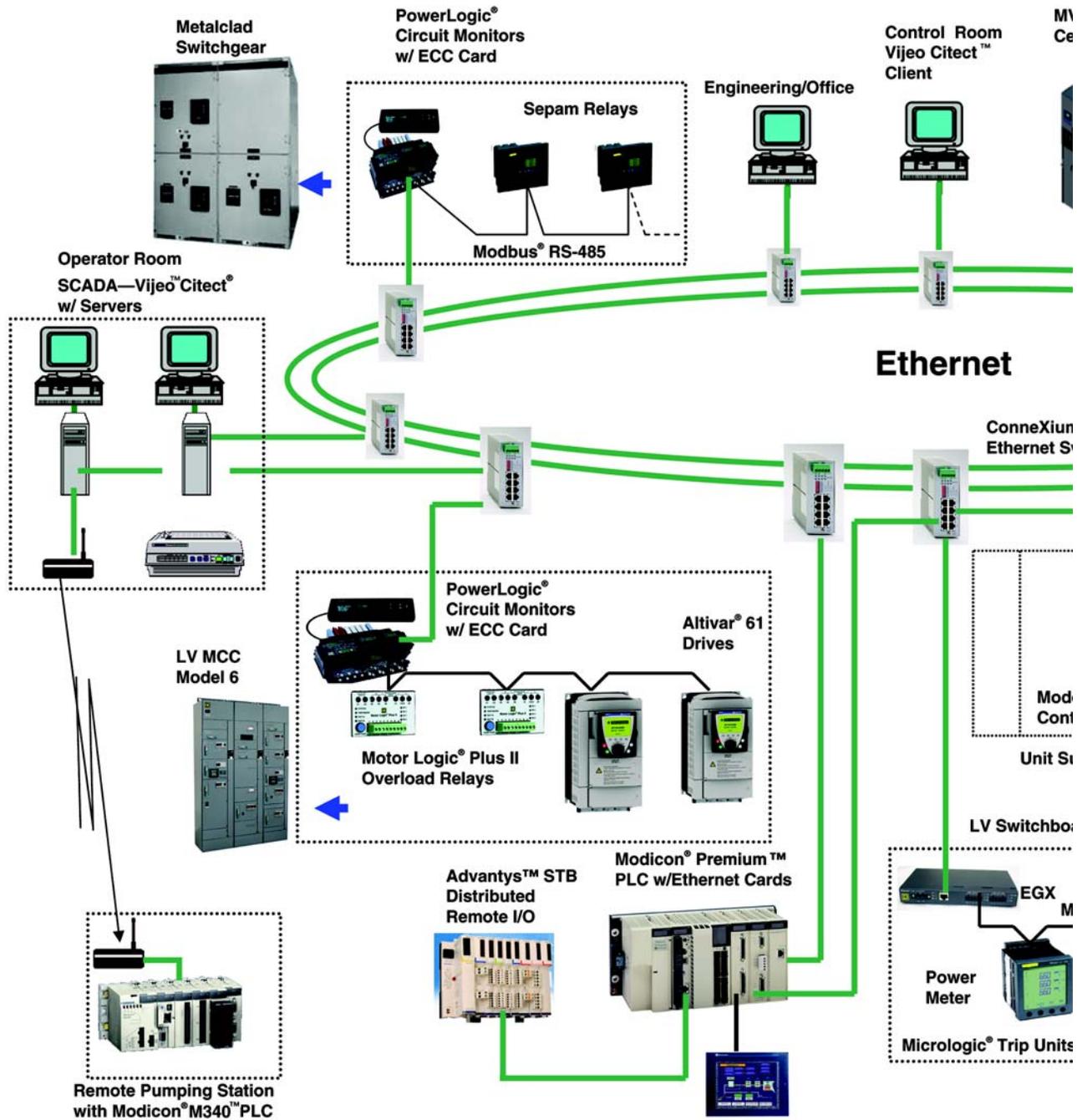
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Typical Product One Line Diagram



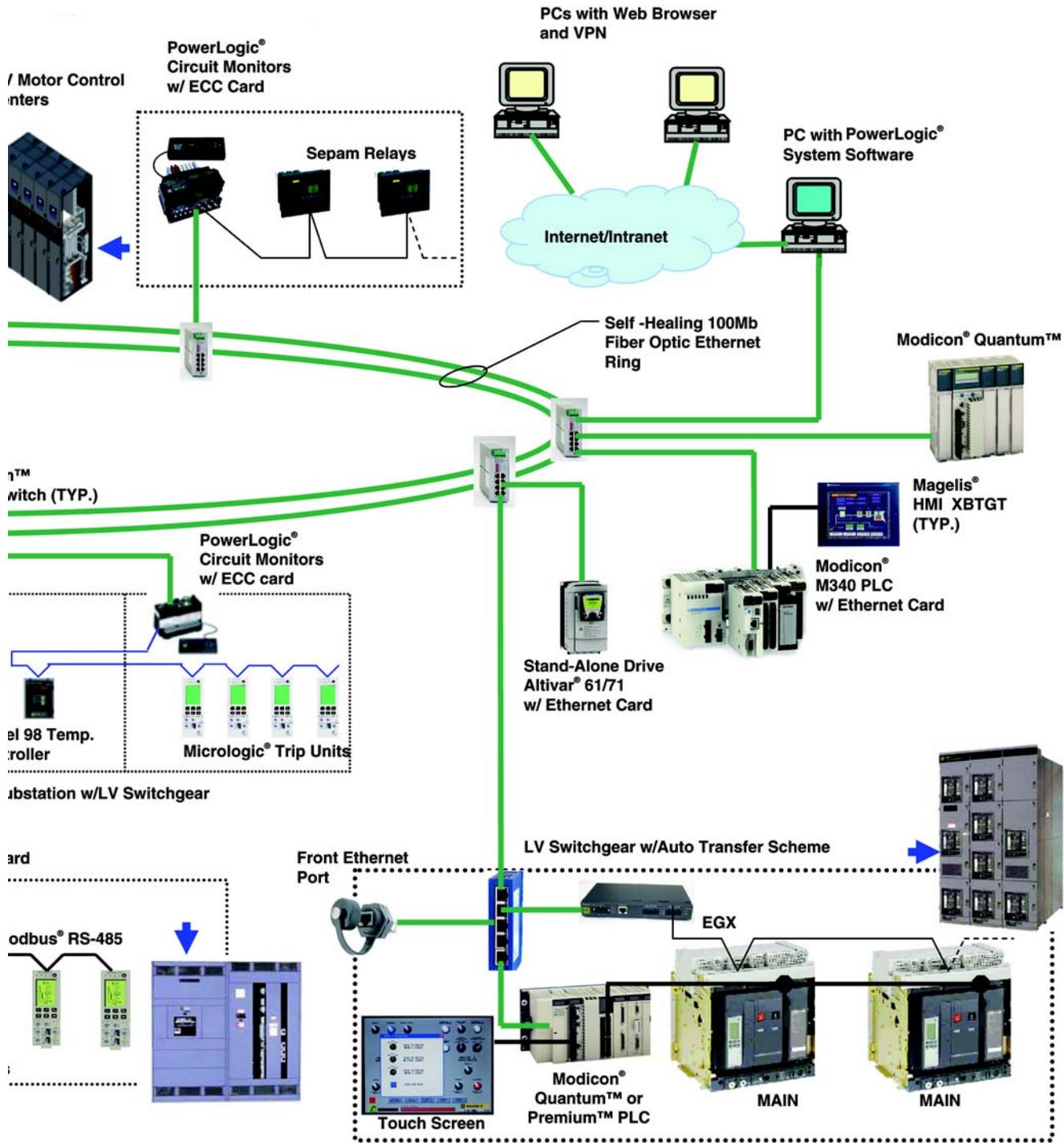
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 Ethernet Communication Diagram

Ethernet Communication Diagram



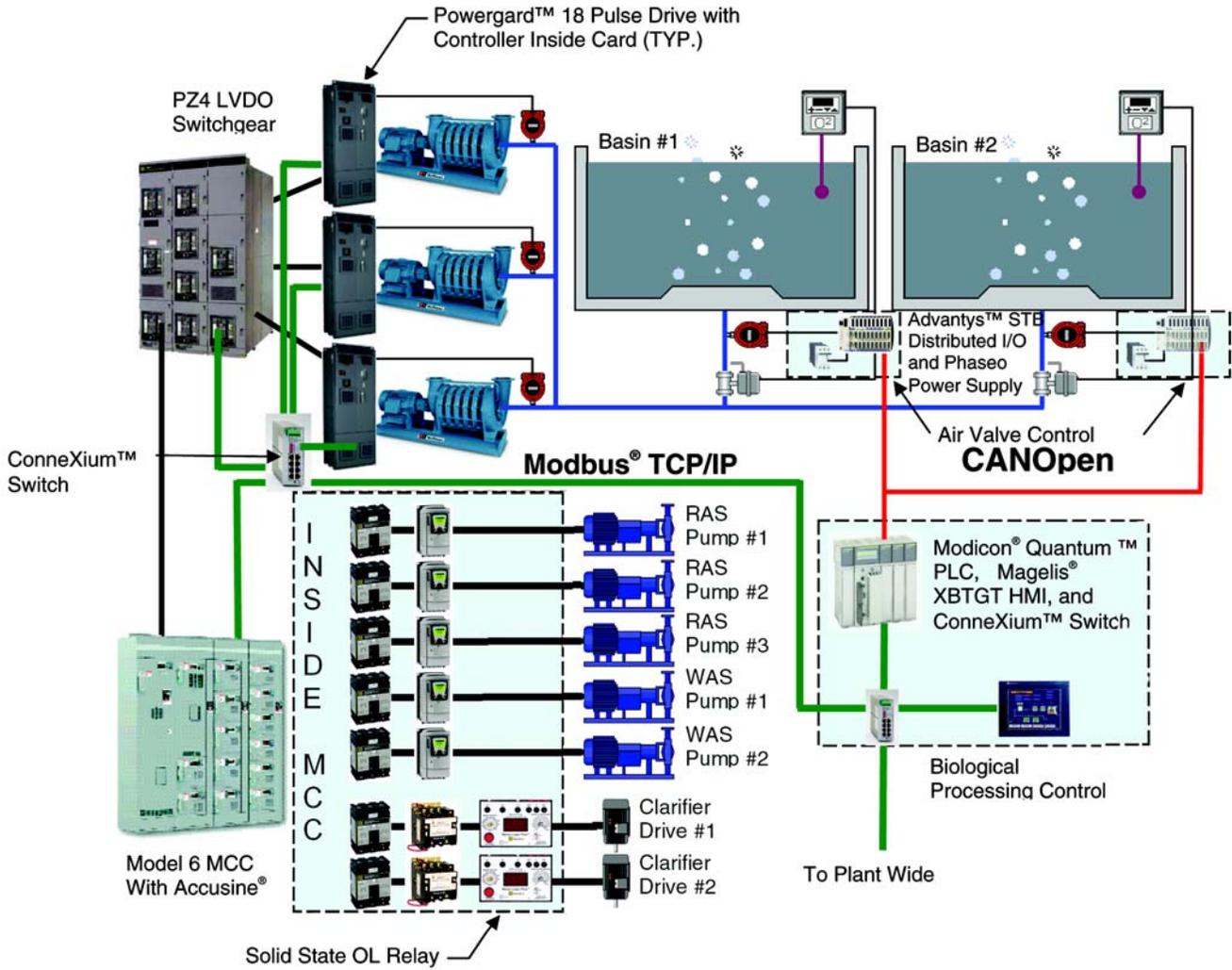
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Ethernet Communication Diagram



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Typical Biological Processing Diagram

Typical Biological Processing Diagram



Medium Voltage (MV) Product Offerings

Masterclad® Metal-Clad Switchgear

Features

Standard features (as defined by ANSI C37.20.2):

- ❑ Removable (drawout) circuit breaker
- ❑ Fully compartmented construction
- ❑ Grounded metal barriers
- ❑ All live parts enclosed
- ❑ Automatic shutters
- ❑ Insulated bus
- ❑ Mechanical interlocks
- ❑ Disconnect type transformers—control power transformer (CPT) and voltage transformer (VT)
- ❑ Grounded breaker truck in and between test/disconnected and connected positions
- ❑ Low voltage instrument/control compartment isolated from primary voltage areas

Masterclad® medium voltage switchgear is used in a wide variety of switching, control, and protective applications including municipal pumping stations, water treatment, and wastewater treatment plants. Masterclad switchgear offers a standard two-high circuit breaker arrangement incorporating a series of basic modular units, control packages and instrumentation that can be assembled in combinations as needed to satisfy your application requirements. Typically, this product is used to distribute medium voltage throughout facilities to various building locations to feed 5 kV and 480 V transformers or large motors. Distributing medium voltage throughout facilities is more cost effective than distributing it at voltages 600 V and below when far distances are encountered.

This class of switchgear protects transformers, motors, generators, capacitors, distribution lines and feeder circuits. Significantly, most of the Masterclad switchgear specified for these applications is relied upon to provide the critical main service entrance protection and controls.

Benefits

- Long life and minimum maintenance: This vacuum interrupter design is capable of 20 to 100 full fault operations (varies by ratings). Total fault clearing time is three cycles. This is the fastest in the industry and reduces voltage sags on the system.
- Safety barriers and interlocks: Full compartmentalization is supplied with primary functions separated by grounded metal barriers. All bussing is insulated, and live parts are not exposed. Safety interlocks work with the circuit breaker racking system. These protective features provide safety for operating personnel.
- Circuit breakers can withstand various levels of commissioning, which involves many switching operations.



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Medium Voltage (MV) Product Offerings

Arc Terminator Metal-Clad Switchgear

Features

- ❑ Sensors are used to detect arcs in medium voltage switchgear
- ❑ The system initiates the closing of a high-speed vacuum switch if an arc is detected via the electronic control unit
- ❑ Two sensing inputs: are used:
 - Optical sensors detect arcing faults
 - Current transformers are used to detect any change in current (both input events must occur together to operate the high-speed switch)
- ❑ The system can be shipped with any new switchgear lineup
- ❑ It is easy to install and operate: no settings or other calculations required during switchgear installation
- ❑ Switchgear protective relaying functions are coordinated to provide maximum protection with the addition of the Arc Terminator system

Medium voltage switchgear can have an additional degree of protection from damaging open arcing faults with the Arc Terminator arc extinguishing system. This system detects and controls the effects of arcing faults. It extinguishes arcs rapidly, significantly minimizing equipment damage and reducing equipment downtime.

How It Works

The Arc Terminator system confines the effects of an arcing fault to the point of initiation. When an arc is detected, a high-speed vacuum switch closes, effectively crow-baring the short circuit. This action creates a solid conducting path for the current parallel with the arc. The open burning arc is extinguished, preventing the buildup of damaging pressures.

The energy released by the arcing fault is significantly reduced. The electronic control requires two sensing inputs: (1) optical sensors to detect arcing faults, and (2) current sensors to detect changes in the current waveform.

An indicator on the junction box (which serves as a collector for the optical inputs) points to the compartment where the arcing fault occurred, making it easy to pinpoint the location of a fault and repair the problem quickly. Once the cause of the fault has been fixed, the system is ready to be reset and returned to normal operation. For critical applications, such as large hospitals and healthcare complexes this means less downtime.

Benefits

- The Arc Terminator system confines the effects of the arc to the point of initiation.
- It enhances protection by detecting and commuting arc fault current.
- It extinguishes high magnitude arc currents within less than 1/4 of a cycle and prevents the buildup of high internal pressures, protecting the equipment from extreme damage and limiting downtime.



Metal-Enclosed Switchgear

Features

- ❑ 2.4–38 kV switching, control, and overload protection
- ❑ Smallest footprint in the industry
- ❑ Compartmentalized construction
- ❑ Low maintenance
- ❑ Fault-making grounding switch (optional)
- ❑ Front access
- ❑ FuseLogic™ system

Metal-enclosed (fusible) switchgear is generally used as a cost-effective way to distribute medium voltage throughout water and wastewater facilities, or most often used for protecting medium voltage transformers that service low voltage switchgear. This equipment is ideal for applications where high duty cycle operation (switching) is not required.

There are several things you want when you're selecting medium voltage switchgear, including cost-saving flexibility, safety-focused design, high reliability, and low maintenance. If you've been searching the metal enclosed switchgear market for these performance advantages, you know that they're difficult to find.

HVL/cc switchgear gives you clear and impressive performance advantages in the 2.4 kV to 38 kV range with ANSI ratings that far surpass anything in the market for a wide range of applications. Full switchgear range is standard UL listed out of factory.

We've taken these goals further with HVL/cc medium voltage metal enclosed switchgear. No other medium voltage metal enclosed switchgear on the market offers these advantages. When you make the comparison based on installation simplicity, performance and total cost of ownership, HVL/cc switchgear becomes the clear choice for system protection and reliability. Its exclusive operational features offer a higher level of system protection, yet it also incorporates innovative design features that reduce the risk of costly maintenance problems.

Features Details

- 2.4–38 kV switching, control, and overload protection are ideal for water and wastewater applications. Improving reliability and performance are the primary goals of switchgear in any switching, control or protective application.
- It is the smallest footprint in the industry (approximately one-quarter size of traditional medium voltage metal enclosed switchgear). This makes it ideal for retrofit applications requiring increased load or duplex switches. The compact footprint fits easily through standard doorways.
- Compartmentalized construction: The fuse/cable compartment is isolated from the main bus, while the main switch contacts are housed in a sealed interrupter.
- Low maintenance: Sealed for life interruption saves time and expense with maintenance-free main contacts and ground switch contacts. This prevents switch contamination, especially in harsh environments.
- The fault-making grounding switch (optional) prevents access to "hot" fuse/cable compartment with mechanical interlock.
- Front access eliminates the need for service space behind the switchgear.
- The FuseLogic system provides single-phase protection and blown fuse indication. This protects downstream motors from overheating due to negative sequence currents.



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Medium Voltage (MV) Product Offerings

Motorpact™ Medium Voltage (MV) Motor Control Centers (MCCs)

Features (Optional)

- ❑ Added personal protection can be provided with our arc resistant enclosures
- ❑ The load grounding switch is capable of closing into 5000 A, which can help eliminate the need for ground bails and straps

Motorpact medium voltage motor control centers are normally used to supply and protect large blower, lift, transfer, and service pump motors that are 200 hp and above in water and wastewater facilities. Feeding large motors with lower voltages (480 V) becomes cost prohibitive because equipment sizes get very large, limited, or unavailable. Also, multiple sets of conduit and cable are needed. Motorpact MCCs are designed and manufactured to meet your power and process control challenges. Our motor controllers feature industry-first innovations that provide unmatched performance, high reliability, low maintenance, and exclusive technologies.

Motorpact motor controllers offer the smallest footprint in the industry, providing the greatest value per square foot of space. Plus, it offers more efficient energy handling capability than others in its class.

Transparent Ready® Motorpact motor controllers allow you to view meter readings in real-time, without having to walk the entire facility. And, you can access a running minimum/maximum history, which can help you spot abnormal conditions.



Full Voltage (FV) Controllers

This type of controller is used for full-voltage starting and stopping of AC motor applications at 2300 V and above.

Benefits

- Contactor ratings of 200 A, 400 A, 450 A, and 720 A to more closely match your load requirements
- Motor overload and short-circuit protection in one package
- Incoming line connection
- Control power transformer (115 V secondary)
- Magnetic three-pole vacuum contactor (mechanically latched types are also available)
- Run-test circuit
- Green “OFF” pilot light
- Red “RUN” pilot light
- Start and Stop push buttons

Water Wastewater Application Guide

Medium Voltage (MV) Product Offerings

Reduced Voltage Autotransformer (RVAT) Controllers

This type of controller is typically used to start very large motors that may cause a voltage drop on the rest of the power system. It also helps with reducing the size of medium voltage transformers needed for these applications.

Benefits

- Is available from 2300 V to 7200 V, with ranges up to 5000 hp
- Provides the highest torque per ampere of line current
- Features an inherently closed transition type, to full voltage running
- Provides voltage taps, which permit the adjustment of starting voltage. This allows you to adjust the starting voltage to suit the system capabilities and limit voltage sags on the power system
- Has acceleration times up to 30 seconds for medium duty, making it suitable for a long starting period
- Has optional heavy-duty auto-transformers available for applications requiring acceleration times greater than 30 seconds

Reduced Voltage Soft Start (RVSS) Controllers

This type of controller is typically used to start large motors that have special load conditions such as eliminating water hammer in difficult pumping applications.

Benefits

- Is a pre-engineered, integrated motor control package for reduced voltage starting and soft stopping
- Allows you to fine-tune the starting parameters to meet a wide variety of unique load conditions and to prevent voltage sags on the power system
- Provides a better alternative to traditional reactor or auto-transformer type reduced voltage starters
- Offers standard and custom curves for greater flexibility, such as providing acceleration and deceleration options that are independent of each other
- Provides a fully rated bypass contactor as standard
- Reduces voltage drop on the system while starting
- Allows the use of smaller medium voltage transformers for this application



FV Controller

RVAT Controller

RVSS Controller

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Medium Voltage (MV) Product Offerings

Medium Voltage (MV) Transformers

Schneider Electric offers a full range of medium voltage transformer products. All transformers are manufactured in Industry Standards Organization (ISO) certified facilities that ensure the highest quality products are provided. They are built and tested to applicable American National Standards Institute/Institute of Electrical & Electronics Engineers (ANSI/IEEE), Canadian Standards Association (CSA), and National Electrical Manufacturers Association (NEMA) standards. Our products are available with Underwriters Laboratories® (UL) listing.

We offer highly efficient, standardized designs, including optional low loss TP1 designs. The product scope includes liquid-filled, dry-type (PowerDry™ II), and two versions of our premium cast coil design (UniCast™ II and Power-Cast® II).

Liquid-Filled, Pad-Mounted MV Transformers

Product Description

- Is available from 45 kVA to 20,000 kVA
- Uses primary voltages from 2.4 kVA to 46 kV, 250 kV below insulation level (BIL) maximum
- Has secondary voltages up to 25 kV
- Utilizes mineral oil and less-flammable seed oil

Liquid-Filled Substations

Product Description

- Is available from 112.5 kVA to 20,000 kVA
- Uses primary voltages 2.4 kVA to 69 kV, 350 kV BIL maximum
- Has secondary voltage up to 34.5 kV, 200 kV BIL maximum
- Utilizes mineral oil, silicone, and less-flammable seed oil

Features

- ❑ Transformers are designed, manufactured, and tested to Square D specifications, ensuring the highest quality in the industry
- ❑ MV transformers are available with UL Listing
- ❑ Liquid-filled transformers are available with factory mutual (FM) label
- ❑ All products meet or exceed applicable ANSI/IEEE standards
- ❑ Square D® brand transformers are manufactured in ISO9001 certified facilities (the most comprehensive standard in the internationally recognized ISO9000 series)



Liquid-Filled, Pad Mounted Transformer



Liquid-Filled Substation

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Medium Voltage (MV) Product Offerings

Power-Cast II™ MV Transformers

Product Description

- Is available from 112.5 kVA to 13,000 kVA
- Uses primary voltages from 2.4 kV to 46kV, 200 kV below insulation level (BIL) maximum
- Has secondary voltage up to 15 kV
- Aluminum windings available
- Forced air provides 50% overload
- Requires no pre-drying before energizing



UniCast II™ MV Transformers

Product Description

- Is available from 112.5 kVA to 3,000 kVA
- Uses 600 V secondary
- Copper windings available
- Forced air provides 33% overload



Power Dry II™ MV Transformers

Product Description

- Is available from 112.5 kVA to 13,000 kVA
- Uses primary voltage 2.4 kV to 35 kV, 150 kV BIL
- Uses secondary voltage up to 15.0 kV
- Forced air provides 33% overload



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Medium Voltage (MV) Product Offerings



Model III Packaged Unit Substation

Combining a primary switch, dry-type transformer, and I-Line[®] distribution section into a single unit, the Model III packaged unit substation is the smallest footprint in the industry. The compact size of this product makes it ideal for servicing remote control or maintenance buildings in water and wastewater facilities where real estate is at a premium. The Model III packaged unit substation can be used in retrofit applications requiring increased electrical demand, as well as new construction requiring multiple zones.

- Has top fed units (37.50 inches (953 mm) deep and 90.00 inches (2286 mm) high) that allow the entire substation to pass through standard-size single doorways and narrow hallways.
- Is available from 75 kVA to 1000 kVA, with three-phase primary voltages of 2400 V to 13800 V

Benefits

- ❑ Economical advantages can be attained when monetary incentives, such as power factor penalty are enforced
- ❑ Adding caps to a power system causes the voltage to rise, providing voltage support when starting large motors
- ❑ When capacitors deliver reactive power, the current on the power system is reduced, allowing additional loads to be added to distribution equipment and transformers. Then, released capacity (kVA) on transformers is achieved
- ❑ Reduced current decreases I^2R losses on power system equipment and cables, allowing them to operate more efficiently and cost effectively

Medium Voltage Power Factor Correction Capacitors

ReactiVar[®] metal enclosed medium voltage capacitor systems from Schneider Electric provide power factor correction, harmonic filtering, and voltage regulation. Depending on the specific application issues and level of harmonic content in the network, fixed, standard (MV5000), anti-resonant (MV6000), and filtered (MV7000) capacitor systems are available up to 20 MVAR at 15 kV. Large water and wastewater power users (over 5 MW) can benefit from centralized medium voltage compensation of power factor and harmonics.

Medium voltage solutions usually require lower initial capital expenditures (\$/kVAR) than low voltage solutions to address the most common power quality problems.

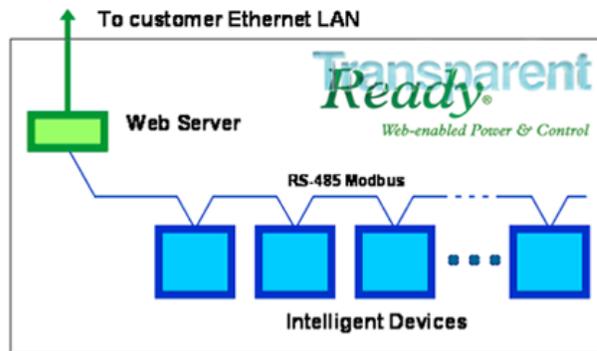


Energy and Power Management

A typical water and wastewater facility utilizes networks for building management and supervisory control and data acquisition (SCADA) systems while operating an interoffice or corporate Ethernet information network. Many times, these networks employ different communication protocols, as well as different physical wiring and interface equipment. Each of these systems provides critical information for efficient facility operation, but blocks interoperability of the separate systems. Managing separate networks for each facility system requires resources, experience, extensive support, and continuous training. These activities increase operating costs and decrease facility efficiency and reliability.

Schneider Electric's policy for networks is based on open standards in order to ensure open connectivity for our customers. The Transparent Ready® family of products emphasizes Ethernet and web technologies (TCP/IP, HTTP, XML, etc.). Modbus®, a defacto protocol standard in many markets, continues to play a central role in our network policy as the main messaging protocol, whether it's at the Ethernet level over TCP/IP ("Modbus TCP") or over RS-485 multi-point communications ("Modbus RTU" or "Modbus serial").

Implementing web technologies on Ethernet provides an extremely flexible communications infrastructure. Utilizing common technologies and infrastructure allows shorter design cycles, lower implementation costs, lower maintenance costs, and provides for continuous process improvement. Utilizing the power of Web technologies like TCP/IP provides an open path to information and control systems on a facility's existing Ethernet network. This approach provides all the benefits of a secure and deterministic architecture without locking into proprietary networks and protocols. Combining those benefits provides unmatched real-time control and open access to critical systems information without the restrictions of proprietary environments or the threat of implementing a field bus that may not exist in a few years. Water and wastewater managers can fully integrate data from many systems within their facilities and be able to better manage their efficiencies.



Merlin Gerin
Square D
Telemecanique

Main Swbd (TRE2)

Home Documentation [logout](#)

Monitoring | Control | Diagnostics | Maintenance | Setup

Single Device Pages
Select a device v

Circuit Summary

6-1-2007
15:13:15

Circuit	RMS Current (Amps) 3-phase Avg.	Real Power (kW)	Power Factor	Breaker Status
Bldg Main CM4	679	479	0.87 lag	---
East Pnl CM3	180	129	0.89 lag	---
West Pnl CM2	234	151	0.81 lag	---
South Pnl Sepam T81	234	115	0.59 lead	---
Assembly Pnl PM8	275	202	0.91 lag	---

Summary Pages

- Circuit**
- Load Current
- Demand Current
- Power
- Energy

Water Wastewater Application Guide

Energy and Power Management

Transparent Ready® Equipment

Features

Transparent Ready Equipment is web-enabled. Intelligent devices are connected to the local area network (LAN) via a PowerLogic Ethernet Server consisting of:

- ❑ CM3000/4000 with ECC Ethernet card
- ❑ EGX Ethernet gateway

Schneider Electric is the first manufacturer in the world to provide Ethernet connectivity across our comprehensive portfolio of power distribution equipment. We call this innovative technology platform Transparent Ready Equipment. It's simply the easiest and most open solution for accessing information about your water or wastewater electrical systems.

All Transparent Ready Equipment products feature an Ethernet connection and embedded web server, designed to organize valuable information for easy access from any computer on your network using any standard web browser. By making it simple to connect your power equipment, we help you get the actionable information you need to reduce costs and increase productivity.

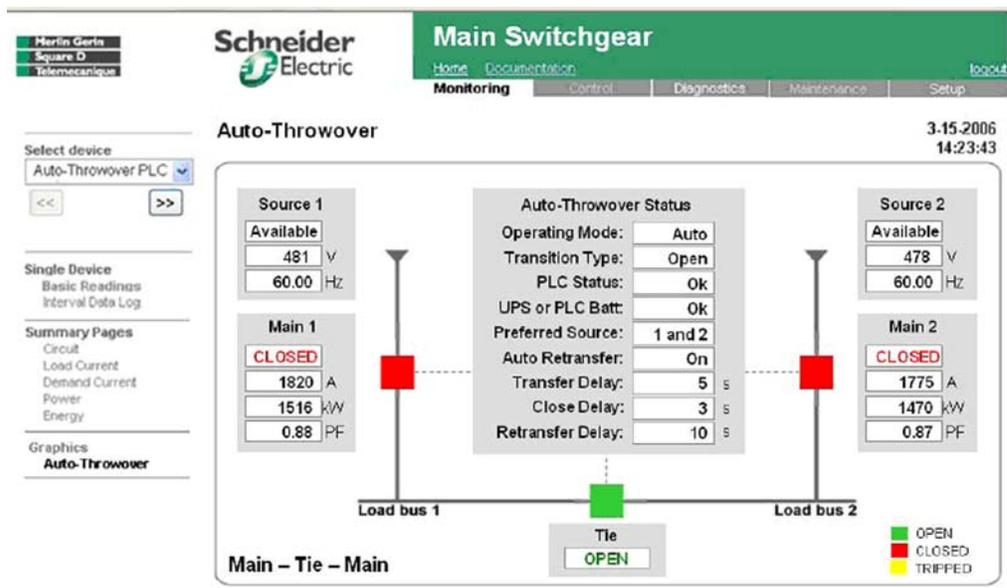
The Difference Between Transparent Ready Equipment and Transparent Ready Technology

Transparent Ready Equipment utilizes devices with our Transparent Ready Ethernet and web-oriented technologies. However, when you order Transparent Ready Equipment, several levels of pre-developed web pages, or a custom web page comes complete with the system.

Data Retrieval

You can obtain data from any of these intelligent devices:

- Masterpact® or Powerpact® circuit breakers with Micrologic® trip units
- Sepam 1000+ medium voltage protective relays
- Circuit monitors: CM4000, CM3000 or CM2000
- Power meters, Enercept, or energy meters
- Model 98 transformer temperature controllers
- programmable logic controller (PLC)-based auto transfer schemes
- Retrofit Enercept power monitoring meters
- Altivar® drives
- Motor Logic® family of solid state overload relays
- Momentum™, Premium™ and Quantum™ PLCs



Protective Relays

Features

- ❑ Complete line of protective relays
- ❑ Preventative maintenance alerts
- ❑ Customizable protective settings
- ❑ Intuitive, graphic display
- ❑ Zone selective interlocking
- ❑ Power monitoring functionality
- ❑ Modbus[®] communications
- ❑ Transparent Ready[®] compatible

Whether you are looking for a simple protection relay or a multifunctional, communicating protection unit for remote network management and operation, you will find the right solution in Square D[®] Sepam protection devices. Sepam Series 20, 40, and 80 are ideally suited to the most commonly encountered applications in water and wastewater facilities. For retrofit or installation into medium voltage equipment (including metal-clad switchgear, metal enclosed switchgear, and motor control centers) there's a Sepam protective relay that is right for your protection needs.

Features Descriptions

- Has a complete line of protective relays: Feeder, motor, generator, transformer, and bus protection—all in a common relay family
- Has preventative maintenance alerts: Self-diagnostics are used for protection assurance; external diagnostics are used for the circuit breaker, current transformer/voltage transformer (CT/VT), and trip circuit
- Incorporates customizable protective settings: The adaptive logic editor utilizes Boolean logic, allowing you to adapt standard control functions to suit varying needs of a power system
- Is equipped with an intuitive, graphic display: The graphic liquid crystal display (LCD) features a back light with auto contrast adjustment. This LCD allows you access to operational and diagnostic information, power measurements and alarms, as well as the password-protected setup
- Offers zone selective interlocking: This is accelerated coordination between protection devices to minimize equipment damage
- Utilizes power monitoring functionality: Relays include power monitoring functionality, including waveform capture, to assist in managing the electrical system
- Incorporates Modbus[®] communications



Water Wastewater Application Guide

Energy and Power Management



Power Monitoring

Many water and wastewater plant managers have reached the same conclusion about their electrical power systems. By employing sophisticated power monitoring equipment to analyze historical and real-time data, they can reduce the cost of electricity and improve its quality and reliability. Their conclusion? Intelligent analysis of power data prevents electrical system problems and saves money.

Benefits

- Provides a better understanding of electrical system loading and demand. This helps cut capital cost from over designing the electrical system when plant expansions or modifications are needed
- Is easier to compare electric bills (kWhs) with utility company statements
- Reveals voltage sags and disturbances that may be causing critical equipment to trip off-line, such as variable speed drives
- Is easier to troubleshoot system problems, such as faults or harmonics
- Helps provide a better understanding of the entire electrical system

Power Meters

Power meters are typically used on feeder circuit breakers for medium voltage switchgear and low voltage switchgear or switchboards. They are also used downstream on low voltage motor control centers and power distribution switchboards and panelboards. These devices have become very powerful and provide more monitoring capabilities than circuit monitors manufactured in the late 90s.

Benefits

- Has basic metering functions that allow metering of current, volts, power, energy and demand readings
- Has power quality readings that include total harmonic distortion for current and voltage readings
- Uses min/max values
- Uses alarm/relay functions
- Has event and data logging on pre-configured values
- Utilizes Ethernet communications that are available via Transparent Ready[®] equipment



Water Monitoring and Control System Cuts Power Costs

Application:

The City of Grand Rapids water department is the largest water supplier for the western half of Michigan. The current control and monitoring system involves the control of several large water pumps and associated valving. Equipment is located remotely and is connected via radio and dial-up data lines. In an effort to cut power costs and increase system capacity, it was decided to upgrade the current system.

Objective:

To reduce power costs

Solution:

The new system includes Modicon® Quantum™ programmable logic controllers (PLCs), Concept™ software, and Modbus Ethernet TCP/IP. Also included is Square D® PowerLogic® power monitoring equipment and Pump-PAK™ solution, with a Magelis® operator display.

Customer Benefits:

- ❑ **Reduced electricity costs:** The new system provides the information needed to choose the most efficient pump combination.
- ❑ **Less downtime:** Concept software facilitates troubleshooting and provides the ability to connect to the PLC from any remote site via TCP/IP. Using information from local Magelis terminals, mechanics can quickly debug valve faults.
- ❑ **Ease of upgrade:** The new system will readily accept installation of faster TCP/IP technologies when they become available, (i.e., a future city-wide fiber system).
- ❑ **Environmental benefit:** Less pollution is created because less electricity is required to pump the same amount of water.

Circuit Monitors

Circuit monitors are typically used to monitor power system parameters on medium voltage switchgear, motor control centers, 480 V substations, and switchboards. Locating them on this equipment enhances your ability to completely understand and troubleshoot your power system when needed.

Benefits

- Provides all basic and advanced metering functions while providing a 0.04% typical accuracy rate
- Is available with 14 data logs and up to 32 MB of memory
- Offers three types of waveform capture: steady state, disturbance, and adaptive
- Detects sag/swell to less than 1/2 cycle
- Provides trending and forecasting functions
- Has optional web-enabled access directly to the meter
- Provides a 5 MHz sampling rate that allows detection of transients lasting only one microsecond (available with CM4000T)
- Offers a global positioning system (GPS) time synchronization option



Water Wastewater Application Guide

Low Voltage (LV) Product Offerings

Low Voltage (LV) Product Offerings

Power-Zone[®] 4 LV Switchgear

Features

- ❑ Smallest footprint in the industry. Masterpact[®] circuit breakers have higher short-time ratings and interrupting ratings than competitive products. Masterpact circuit breakers meet the ANSI specified number of operations with no maintenance required
- ❑ Electrically operated circuit breakers are listed to UL 1066, and the structure is listed to UL 1558
- ❑ 200 kA short-circuit current rating (SCCR) without fuses
- ❑ Increased wire bending space
- ❑ Available up to 5000 A bus rating
- ❑ Micrologic[®] trip units with power monitoring, control, and communications
- ❑ Differential ground fault option for 4-wire systems with multiple sources

One of the major benefits of using ANSI-rated switchgear is the structure and circuit breakers have defined short-time withstand ratings (short circuit current withstand for 30 cycles). When properly adjusted, this allows main and feeder breakers to coordinate with downstream protective devices to ensure the device closest to the fault clears first. This is very important when trying to coordinate with downstream main circuit breakers in motor control centers, switchgear, or other devices downstream. In addition to short-time withstand ratings, other benefits such as 100% rated circuit breakers (from 800 A to 5000 A frames), drawout construction, and maintainability for extended life make low voltage switchgear the primary choice in water and wastewater facilities.

Major new design and operational features have also been built into the Power-Zone 4 switchgear structures, for longer life and increased reliability.

Options

- Has programmable logic controller (PLC) based auto transfer schemes
- Has Transparent Ready[®] communications utilizing PowerLogic[®] equipment
- Is available with Surgelocic[®] transient voltage surge suppression (TVSS)
- Arc flash application options:
 - Arc flash limiting feeder circuit breakers up to 2000 A reduce arc incident energy on downstream equipment, such as motor control centers and distribution panels
 - Through-the-door circuit breaker operation allows the unit to be operated/racked while the door is closed; this reduces National Fire Protection Association (NFPA) 70E personal protective equipment (PPE) category by one level
 - Rear-hinged doors allow easy access to cables, reducing NFPA 70E 2004 PPE category by one level



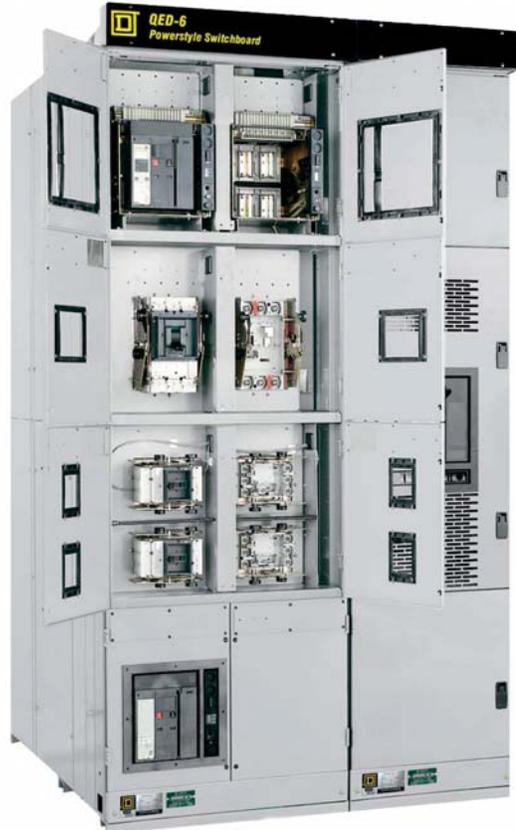
Low Voltage (LV) Switchboards

Power-Style® QED-6 LV Switchboards

Features

- ❑ Masterpact® and Powerpact® circuit breakers have higher short time ratings and interrupting ratings than competitive products
- ❑ Up to eight Masterpact NT circuit breakers can be mounted in a single 30.00 in. (762 mm) wide section
- ❑ Powerpact circuit breakers: 250 A and 600 A frame for smaller loads
- ❑ Electrically operated circuit breakers are UL 489 rated, and the structure is listed to UL 891
- ❑ 150 kA short-circuit current rating (SCCR) without fuses @ 480 V (200 kAIR @ 240 V)

Rear connected switchboards offer many of the same benefits of American National Standards Institute (ANSI)-rated switchgear: short-time withstand ratings on the circuit breakers and structures, as well as high short-circuit interrupting ratings. Lower equipment cost, 100% rated drawout circuit breakers (circuit breaker frame sizes to 250 A to 5000 A), and maintainability for extended life are reasons this product is used in these facilities. Power-Style® QED-6 switchboard structures offer many of the same benefits as Power-Zone® 4 switchgear.



**Masterpact® NW
Circuit Breaker**



**Masterpact NT
Circuit Breaker**



**Powerpact®
H-Frame
Circuit
Breaker**



**Powerpact
J-Frame
Circuit
Breaker**



**Powerpact
D-Frame
Circuit
Breaker**

Water Wastewater Application Guide

Low Voltage (LV) Product Offerings

Power-Style® QED-2 LV Switchboards

Features

- ❑ Front accessible load connections
- ❑ Front and rear alignment standard
- ❑ Switchboard fed by cable, busway, transformer, QED switchboard or other
- ❑ Switchboard ratings through 5000 A, 200 kA; higher amperages available
- ❑ Main devices in six sub-division or single main configurations
- ❑ Main lugs in separate section in line-up or behind devices
- ❑ Group-mounted mains and branches
- ❑ PowerLogic® system customer metering from ammeter, voltmeter, wattmeter to waveform capture, data logging, alarm/relay functions, disturbance monitoring and programmable logic, including custom communications capability and inter-wiring.

QED-2 switchboards are used in many areas of the water and wastewater electrical system. Oftentimes, they are used for service entrance, supplying power to pump and process control panels and other building equipment, as well as to the primary of 480 V transformers that supply 208/120 V power distribution units. With QED-2 switchboards, you can also specify options, such as automatic throw-over systems with hot stand-by programmable logic controller (PLC) solutions for paralleling equipment applications between incoming utilities and generators.

These switchboards are available with single or multiple mains and distribution sections. Individually mounted mains use Powerpact® R-frame electronic or Micrologic® molded case circuit breakers through 2500 A, and Masterpact® NW two-step stored energy electronic trip circuit breakers for fixed or drawout applications through 5000 A.

QED-2 distribution sections include I-Line® circuit breakers. With I-Line plug-on circuit breaker construction, the line end of the circuit breaker plugs directly onto the I-Line panel bus assembly. This design allows you to quickly install and wire circuit breakers from the front of the switchboard. In addition, I-Line circuit breakers are keyed to mounting slots in the support pan for automatic alignment and faster installation. I-Line switchboard sections are available in single- or double-row construction.

If you require higher feeder ampacities, QED-2 switchboards are available with individually mounted branch devices up to 4000 A. They include both thermal-magnetic and electronic trip molded case circuit breakers. You can use electronic trip for equipment ground-fault protection.

Water and Wastewater Plant Application

- Service entrance
- Paralleling equipment
- Process and pump control panels distribution and feeder circuits
- Feeder circuits to downstream motor control centers (MCCs)

Additional Circuit Breaker Features

- Has thermal-magnetic, electronic, Micrologic, or stored energy fix-mounted circuit breakers and Masterpact NW drawout mounted circuit breaker mains and feeders
- Offers thermal-magnetic and electronic circuit breakers with standard, high, extra-high, or current limiting capability
- Offers exclusive Micrologic trip circuit breakers, 80% or 100% rated with harmonic monitoring, waveform capture, and Transparent Ready® monitoring
- Provides zone selective interlocking on Micrologic circuit breakers, group-mounted 100 A/250 A thermal-magnetic circuit breakers with add-on ground fault.



Low Voltage (LV) Motor Control Centers (MCCs)

The low voltage MCC is the backbone of most water and wastewater facilities. MCCs supply power to the raw water pumps, coagulation/flocculation drives, backwash, discharge pumps, and many other motor loads in a water facility. It is also prevalent in wastewater facilities for loads, such as aerators, mixers, and blowers, as well as return and activated sludge, influent, transfer, and discharge pumps. Motor control centers normally contain conventional and solid state motor starters, AC drives, panelboards, transformers, power monitoring and control, programmable logic controllers (PLCs), input/output (I/O), and human machine interfaces (HMIs). For remote areas, these MCCs may be the power distribution and control stations.

Options

- Main circuit breaker or fusible switch
- Full Voltage Non-Reversing (FVNR), Full Voltage Reversing (FVR), two-speed starters, reduced voltage, wye-delta starters
- NEMA Sizes 1–6
- Branch feeders with circuit breakers or fusible switches
- Variable speed drives to 500 hp
- Automatic transfer switches
- programmable logic controllers (PLCs)
- Transient Voltage Surge Suppression (TVSS)—UL Listed units with surge protection for 120 kA to 240 kA surge capacities
- Solid state overloads
- Solid state reduced voltage starters
- PowerLogic® monitoring systems
- Distribution transformers and panelboards

Model 6 LV MCCs

The Model 6 motor control center enclosure is built to be this backbone with industrial grade features specially engineered to deliver rugged, dependable service for years to come. Packaging everything into a motor control center is common in water and wastewater facilities. This reduces installation costs and centralizes equipment for access and maintenance by facility personnel.

Features Description

- Incorporates standard section dimensions of 20.00 in. (508 mm) (W) x 90.00 in. (2286 mm) (H) x 15.00 in. (381 mm) or 20.00 in. (508 mm) (D)
- Constructed of 12-gauge steel frame and welded corner channels for exceptional structural rigidity
- Comprised of a structure that is braced for 42K AIC as standard and built to meet or exceed Underwriters Laboratories (UL), National Electrical Manufacturers Association (NEMA), and Electrical and Electronic Manufacturers Association of Canada (EEMAC) standards
- Full-depth vertical wireway to provide maximum wire pulling area
- Horizontal bus located at the top of the structure for easy installation, inspection and maintenance without having to remove units
- Uses captive horizontal splice bars to prevent bar loss and make connecting sections for reliable, long-term performance
- Uses tin-plated copper bussing that supplies an excellent electrical connection
- Uses vertical ground bus in each section that mates with ground stabs on the rear of each plug-in unit, creating a positive ground connection
- Utilizes rugged, quarter-turn fasteners on the unit and wireway doors, reducing installation and maintenance time



Water Wastewater Application Guide

Low Voltage (LV) Product Offerings

Intelligent LV MCCs (iMCC)

Features

- ❑ Intelligent devices
- ❑ Device-level networks

Benefits

- ❑ Remote monitoring capability
- ❑ Reduced downtime and system interwiring
- ❑ Control to every bucket
- ❑ Lower commissioning costs
- ❑ Flexible configuration
- ❑ Cabling system compliant to applicable standards. DeviceNet solution is Open DeviceNet Vendor Association (ODVA) certified.

A key feature of our iMCC solution is the integration of intelligent devices and device-level networks for control and automation that delivers improved performance. Popular network protocols such as DeviceNet, Modbus and PROFIBUS communicate directly to every unit of the iMCC for an effective method of connecting centralized control to widely distributed I/O. The network of your choice creates a common thread for a variety of motor control equipment that not only improves control, but also allows for simple and easy installation and operation.

Networking allows for easy monitoring of critical data of each motor or load connected to the iMCC, enabling precise process control at all times. With this information, your staff can respond to potential problems proactively. Real-time access to information and records of last faults allows for simplified diagnostics and reduced downtime.

Using network control to consolidate all I/O communications significantly reduces the amount of tedious wiring that would normally be required for a hardwired I/O MCC with similar functionality. The network cabling consists of a five conductor cable and is constructed into the topology that is appropriate for your networked solution. Our industry-leading full-depth wireway effectively separates network cabling from high voltage cabling. Additionally, our standard wireway barrier isolates the communication cabling from the load cabling routed in the vertical wireway.



Harmonic Filtering and Power Factor Correction (PFC)

Power electronic loads, such as drives, ozone generators and ultra violet (UV) filtration equipment have become increasingly abundant in the water and wastewater treatment industries because of their many benefits. But, they have one major drawback in common: they produce harmonics. Harmonics may disrupt other loads, increase operating costs, and lower the reliability of the electrical network.

In addition, applying PFC is complicated by the presence of harmonics in a network. Symptoms of problematic harmonic levels include overheating of motors, drives, and cables, as well as thermal tripping of protective devices and experiencing logic faults of digital devices. All of these problems can result in downtime. The life span of many devices may be reduced by overheating. Furthermore, by reducing harmonic levels, the need to oversize transformers and cables to account for harmonic heating effects is lessened. Schneider Electric offers many types of harmonic filtering and power factor correction solutions to address these common problems.

AccuSine® Power Correction System (PCS)

AccuSine PCS is commonly identified as an active harmonic filter, although it is much, much more.

AccuSine PCS can be universally applied for all types of harmonic generating loads, even on the same supply bus. It can be applied on sources rated 208 V to 480 V, 50 Hz or 60 Hz. Additionally, the performance is the same regardless of the source characteristics. Whether the source is utility, generator, uninterruptible power supply (UPS), or multiple sources, AccuSine operates the same and is selected according to the loads. No electrical simulations are needed.

AccuSine PCS is offered in a standard NEMA 1 enclosure or in the Model 6 motor control center. Other enclosure types are available upon request.

AccuSine is designed to meet the most stringent level of IEEE 519-1992 Table 10.3 at the point of common coupling (PCC) with a utility, at an internal bus, or at an individual nonlinear load. Using AccuSine in conjunction with 6-pulse drives is often more cost effective than using 18-pulse drives as a means to reduce harmonic distortion. Additionally, active filters plus 6-pulse drives are physically smaller and more efficient for all combinations and sizes.

Features

Dynamically corrects power quality by providing:

- Active harmonic filtration
- Resonance prevention
- Power factor correction
- Dynamic VAR compensation

AccuSine Reduces Harmonic Current Distortion at a Wastewater Treatment Plant

Application:

A wastewater treatment plant installed variable frequency drives (VFDs) to improve control of raw sewage pumps and to decrease operating costs through variable speed operation.

Problem:

A variety of unexpected problems occurred, including interference with the computer management, circuit breaker tripping, plant shut down, and partially treated sewage that was dumped in a nearby river.

Solution:

AccuSine performing active harmonic control, cancelled the harmonic current caused by the VFD and reduced the total harmonic current distortion (as defined by ANSI/IEEE std 519-1992) from 39.0% to 4.1%—ensuring trouble free operation of the plant.



Water Wastewater Application Guide

Low Voltage (LV) Product Offerings

Reactivar® Power Factor Capacitors and Passive Harmonic Filter Systems

When the total content of nonlinear loads is less than 15% of all loads, fixed or stepped power factor capacitors can be used for displacement power factor correction. Products such as the AV4000 and AV5000 series are excellent choices.

When the total content of nonlinear loads is less than 50% of all loads, fixed or stepped detuned power factor systems, AV6000/AT6000, or fixed or stepped fifth harmonic tuned filters, AV7000/AT7000, are good product choices. In all cases, be sure to perform simulations to ensure that capacitor resonance does not occur. When the nonlinear load content exceeds 50% of the total loads, AccuSine® PCS is typically the best solution.



Fixed Capacitors

Fixed capacitors are offered, but are not recommended in the presence of AC and DC drives. Capacitors are a low impedance path for harmonic currents given off by drives and other harmonic generating loads. The capacitors will absorb these harmonic currents and will cause them to fail prematurely. Also, be careful when using fixed capacitors in motor control centers with motors. If the capacitor is not sized properly with the motor, switching can cause transient over voltages that can damage the windings.

Low Voltage (LV) Transformers

Drive Isolation LV Transformers

Isolation transformers have been used upstream on AC and DC drives for many years in water and wastewater facilities.

Benefits

- ❑ Reduced line notching
- ❑ Harmonic reduction
- ❑ Drives protected from transients
- ❑ Common mode noise reduction
- ❑ Ground-fault isolation

Benefits Descriptions

- Provides reduced line notching caused by silicon-controlled rectifiers (SCRs) on the front end of DC drives. This line notching on the sine wave can cause clock circuits in electronic circuits to over count because of multiple zero crossings
- Provides harmonic reduction:
 - Reductions of harmonic currents due to the impedance causing a harmonic (high frequency) voltage drop across the transformer. This reduces harmonic current distortion
 - Standard delta-wye transformers have a 30° phase shift. When delta-delta (no phase shift) and delta-wye transformers are used together to service two identical 6-pulse drives, and drawing identical current— fifth and seventh harmonic will be eliminated. This means that the harmonic current will be greatly reduced.
- Protects drives from transients caused from capacitors switching or lightning on upstream distribution circuits. These transients sometimes cause drives to trip on over-voltage on the DC bus.
- Provides common mode noise reduction: This keeps noise away from rest of power system components.
- Uses ground-fault isolation: If the secondary of a delta-wye isolation transformer is grounded, ground-fault currents are limited to the secondary side. This prevents upstream devices from tripping on ground faults.

Square D® drive isolation transformers and TP-1-compliant energy efficient transformers are available in NEMA Type 2 enclosures. They can be converted to NEMA Type 3R with the installation of the optional, field-installed weathershield kit, available with #316 painted stainless steel. (NEMA Type 2 and NEMA Type 3R can be provided with optional stainless steel weathershield kit.)



Water Wastewater Application Guide

Low Voltage (LV) Product Offerings

Features

- ❑ Smaller total area used: with 3.00 in. (76 mm) clearance from ventilated openings instead of 6.00 in. (152 mm), reducing the distance from the wall to the front of the device by 3.00 in. (76 mm)
- ❑ Terminals are sized to handle lug kits that are coordinated with other Square D products, increasing the ease of installation when used with other Square D equipment
- ❑ Increased wiring compartments provide a bending radius for 250% primary cables and multiple feeds on the secondary
- ❑ All units have 200% neutral to allow you to feed standard and non-linear panels
- ❑ 220 °C UL Listed insulation system
- ❑ Decreased weight for easier handling of units

Energy Efficient LV Transformers

These highly efficient transformers are designed to meet anticipated Department of Energy guidelines set forth in the 1992 Energy Act, H.R. 776, which requires lower energy consumption levels, including electrical. Schneider Electric and the National Electrical Manufacturers Association (NEMA) have been proactive in developing an Energy Efficient Standard (TP1-1996) designed to provide lower energy consumption levels.

Schneider Electric introduced the first TP1-compliant low voltage dry-type distribution transformers in December 1998. With the 2005 Energy Act, Schneider Electric is expanding its offering of TP-1-compliant products by launching a new line of TP-1 qualified transformers.

Minimum efficiencies have been established for each size of transformer, and extensive design, testing, and manufacturing time has been spent to ensure each transformer meets or exceeds these efficiencies.

Surveys show that typical loading of low voltage dry-type transformers on a 24-hour average basis is only 35% of full-load rating. At such loading levels, Square D[®] Lean Power[™] Energy Efficient Transformers from Schneider Electric provide the best combination of optimal performance and superior quality.

The Square D Energy Efficient transformer offering includes all of the popular options, including low temperature rise, 115 °C and 80 °C, and aluminum or copper windings. These transformers are part of a complete line of Lean Power products from Schneider Electric. Our power conservation, management and monitoring products, systems, and services help to reduce energy consumption in business and industry environments.

Schneider Electric also offers NEMA Type 4X general purpose transformers that are resin encapsulated, non-ventilated and utilize a painted #316 stainless steel enclosure.



PowerLink® G3 Lighting Control

Benefits

- ❑ Reduce energy costs—save up to 15% on your electric bill energy costs associated with lighting by controlling when and where energy is being used
- ❑ Small size eliminates costly and cumbersome contactor and special relay cabinets
- ❑ See a rapid return on your investment—typically less than two years
- ❑ Versatile design, easy to design and commission. Accommodates a wide variety of lighting and other loads.
- ❑ Improve productivity—save energy without sacrificing occupant comfort
- ❑ Web-enabled Transparent Ready® Equipment allows monitoring and control from the convenience of a standard web browser
- ❑ Receive an E-mail or pager notification when a particular circuit, lighting area, or input (e.g. photocell) does not operate as planned

PowerLink G3 lighting control systems provide an immediate return on your energy savings investment by automatically switching lights “off” during unoccupied periods. This includes treatment areas, catwalks, equipment rooms, offices, or any other areas where you want controlled lighting—meaning big savings and a quick payback.

Compared with other energy savings technologies, a PowerLink G3 lighting control system can provide both a lower initial capital outlay and greater energy savings.



Water Wastewater Application Guide

Low Voltage (LV) Product Offerings

Panelboards

Engineering and maintenance managers, engineering consultants and contractors prefer Square D® I-Line®, NF, and NQOD panelboards for use in water and waste water applications. These products are widely recognized as the industry leaders in reliability and versatility.

Water Wastewater Applications

- Power for control and process equipment
- Building distribution circuits



I-Line® 600 V Panelboards

Main Circuit Breaker Panelboards

- Accept a maximum 1200 A, thermal magnetic 80% or 100% rated electronic main and branch breakers
- Available factory-assembled or merchandised
- Factory-assembled main circuit breaker interiors are available bottom-feed or top-feed
- Available with a short-circuit current rating (SCCR) up to 200 kA maximum (100 kA @ 600 Vac) when supplied by an I-Limiter® circuit breaker
- Available with a silver-plated or tin-plated copper bus or tin-plated aluminum bus
- Solid neutral is mounted in the main compartment with the main circuit breaker

Main Lugs Only Panelboards

- Available with main lug only interiors rated up to 1200 A
- Accept a maximum 1200 A, thermal magnetic 80% or 100% rated electronic branch breakers
- Available factory-assembled or merchandised
- Available with a SCCR up to 200 kA maximum (100 kA @ 600 Vac) when supplied by an I-Limiter circuit breaker
- Available with a silver-plated or tin-plated copper bus or tin-plated aluminum bus
- Solid neutral is mounted in the main compartment with the main lugs
- Hinged cover, isolated main lugs compartment
- Main lug interiors are available as top-feed or bottom-feed

I-Line Plug-On Unit with Surgelagic® Transient Voltage Surge Suppression (TVSS)

- Plug-on design requires less cable and conduit than end gutter-mounted TVSS unit, saving labor time and material costs
- Bus-connected design enhances performance
- Integrated TVSS and circuit breaker disconnect feature compact design, requiring only 13.50 in. (343 mm) of branch mounting space
- SCCR up to 200 kA rating (100 kA @ 600 Vac) meets a wide variety of customer applications

I-Line Circuit Breakers

- I-Line panelboards are designed to accept the following circuit breakers: FY, FI, HD, HG, HJ, HL, QB, QD, QG, QJ, QO, KI, JD, JG, JJ, JL, LA, LH, LC, LI, LE, LX, LXI, MG, and MJ
- PG, PJ, PL, RG, RJ, and RL with Transparent Ready® Equipment (TRE) communications and electronic trip units

Water Wastewater Application Guide

Low Voltage (LV) Product Offerings

NF 480/277 V Panelboards



Square D[®] NF panelboards are typically used for supplying power to process control panels, heating, ventilation, and air conditioning (HVAC) equipment, 277 V lighting, and 480 V transformers for 208/120 V panels. Ratings include main lugs 125–800 A and main circuit breakers 125–600 A. Branch circuit breakers (bolt-on) are 1-pole, 15–70 A; 2-pole, 15–125 A; and 3-pole, 15–125 A. One-pole equipment protective devices (EPD) are also available.

Main Lugs Interiors

- Top or bottom feed
- 65 kAIR maximum branch circuit breakers at 480Y/277 Vac (fully rated)
- Series rated to 200 kAIR maximum when supplied by remote I-Limiter[®] circuit breaker
- Factory-installed main lugs on all interiors
- 125–400 A main lug interiors are convertible to main circuit breaker by adding a main circuit breaker adapter kit and main circuit breaker
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated copper bus is available as an option; 600 A and 800 A are only available with copper
- Branch connector fingers are tin-plated copper; silver-plated branch connector fingers are optional
- Optional Transient Voltage Surge Suppression (TVSS) available

Main Circuit Breaker Interiors

- Top or bottom feed
- 65 kAIR maximum branch circuit breakers at 480 Y/277 Vac
- 200 kAIR with I-Limiter main circuit breaker
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard)
- Tin-plated copper bus is available as an option; 600 A only available with copper
- Branch connector fingers are tin-plated copper; silver-plated branch connector fingers are optional
- 125 A main circuit breaker interiors contain factory-installed back-fed EDB, EGB, or EJB main circuit breakers
- Optional TVSS available
- 250 A main breaker interiors use the standard main lug interior and the appropriate HG, HJ, HL, JD, JG, JJ, JL, or KI circuit breaker
- 400 A main breaker interiors use the standard main lug interior and the appropriate LA or LH circuit breaker
- 600 A main breaker interiors use the standard main lug interior and the appropriate LC or LI circuit breaker

Water Wastewater Application Guide

Low Voltage (LV) Product Offerings



NQOD 208/120 V Panelboards

Main Lugs Interiors

- Will accept plug-on or bolt-on branch circuit breakers
- Top or bottom feed
- 65 kAIR maximum branch circuit breakers (fully rated)
- 200 kAIR maximum when supplied by remote I-Limiter[®] circuit breaker (series rated)
- Field-installable sub-feed lug kits for 100 A to 225 A interiors
- Factory-installed main lugs on all interiors
- 225 A to 400 A main lug interiors are convertible to a main circuit breaker by adding a main circuit breaker and adapter kit
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated copper bus is available as an option. Branch connector fingers are all tin-plated copper; silver-plated branch connector fingers are optional
- 200% neutral bus optional
- Transient Voltage Surge Suppression (TVSS) optional

Main Circuit Breaker Interiors

- Will accept plug-on or bolt-on branch circuit breakers
- Top or bottom feed
- 65 kAIR maximum branch circuit breakers (fully rated)
- 200 kAIR maximum when supplied by I-Limiter circuit breaker (series rated)
- Available with silver-plated copper or tin-plated aluminum bus (aluminum is standard). Tin-plated copper bus is available as an option. Branch connector fingers are all tin-plated copper; silver-plated branch connector fingers are optional
- 200% neutral bus optional
- TVSS optional
- 100 A main circuit breaker interiors include a factory-installed back-fed QOB main circuit breaker
- 225 A main circuit breaker interiors use:
 - Standard main lug interiors
 - Main circuit breaker adapter kit
 - Appropriate QBL, QDL, QGL, QJL, JDL, JGL, JLL, JLL, or KIL circuit breaker
 - 250 A main circuit breaker interiors are factory assembled only
- 400 A main circuit breaker interiors use:
 - Standard main lug interior
 - Main circuit breaker adapter kit
 - Appropriate LAL or LHL circuit breaker

Automation and Control

Key Applications

- Influent and effluent pumps
- High service pumps
- Booster pumps
- Desalination
- Surface aerators
- Flocculators
- Digested sludge pumps
- Utility water pumps
- High pressure pumps
- Sewage lift pumps
- Submersible pumps
- Sludge return pumps
- Centrifugal or positive displacement blowers

In today's environment, the water and wastewater operator is concerned with dynamic regulations, more geographically dispersed plants, increased record keeping, and fewer employees due to a tighter operating budget. Schneider Electric's automation and control products represent the best solution to these demands. Using our low cost starter solutions or our programmable logic controller (PLC) and human machine interface (HMI) products, you will find that our systems are the easiest to implement and the lowest cost to own and operate.

Low Voltage Variable Frequency Drives (VFDs)

Packaged low voltage VFD products simplify installation and startup through the integration of operator interface and controls protected within standalone environmental enclosures in wall or floor mount construction. These designs are optimized with disconnect means, circuit breakers, push buttons, selector switches, sequencing logic, and communication along with standard and engineered options to meet a variety of water or wastewater application requirements.

M-Flex™ Packaged VFDs (Engineered Products)

The M-Flex family of packaged variable frequency drives features the new Altivar® 61 or 71 adjustable frequency power converters. These converters provide a robust packaged adjustable speed solution for commercial, industrial, and municipal process applications where high functionality of features are required. M-Flex packaged VFDs offer a platform of standard, engineered, and custom-built features to meet the most demanding application and specification requirements.

Over 120 definable factory options are available that cover control, power, and enclosure modifications. The M-Flex packaged VFD is offered in a parallel Class 8898 motor control center design. All M-Flex packaged VFDs are UL508C Listed to 100,000 A short-circuit current ratings to meet the flexibility of short-circuit coordination equipment needs. A seismic qualification option is also available for wall and floor mount configurations tested to International Code Counsel Evaluation Service (ICC ES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156).

M-Flex packaged VFDs are low voltage products available in the following ratings:

Variable torque (Light duty ratings—110% current limit)

- Altivar 61 power converter
- 1 to 500 hp, 460 V
- 1 to 50 hp, 208/230 V

Constant torque (Heavy duty ratings—150% current limit)

- Altivar 71 power converter
- 1 to 450 hp, 460 V
- 1 to 40 hp, 208/230 V

M-Flex packaged VFDs are available in Type 1 (general purpose) or Type 12/12K (drip/dust proof) enclosures in integrated or barriered designs.

Integrated enclosures can be wall or floor mounted, depending on size. They provide a circuit breaker disconnect and enough room for power peripherals, including isolation and bypass contactors—all within the same enclosure.

Barriered enclosures separate power and control circuits, such as a bypass, from the drive control. The separate compartments allow for maximum flexibility if it is necessary to service a drive in bypass operation.



Water Wastewater Application Guide

Automation and Control

PowerGard™ Series C 18-Pulse Packaged VFDs (Engineered Products)

For municipal and industrial pumping applications, PowerGard Series C 18-Pulse packaged VFDs feature the Altivar® 61 and 71 adjustable frequency drives/power converters. Schneider Electric's experience and expertise in power distribution and power quality measurement are combined with solid state motor control that provides a premium method of clean power.

PowerGard 18-Pulse packaged VFDs are ideal for installations specifying “clean power” low harmonic content in compliance with Institute of Electrical & Electronics Engineers (IEEE) 519 guidelines for harmonic mitigation in electrical power systems. It utilizes a patented 18-Pulse technology that enables the PowerGard to achieve in excess of 95% cancellation of characteristic harmonic currents. Other multi-pulse topologies vary greatly in design and effective cancellation techniques. Many multi-pulse drives do not provide balanced cancellation of harmonic currents, which can result in only marginal cancellation of the characteristic harmonics.

PowerGard 18-Pulse packaged VFDs are UL508C Listed and are available in Type 1 (general purpose) or with fan filter options. All PowerGard 18-Pulse packaged VFDs are UL508C Listed to 100,000 A short-circuit current ratings to meet the flexibility of short-circuit coordination equipment needs. A seismic qualification option is also available, tested to International Code Counsel Evaluation Service (ICC ES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156).

PowerGard 18-Pulse drives are low voltage products available in the following ratings:

Variable torque (Light duty ratings—110% current limit)

- Altivar 61 power converter
- 50 to 500 hp, 460 V

Constant torque (Heavy duty ratings—150% current limit)

- Altivar 71 power converter
- 40 to 450 hp, 460 V



E-Flex™ Packaged VFDs (Standard Products)

E-Flex is the commercial alternative of packaged variable frequency drives (VFDs) that provide an efficient and economical adjustable speed solution for fan and pump applications. It combines the sturdy construction of a fully enclosed cabinet in wall mount construction with a hinged door and rotary through-the-door disconnect.

The E-Flex packaged VFD is also offered in an optimized and efficient Type 3R outdoor rated enclosure design. This gives you the ability to free up space in congested equipment rooms while saving cost in wiring and installation expenses.

Limited defined options include industrial control operators, line contactors, fully rated isolation and bypass contactors, circuit breaker disconnect, 3% or 5% AC line reactors, communication cards, and door-mounted graphic terminal display to provide unparalleled value. All E-Flex packaged VFDs are UL508C Listed to 100,000 A short-circuit current ratings to meet the flexibility of short-circuit coordination equipment needs. A seismic qualification option is also available for all wall mount configurations tested to International Code Counsel Evaluation Service (ICC ES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156).

E-Flex packaged VFDs are low voltage products that are available in Type 1 (general purpose), Type 12K (drip/dust proof), and Type 3R (outdoor rugged) enclosures with the following ratings:

Variable torque (Light duty ratings—110% current limit)

- 1 to 100 hp, 460 V
- 1 to 50 hp, 208/230 V
- Type 1, 12K rated -10 to 40 °C for indoor installations
- Type 3R rated -10 to 50 °C for outdoor installation



Water Wastewater Application Guide

Automation and Control

Key Applications

- ❑ Pumps (prevent water hammer and control check valve slamming on deceleration)
- ❑ Large air supply fans
- ❑ Conveyors
- ❑ High inertia loads
- ❑ Used to reduce current when starting the booster and well pump motors by small stand-by generators

Available Ratings

- ❑ 3 to 200 hp, 208 V
- ❑ 5 to 250 hp, 230 V
- ❑ 10 to 500 hp, 460 V
- ❑ 15 to 600 hp, 575 V
- ❑ Type 1, Type 12 rated 0 to 40 °C for indoor installations
- ❑ Type 3R rated 0 to 50 °C for outdoor installations



Soft Starts

Enclosed Soft Start Motor Controllers (Engineered Products)

The range of Enclosed 48 soft starts packages the advanced functionality of the Altistart® 48 soft start with the exclusive Torque Control System (TCS). TCS minimizes mechanical stress on pipes by reducing water hammer usually found in large piping systems. TCS optimizes ramp control during starting and stopping and minimizes motor heating temperature during motor acceleration. By controlling motor torque, the Altistart 48 provides precise starting and stopping control, regardless of motor load versus traditional reduced voltage or current limit designs. A Modbus® RS485 serial port is also standard and can be used to connect to PowerSuite™ software for easy configuration, start-up, and diagnostics.

Available as a pre-engineered and custom-built product, Enclosed 48 soft starts can be configured based upon exact specifications to optimize the unit for specific application requirements up to 600 hp. Combination devices are available with either a circuit breaker or fusible disconnect. The Enclosed 48 features coordinated short-circuit current ratings up to 100 kA (fused) and 30 kA (circuit breaker), along with a seismic qualification option for wall and floor mount configurations tested to International Code Council Evaluation Service (ICC ES) Acceptance Criteria for Seismic Qualification Testing of Nonstructural Components (AC156).

As the most fully integrated enclosed soft start on the market, the Enclosed 48 features genuine Schneider Electric components, including circuit breakers, operating mechanisms, control relays, contactors, and terminal blocks to ensure easy device configuration and reliable soft start operation for your application.

In addition to the Altistart 48 soft start, Enclosed 48 units are supplied ready-fitted with an overcurrent protection device, shorting (bypass), and isolation means; so no additional components are required. Installation becomes quick and easy as all that is required for operation is unit mounting and connection to the supply and motor.

Open/Panel-Mounted Drives and Soft Starters

Schneider Electric offers a full range of open/panel mounted drives and soft starters for your water and wastewater plant. These can be applied to influent screens, grit removers, clarifier motors, and other applications. Whether for a new installation or as a replacement device, we have the drive for your application.



Water Wastewater Application Guide Telemecanique® Programmable Logic Controllers (PLCs)

Telemecanique® Programmable Logic Controllers (PLCs)

Modicon® M340™ PLC

The Modicon M340 is Schneider Electric's **newest** PLC and is the most integrated ever! The M340 has the compactness needed to keep costs down with the power of larger PLCs. This will provide you with the power needed to handle today's tough treatment requirements.

The M340 is perfectly suited for lift stations, headworks, biosolid machines, and oxidation ditches—just to name a few. The M340 employs an all-power-inside concept that is based around a 64-bit central processing unit (CPU). This PLC boasts high-performance processing and is small enough to create a system that provides flexibility beyond any before. With up to three built-in CPU communication ports, large portable memory card options up to 4 Mb, 64-channel high-density modules, and embedded web-servers, the Modicon M340 PLC enables a powerful solution for original equipment manufacturers (OEMs) and projects demanding more productivity in their PLCs.

Programmed with the same Unity™ Pro software that programs our Quantum™ and Premium™ family of PLCs, you can dramatically reduce development, setup time, and effort. The M340 and Unity Pro software is based on features like five standard IEC 61131-3 language selections, re-usable application logic libraries, and a simple Ethernet configuration setup. Installers, municipalities, process suppliers, and system integrators gain fast, easy, and efficient startups. Municipalities also gain longterm reliable control, resulting in very low site maintenance requirements.



New!

Water Wastewater Application Guide

Telemecanique® Programmable Logic Controllers (PLCs)

Modicon Solution Helps City of Hamilton Clean More Water

Application:

The city-owned City of Hamilton wastewater treatment facility in Hamilton, OH serves 63,000 residential and commercial customers. This plant expansion was installed without shutting down the existing process.

Objective:

- ❑ To provide better data acquisition and control capabilities.
- ❑ To improve system reliability.
- ❑ To enhance system troubleshooting capabilities
- ❑ To increase treatment capacity, but not employee requirements.

Solution:

Complete power and automation solution, including local support, training, and start-up for the PLCs, drives and power monitoring system.

The Modicon Quantum PLC communicates via a fiber optic Modbus Plus network. This network provides the backbone for plant-wide alarming and troubleshooting capabilities. The five PLCs control the Altivar® 66 drives via hard-wired analog signals and monitor the drives' status via the Modbus Plus network. The man-machine interface is provided by PanelMate™ 4000 stainless steel units.

The treatment process was maintained while the old equipment was decommissioned and the new system placed on-line.

Customer Benefits:

Measurable benefits include an increased treatment capacity of an estimated maximum flow of 62 MGD (up from the original 32 MGD). The bulk of this added capacity is dedicated to handling peak wet weather flows through the plant and thus eliminating raw wastewater overflows in the city's sewage collection system. The increased reliability of this system serves to better protect the environment.

Modicon® Quantum™ PLC

Telemecanique® Modicon® Quantum™ PLCs offer the best performance levels on the market for program execution. This high-end PLC offers five IEC 61131-3 compliant programming languages. Furthermore, some processors even offer the 984 ladder logic that your legacy PLCs use!

The Quantum system provides you with memory capacity up to 7 Mb, integrated Transparent Ready®, Modbus®, TCP/IP Ethernet port, web server, high-speed universal serial bus (USB) socket, redundant power supplies, input/output (I/O) cabling options, and true hot standby. All of this is backed by a maximum I/O capacity of 64,000 discrete points with 72 different I/O modules to choose from. Discrete and analog intrinsically safe I/O modules are available. In addition, the Quantum PLC has powerful communication options including Modbus, Modbus Plus, PROFIBUS-DP, Ethernet (Modbus TCP/IP) and DeviceNet. Therefore, this PLC can exceed your expectations whether it is controlling a large water and wastewater process, or combining control from several different areas of your plant.



RTU SCADA System Replaced by Open PLC Solution

Application:

The system consists of a main water plant with 13 remote well and pump station sites. The existing communication system used leased phone lines, and the client wanted to maintain them.

Objective:

To procure a system that would cut the water company's annual maintenance costs significantly and to upgrade their SCADA package.

Solution:

- ❑ Modicon Quantum PLC with Hot Standby
- ❑ Modicon Momentum™ PLC
- ❑ Modbus Bridge

Customer Benefits:

- ❑ Increased reliability of the system due to the redundant Modicon Quantum PLCs and the redundant SCADA computers.
- ❑ Each remote site will continue to control its local I/O, even if the lease line communication to that site is lost.
- ❑ The update time of the network was reduced from 15 minutes to less than two minutes. This is a 700% improvement!
- ❑ The report package of the Citect® software meets the current demands of the EPA without any custom configuration.

Water Wastewater Application Guide Telemecanique® Programmable Logic Controllers (PLCs)

Modicon® Premium™ PLC

PLC Provides New Technology Upgrade to Water Treatment Plant

Application:

This application is for a municipal water/wastewater treatment plant upgrade in the southeastern United States. It entails upgrades to four existing lift stations and the main plant that controlled these stations. Each lift station had remote I/O that received instructions from the main plant.

Objective:

To upgrade to a more reliable system and provide local control to each lift station.

Solution:

Modicon TSX Premium PLC

Customer Benefit

- A reliable system that is expandable.*
- Local control from each pump station.*
- The ability to communicate from the plant to each lift station and back through leased phone lines or radio.*
- The ability to communicate between lift stations.*

With 2048 Discrete input/output (I/O), the Telemecanique® Modicon® Premium™ PLC is optimized for small to medium size process control applications. However, it is still robust enough to handle the demands of water and wastewater. Whether it is used as a main controller or in an original equipment manufacturer (OEM) package, the multiple levels of processors, “plug and play” memory, and rack additions allow for instantaneous system expansion while minimizing component costs. Furthermore, you can maximize uptime and warm standby with diagnostic and maintenance capabilities, such as diagnostic function blocks, run-time screens and field exchangeable memory options. Additionally, the Premium’s web server capability provides you with the Transparent Ready® openness you expect from Schneider Electric. Plus, the Premium has powerful communication options such as Modbus®, Modbus Plus, PROFIBUS-DP, and CANOpen. Furthermore, the Premium’s web server, and Modbus TCP/IP protocol makes Ethernet communication more transparent than ever.



Water Wastewater Application Guide

Telemecanique® Programmable Logic Controllers (PLCs)

Modicon® Momentum™ PLC

The Telemecanique® Modicon® Momentum™ platform is ideal for small distributed input/output (I/O) applications with local intelligence. When combined with the optional central processing unit (CPU) module, the Momentum PLC becomes an excellent distributed control platform. The Momentum PLC is ideal for applications such as influent screening, fluoride injection, or remote terminal unit (RTU) applications. The Momentum PLC consists of components that easily snap together in various combinations to form versatile control systems or sub-systems. The broad range of available components range from traditional I/O to a processor with an embedded Transparent Ready® web server. This variety includes all of the major fieldbus and control networks from Ethernet to PROFIBUS-DP, DeviceNet, Modbus® Plus and others. Thus, the Momentum offers the power and flexibility of larger PLCs in a smaller package.

Automation and Control of a Ground Water Based Municipal Water System

Application:

The City of Fresno Water Division is approximately 110 square miles in area, and its current water supply comes entirely from underground. In order to supply water, the City, over several decades, has installed over 245 wells. Fresno's water system is now the second largest ground water system in the United States.

Objective:

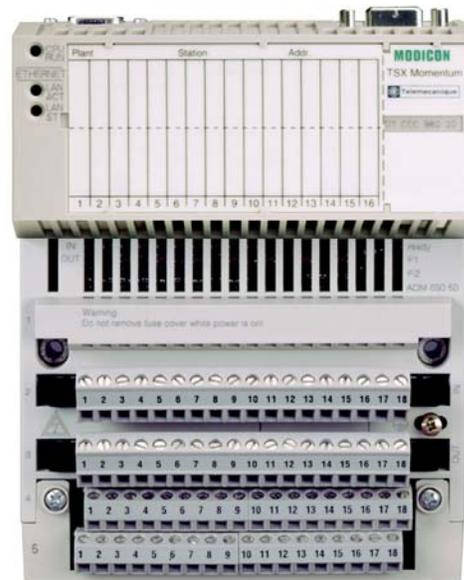
- ❑ To improve customer satisfaction by providing a reliable water supply for new and existing customers.
- ❑ To provide water to customers that is treated to drinking water standards.
- ❑ To allow the City of Fresno to better manage depleting ground water supplies using this control system.

Solution:

A non proprietary PLC-based supervisory control and data acquisition (SCADA) system was designed by the City of Fresno Water Division engineering staff around Modbus-RTU protocol over a 900 Mhz MAS radio system. This new system has the same or better performance as the older system and has far superior usability programmability, and flexibility. The Modicon PLCs selected are programmable in ladder logic and structured text.

Customer Benefits:

- ❑ Time spent programming well site controllers (Momentum). The old system involved using assembly language and burning chips.
- ❑ The city can also program over the radio. In some cases, this saves travel time.
- ❑ The use of structured text in the well site controllers allowed the city to add features previously unheard of. Algorithms, which calculate the season, holiday, time of day, and utility power rate eliminate running certain pumps when it is not economical to do so. Running them at the wrong time leads to penalties from the local utility.
- ❑ Online trending of field data on FactoryLink has aided in troubleshooting speed. The use of a non proprietary database allows the Water Division to access the data and process it using web.



Water Wastewater Application Guide Telemecanique® Programmable Logic Controllers (PLCs)

Twido® Ultra Compact PLC

The Twido compact and modular PLCs provide improved simplicity and flexibility. A programmable controller for standard applications (from 10 to 252 input/output (I/O)), the Twido PLC is ideal for simple stand-alone installations. These installations include chemical feed, sewage grinder, and septage receiving applications. Twido PLCs are Ethernet-enabled and can even be programmed via Bluetooth technology!



Advantys™ Modular Distributed I/O

The Advantys STB I/Os are a distributed I/O platform that provides a wiring solution, power management, and device integration system all in one compact system. As an open modular IP20 distributed I/O platform, Advantys STB is a cost-effective, feature-rich distributed I/O solution. It places I/O at the point of control to provide a 60% savings in wiring and installation costs while improving reliability and operation. These devices can also be configured to react in a pre-determined way in case of communication loss with the PLC. This feature can ensure your aerators are running, even if communication is lost. This is peace of mind you can't afford to be without!



Water Wastewater Application Guide

Starters and Contactors

Starters and Contactors

When you get down to it, reliability depends on your equipment responding exactly as you need—time after time. Schneider Electric starters, contactors, and relays are designed to exceed your reliability demands. Furthermore, we understand that you are being asked for more and more operational data from all aspects of your plant. We have the tools to gather unprecedented data from your motors in a compact package with easy access for monitoring and data logging purposes.

Type S NEMA Magnetic Contactors and Starters

The family of NEMA starter products includes combination, manual, and magnetic starters. These products are perfect for applications with a large number of starts/stops per hour such as with influent screens, grit classifiers, and chemical feed systems. They are also perfect for a wide variety of motor types, thus simplifying product selection. Square D® Class 8536 starters are available in NEMA Sizes 00-7 and are designed for operation at 600 Vac or less at 50–60 Hz.



IEC Type Contactors and Starters

IEC starters and contactors are a perfect solution for applications where the motor loads are well understood or space is limited. These devices are best suited for the majority of water and wastewater motors that do not experience a large number of start/stops per hour. A good example for use is in aerator or blower applications. To achieve the budget advantages afforded by these devices, they are more closely matched to a specific motor's actual application. This ensures that you have the reliability you need. Our IEC offering is in four different lines: the TeSys® U-Line, F-Line, D-Line, and K-Line.



Human Machine Interface

Ethernet TCP/IP Communications Control Holland, MI City Water Treatment Plant

Application:

The City of Holland, Michigan. A water treatment control system relied on powerful Schneider Automation controllers programmed graphically using function blocks, an Ethernet control network (rather than a proprietary control network), web pages stored within the controllers' Ethernet modules, and PC HMIs arrayed as independent network nodes.

Objective:

To replace the existing slow control system (PC-based) to a revolutionary control system that will add reliability and high speed communications.

Solution:

Transparent Ready® equipment gave them the ability to access and control the plant without the need to be present at the site.

Customer Benefit:

Authorized personnel can have secure remote access to the plant using a standard web browser on their PCs.

An integral part of any automation and control solution is the operator's ability to interface with the system. Schneider Electric offers a broad variety of solutions for water and wastewater facilities—from traditional pilot lights up to panel mount personal computers (PCs).

Operator Interface Terminals

The Telemecanique® Magelis® line of operator terminals provides a quick and easy method of gathering and entering real-time data from our programmable logic controllers (PLCs). They come in two basic varieties to satisfy every water and wastewater application.

Telemecanique® Magelis® XBTGT Terminals

For applications where graphics can aid in interface, the XBTGT is the answer. These can be found on anaerobic and aerobic treatment, as well as incinerators and membrane filters, just to name a few. XBTGT terminals feature a high level of communications (onboard Ethernet, simultaneous multiple link with Uni-Telway™, Modbus®, Modbus TCP/IP) and external data medium (Compact Flash card) for storing production data and backing up applications. XBTGT terminals also accept analog video camera input for live plant monitoring to improve plant security.



Telemecanique® Magelis® XBT-R/N System

For smaller applications, such as polymer feed systems or septage receiving stations, a text only solution may be beneficial. For these applications, the XBT-R/N is the best fit. The XBT-R/N system was designed for simple installation and operation. It comes in two- and four-line models. Also, the XBT-R/N system has up to 20 keys, of which 12 are configurable with changeable legends.



SCADA Software

The collection, treatment, and distribution system for a metropolitan water and wastewater treatment and monitoring system typically covers hundreds or thousands of square miles. Water levels may need to be monitored on distant reservoirs and lakes, chemical treatments and flow rates controlled in multiple tanks and lagoons, pumps operated at lift stations and regulatory reports generated for local and national authorities.

A Vijeo™ Citect® system can be scaled to fit any size water treatment facility or combination of utilities, while it centralizes management and ensures round-the-clock reliability and regulatory compliance. It operates over large networks with different types of communications, including auto dialers, wireless networking and other supervisory control and data acquisition (SCADA)-based water systems.

Also, a Vijeo Citect system provides safe, cost-effective, and reliable control over plant processes. This solution ensures continuous monitoring and control of plant operations such as: wastewater collection systems; water distribution systems; pump stations; sewer diversion; wet weather overflow protection; water irrigation systems; weather monitoring, remote operations and pumps, and remote terminal units (RTUs).

Vijeo™ Citect® Offer

The total integration of Vijeo Citect in Schneider Electric preferred architectures offers high productivity at all stages of system life, from development to maintenance. Its object library, common to the entire Vijeo offer, and its future ability to visualize all the new Magellis® graphic terminals, guarantee users a shared universe for creation of human machine interface (HMI)/SCADA applications.

Major Customer Benefits

- The complete basket of HMI/SCADA products will allow the customers to receive best of automation system.
 - Scalable from message display to supervision
 - Fully consistent with the HMI offer and Web offer
 - Fully integrated with control and HMI offer with tools such as OFS and FastLink, providing the ability to create a common tag database in SCADA from the PLC program
 - UAG offers greater integration for Vijeo Citect with Unity applications
- Consistency and Integration with HMI in order to:
 - Reduce training time and cost
 - Reduce the number of licenses
 - Apply portability and reusability
 - Reduce engineering time (single tag entry)
 - Unify and make the security consistent
 - Provide fast problem identification and problem solving
 - Reduce downtime and optimize operation
- Integration with control in order to:
 - Reduce engineering time (single tag entry)
 - Unify and make the security consistent
 - Provide fast problem identification and problem solving
- Available world wide from a Tier 1 supplier, offering:
 - Sustainability
 - One stop shopping

Features

- ❑ Synchronization of Vijeo Citect and Unity Pro™ databases.
- ❑ Automatic installation of OFS (OPC Factory Server) as inputs/outputs data server.
- ❑ Periodic database synchronization during the fine-tuning phase
- ❑ Application automatic consistency check via OFS in runtime mode.
- ❑ Total availability of essential production data, assuring permanent operation monitoring

Services and Engineering Services

Phone: 1-888-SQUARED

Square D Services offers one source of service expertise on all major brands of electrical equipment. Our solutions are designed to enhance performance, improve reliability and extend equipment life.

Expert Energy Services

- Provide expert energy and utility consulting services.
- Act as an energy advisor relating to complex utility issues.
- Assist client in energy decision making processes.

Start-up and Commissioning

- Inspection and testing of Schneider Electric equipment prior to energizing to verify equipment
- Is free of damage during shipment and installation
- Has been properly installed, and networks properly terminated
- Performs to the system design specifications
- Meets optimum performance standards
- Performed by factory-trained technicians, knowledgeable of our latest product innovations
 - Is loaded with current firmware revisions (when applicable)
- Verification of proper installation through mechanical and electrical testing and inspection prior to equipment energizing
 - As-installed documentation to establish a baseline for future reference and trending

Customer Training

- Offered for all Schneider Electric products
- Designed around customer's equipment
- Offered on-site and typically includes classroom and hands-on training
- Customer value
 - Square D product knowledge
 - Factory-trained technicians
 - Customer focused
- NFPA 70E training workshop
 - 8-hour course taught by certified instructors
 - Designed to provide participants with a basic understanding of safe workplace practices
 - NFPA 70E Part 2 (Arc Flash) standards are reviewed and explained
 - Includes an overview of proper distribution equipment maintenance

Water Wastewater Application Guide

Services and Engineering Services

Testing Preventive Maintenance

- Periodic inspection and maintenance to help extend equipment life and ensure operating efficiency
- Comprehensive mechanical and electrical testing to ensure proper functional operation, including:
 - Cable testing
 - Relay and metering calibration
 - Infrared testing
- Also available:
 - Custom service agreements
 - Facility-wide outage management
- Services also available for non-Schneider Electric equipment

Engineering Studies

Square D Services is focused on helping facilities solve complex power system issues that may involve equipment, automation, the electrical system or the utility. Based upon specific application needs, our engineered solutions are designed to lower life cycle cost while maximizing power system reliability. These services include: Electrical Systems Analysis, Electrical Distribution Designs, On-Site Audits, System Coordination, Power Quality Correction, and Power Management.

Power System Assessment

- Evaluates the condition of the electrical system
- Improves system reliability and availability
- Enhances electrical safety
- Provides essential documentation of system configuration, condition and maintenance
- Ensures proper operation of new or modified loads
- Prioritizes system improvements

Power Quality Studies

- Analyze power system disturbances and interruptions that decrease productivity and reliability
- Reduce cost effect of poor power quality
- Troubleshooting power system problems caused from utility voltage sags, lightning or from medium voltage capacitors switching

Harmonic Studies

- Identify excessive harmonic distortion and loading
- Properly size capacitors in the presence of harmonic generating loads
- Evaluate and identify harmonic mitigating savings opportunities
- Solve problems due to voltage notching caused by SCR firing in DC drives
- Optimize existing electrical distribution system and ensure proper operation of sensitive equipment
- IEEE 519 compliance

Short Circuit, Coordination, and Arc Flash Analysis

- Identifies over-dutied equipment due to high fault currents caused by system design additions or utility network changes
- Prevents nuisance tripping of protective devices and insures coordination with downstream devices
- Checks that feeder and branch conductors are adequately protected
- Generates updated AutoCAD one line diagram model of facility
- Addresses ground fault coordination and grounding concerns
- Identifies NEC code violations
- Determines proper personal protective equipment (PPE) for workers who work on energized parts per NFPA 70E or IEEE 1584
- Provides arc flash tables to determine required labels for equipment
- Determines arc flash boundaries for non-qualified personnel

Total Energy Control

Demand Management

- Develop customized Energy Action Plan and facilitate continuous implementation
- Perform detailed load analysis and process reviews related to utility systems
- Identify optimization strategies and evaluate technical and financial feasibility

Supply Management

- Organize and monitor utility data and perform detailed cost and consumption analysis
- Assist with energy procurement policies to leverage lowest-cost highest-value services
- Evaluate corporate risk tolerance and recommend compatible energy purchase strategies

Additional Studies Available

- Power factor correction
- Transient motor starting
- Load flow using portable metering or simulated with software

Drive Replacement

- Supply a replacement drive that fits into the existing enclosure
- Replacement drives are manufactured and supported by Square D and include drive start-up and factory warranty
- Retrofill capabilities
- Direct replacement available for any OmegaPak enclosure

Contactors Conversion for Motor Starting Applications

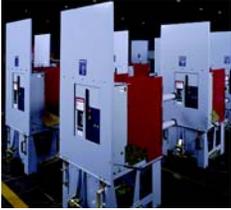
- Circuit breakers are not designed for the extreme duty cycle encountered in motor starting applications
- Circuit breaker interrupting element is replaced with a fused vacuum contactor
- Available for low and medium voltage circuit breakers
- Cycle counter; rated 300,000 operations
- In-line current limiting fuses to meet short-circuit capacity
- Contact wear indicators
- Improved reliability and reduced maintenance

Water Wastewater Application Guide

Services and Engineering Services

Retrofill and Upgrade

Direct Replacement Circuit Breakers



- Extends the life of existing switchgear at a fraction of the cost and installation time of new equipment
- Install a new circuit breaker element and carriage assembly into an existing line-up with little-to-no modifications to the switchgear
- The new circuit breaker interfaces with the existing structure and maintains safety interlocks inherent in the original design
- Designs available for most major manufacturer's switchgear
- Upgrades line-up to current technology with minimal downtime
- Available for low- and medium-voltage equipment using
- Masterpact® and Magnum™ circuit breakers

MV and LV Retrofill Solutions



- Install a new circuit breaker and cradle into an existing switchgear cubicle, which has been adapted to accept the new equipment
- Includes new cubicle racking mechanism, primary and secondary disconnects
- Designs available for most major manufacturer's switchgear
- Cost-effective way to upgrade switchgear to current technology
- Available for low- and medium-voltage equipment

C⁵ Reconditioned Program



The C⁵ Reconditioned program for low voltage and medium voltage power circuit breakers ensures each breaker is Checked, Cleaned, Corrected, Calibrated and Certified through the following steps:

- Complete disassembly and inspection of the circuit breaker at the component level
- Clean and repaint/replate key components; replace old hardware
- Identify damaged or defective components for replacement (additional charge to replace)
- Relubricate moving parts and operating mechanisms
- Calibrate to manufacturer's specification when the circuit breaker is reassembled

Remote Racking Systems

- Automatically controlled medium voltage circuit breaker racking operations are performed from a safety distance (25 to 30 ft.) via a control panel
- Removes operator from direct contact with circuit breaker
- Circuit breaker is in trip-free condition during racking operation
- Fully ANSI tested (more than 500 racking operations)
- Can be used with air magnetic SF6 or vacuum circuit breakers

Services for Telemecanique® Automation and Control Equipment

Phone: 1-800-468-5342

Automation Migration

Update Square D® Sy/Max™ and Modicon® 984 PLC platforms to the latest Modicon PLC products.

- Converter plates to match mounting configuration and simplify conversion
- Connector adapters to eliminate re-wiring
- Software conversion to speed update process and minimize re-programming
- On-site startup assistance

Industrial Electronics Repair

Repair of industrial electronic products from almost any manufacturer.

- An all-in-one electronics repair service streamlines purchasing procedures
- Searchable online catalog and printed price guide keeps repair pricing accessible and predictable
- Quick turnaround time keeps spares inventory at a minimum, which reduces inventory costs
- All-inclusive product warranty eliminates costs of re-repairs

High quality repairs, as ensured with our proprietary test fixtures and problem/resolution database, means that the on-site spares inventory is dependable, which minimizes unscheduled downtime. Process traceability ensures that submitted products can be tracked down quickly in an emergency.



Emergency Services

- 24 hours a day, 7 days a week coverage
- Modicon, Sy/Max, and Telemecanique product lines
- Network troubleshooting
- Programming assistance
- System troubleshooting

Network Certification

- Remote I/O, MB+ and Ethernet
- Correct cable routing, tap/splitter, and connector installation
- Physical testing of network components
- Oscilloscope noise analysis
- Network ground verification
- Time Domain Reflectometer (TDR) cable integrity testing

**Water Wastewater Application Guide
Services and Engineering Services**

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