Semiconductor Factory
Your partner
for Worldwide Overall
Equipment Efficiency
Your challenge...

- Increase manufacturing equipment yield
  - Reduction of equipment MTTR (Mean Time To Repair) and improvement of MTBF (Mean Time Between Failure)
  - Reduction in the number of non-product wafers
  - Reduction in time taken to detect errors which results in less WIP exposure
  - Minimization of run-to-run and wafer-to-wafer variation.

- Ensure 100% reliable supply of key Utility to manufacturing
  - Secured Power supply and distribution to utility workshops
  - Ultra Pure Air supply and secured Exhaust for Clean-rooms
  - Ultra Pure Water supply to production tools
  - Ultra Pure Power supply to production tools.

- Safety of people & equipment inside and around the Factory
  - Secured & reliable Exhaust of toxic elements
  - Continuous solid & liquid waste treatment
  - 100% reliable safety systems.

The Holy Grail of Semiconductor:
OEE (Overall Equipment Efficiency)

Water fabrication is a huge investment (1 to 2 B Euros) so the optimization of the overall equipment efficiency is the unique way to ensure an acceptable ROI, (Return On Investment).
New electric network architectures to
- Increase availability & safety regarding to the growing
  process constraints
- Facilitate maintenance operation
- Operate and control network through the Energy Management System
- Enable evolution without shutdown
- Enable maintenance policy
- Avoid Electromagnetic Compatibility trouble.

Specific Power Quality systems to ensure
- High quality energy supply to the production tools
- Continuous and reliable energy supply to the key utilities
- Continuous and reliable energy supply to the critical systems such as
  exhaust & safety systems.

Monitoring and Control of the Utility
- Real-time views of electrical and piped utility information
- FMCS (Facilities Management & Control System)
- Control & regulation of air & water treatment units
- Control & regulation of piped utility supply.

Advanced Process Control (APC)
- To collect & analyze data from the manufacturing equipment in real time.

Semi F47 complying devices
- To increase the voltage sag immunity of semiconductor
  processing equipment.
Schneider Electric,
your partner for...

1- Global desensitization

Operational requirement
Eradicate any financial impact of an electrical network fault (which is commonly estimated at more than M$1 per event).

Dependability
Electrical installations are designed to distribute an average power of between 5 and 50 MW. They generally hinge around a vast double feeder type network.
- They incorporate a large amount of "supply safeguarding" equipment from the delivery substation to the process equipment:
  - double EHV feeders,
  - double busbar MV distribution switchboards,
  - LV distribution switchboards and motor control cubicles (MCC) with withdrawable switchgear,
  - a power station. (Generator connected to the distribution network and numerous backup generator units spread throughout the site).

---

1. HV substation
   Association with VA Tech

2. MV Switchboard
   up to 40 MVA IEC - ANSI

3. MV/LV Substation
   up to 2500 kVA

4. MV/LV Switchboard
   PCC & MCC IEC - ANSI
   up to 7500 A - 1000 V
Electrical distribution system architecture principle

- In order to find the best route to achieve maximum power source dependability (reliability, availability, security & maintainability) we use a combination of:
  - design architectures,
  - appropriate and smart equipment;
- MV incoming and back up generators,
- Busbar Trunking System,
- High quality LV switchboards;
- UPS systems with lower MTTR figures;
- and a re-evaluation of some of the old traditional designs to bring them in line.

Project Requirements

- Isolation transformers
  - The range of cast resin dry type LV/LV transformers covers a power range from 1 to 1,250 kVA.
  - Single or three-phase DTY
  - Earthed shield between the primary and secondary windings
  - Oversized neutral.

- Reactive power correction
  - Used for both MV and LV applications:
    - Fixed or automatic correction equipment:
    - Prolong your equipment’s service life,
    - Avoid nuisance tripping and sensitive equipment destruction.

- Harmonics filtering
  - Solution to harmonics pollution.
  - Overall harmonics attenuation or order by order
  - Cos. f enhancement
  - Extended equipment service life
  - Reduced power levels consumed.
Production tools must be totally protected against any voltage disturbance.

- Schneider Electric and its subsidiary MGE-UPS propose solutions capable of meeting the express requirements of a Wafer processing plant.

- In addition to the factory global desensitization, specific “Secured Power” systems dedicated to the manufacturing equipment will supply them clean “Ultra-Pure-Power”.

**Example for 2000 kVA transformer, 3 UPS unit 600 kVA:**

- Optimized for existing architecture
- N+1 redundancy
- Instantaneous transfer (< 1 ms)
- Existing LV Switchgear not modified
- Battery autonomy depends on voltage outage duration
3. Specialized Utilities must be supplied to the process permanently and without any disturbances.

- This means that UPW (Ultra-Pure-Water) plant, HVAC Process cooling water and Exhaust systems may cause huge losses or danger when power supply from the GRID experiences disturbances, e.g. voltage drop, sag, power interruption, etc.
- The Variable Frequency Drives (VFD) that are available in the market today are only able to ride through power dips for at most a few hundred milliseconds. These VFDs, or more commonly known as “invertors”, will not “trip” when the power supply experiences voltage dip, but it may, depending on the type of loads, cause the motor to suffer reduction of speed instead.
- Schneider Electric has developed a system that provides cost-effective mitigation solution for not just sag protection but also to overcome the power interruption. This system can be used to provide pure and clean power supply to critical loads. It can also be utilized to enhance the standalone standard VFD ride through capability thus providing constant desired motor speed during disturbances.

Advantages over the existing products

- No need for batteries.
- Space saving.
- Reliable.
- Low cost/competitive price. Developed using standard Schneider products, the benefit from the economics of scale push the prices lower.

Cost-effective devices to overcome disturbances problems are the n°1 priority for the end users.
Safety, continuity of service and cost-saving for all Electrical Distribution network architectures.

Merlin Gerin’s SeeFox Energy Management and Control System can be used to control simple or complex electrical networks:
- control the link with the power distributor,
- optimise the operation of the electrical system.

SeeFox incorporates communication with all the installed Electrical Distribution equipment, including third-party equipment with recognised protocol. It also interfaces with high-level information systems (FEMCS).

Schneider Electric’s EMCS integrates the supervision and monitoring of all the electrical equipment into the process Control Systems environment.
Total system approach to power management

- The POWERLOGIC® Monitoring and Control System for WAGES (Water, Air, Gas, Electric and Steam) applications is a single system that makes it easy to obtain the information you need, when you need it, to make those important cost saving decisions.
- The POWERLOGIC system provides real-time views of electrical and piped utility information (water, air, gas, electric and steam) and stores it in non-volatile on-board data logs within circuit monitors and WAGES meter blocks. This historical data is then automatically gathered and made available in readily-accessible, standard reports so you can save them in a Web format for browser-based viewing. With consolidated WAGES information from POWERLOGIC, our experts, or yours, can make informed decisions to reduce utility costs and improve your facility’s efficiency quickly and easily.

The POWERLOGIC system has an extensive line of electrical monitoring devices and can also accept inputs from other meters, including piped utilities. WAGES meter inputs are collected, converted and communicated via a variety of delivery devices, including Ethernet, radio and telephone modems.

e-analysis for electrical quality control

With eAnalysis
- Customer has on hand a continually updated monitoring chart regarding:
  - the compliance with his electricity supply contract,
  - the operating conditions of his installation,
  - the quality and availability of the electrical power that is supplying his loads.
- eAnalysis gives the consumption profile so as to optimise customer’s contract and the analytic breakdown so as to reduce customer’s consumption.
- eAnalysis gives the necessary information to implement preventive maintenance, manage spare parts or even schedule renovation.
- eAnalysis allow you to identify the sources of disturbances and the solutions to ensure the quality and availability of power to suit the needs of your business.

Customer benefit
- Electricity bill savings optimisation of electrical installation operating costs and investments improvement of electrical power reliability and quality.
General offer for...

Web serving Control and Power

Thanks to Web technologies, Transparent Ready™ products, software and services provide new wide-open solutions for optimizing electrical distribution, industrial control and automation performance.

New Schneider Electric offers Web-enabled products, software and services, a standard web browser such as Internet Explorer® provide immediate access to all the information you need in real time from any location by any authorized personal around the clock.

So along with the benefits of Transparent Ready™ initiative, you'll gain easier access to information to get decisions right and help maximize your competitiveness.

Clean Room environment control systems

Schneider Electric subsidiary TAC-AB is among the world leaders for room environment and atmosphere control system, including industrial clean-rooms.
Motor Control Centers

Schneider Electric provide a wide range of IMCC (Intelligent Motor Control Center) in IEC and NEMA standards with the most advanced components for motor starting, protection, command and controls.

Active harmonic filtering in MCCs improves electrical network reliability to reduce operating costs and equipment downtime

- ReactVar AccuSine PCS Harmonic control benefits:
  - decreases overheating of electrical cables switchgear and transformers,
  - reduces downtime caused by nuisance thermal tripping of protective devices,
  - increases network reliability and reduces operating costs,
  - compensates each phase independently,
  - filters to the 50th harmonic,
  - costly harmonic studies are minimized,
  - power factor correction capacitors can be left in place. AccuSine PCS stabilizes the system by providing a perfect source for the load,
  - scalable. It is applied on the bus, and capacity can be added as needed.
General offer for utilities machinery

Power & control components and devices

In order to ensure a good homogeneity and easy maintenance within and among the Utility Workshops, Schneider Electric can supply most of the key “Power & Control” components and devices to the Machinery’s OEM’s.

### General offer for utilities machinery

<table>
<thead>
<tr>
<th>Electric Distribution Board</th>
<th>Motor Control &amp; Protection</th>
<th>Utility Process &amp; Automation</th>
<th>Human Interface</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Voltage Switchboard</td>
<td>Soft Starter</td>
<td>Distributed I/O</td>
<td>Digital colour HMI</td>
</tr>
<tr>
<td>High Power LV circuit-breaker</td>
<td>Variable Speed Drive</td>
<td>PLC up to 1024 I/O</td>
<td>Push buttons, indicators, selectors switches</td>
</tr>
<tr>
<td>MCCB</td>
<td>Multiple Functions protection relay</td>
<td>PLC up to 64.000 I/O</td>
<td>Photo-electric, inductive &amp; capacitive detection</td>
</tr>
<tr>
<td>Final Distribution Low Voltage circuit-breaker</td>
<td>Combined Starter (circuit-breaker + contactor)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Quickfit technology for motor starter components**

**Semi S2 0200**

- Solutions against Hazardous Energy Isolation
- SEMI S2-0200 compliant EMO’s:
  - Full EMO button and guard
  - Narrow EMO guard
  - New guard for use with “Trigger Action” EMO buttons
  - All contacts positive opening - EN418

*All approved by GS3*

Our offer is compliant with most of international standards and label such as: IEC, UL, CCC, CE.
Improve equipment reliability and performance with Semi F47 voltage sag solutions from Schneider Electric

- Schneider Electric is the industry leader in supplying SEMI F47 information, compliant electrical components, and sag mitigation solutions and technology that can be applied to all or specific areas of a tool to obtain equipment Semi F47 conformance.
- Schneider Electric devices are tested by an independent agency, EPRI PEAC, in accordance with the Semi F42 test standard, and performance is based on initiating the sag at the zero crossing point of the waveform. All devices carry Semi F47 certificates of conformance.

**Semi F47 certified products**

**Low Voltage Ride Through Module**
By ensuring SEMI F47 compliance of AC powered IEC contactors and relays, TELEMECANIQUE Low Voltage Ride Through Modules can be used to increase the voltage sag immunity of semiconductor processing equipment. These modules make it possible for AC powered TELEMECANIQUE contactors and relays to exceed the requirements of SEMI F47.

**D-Line Contactors**
are Semi F47 compliant and are perfect for high-density contactor applications. D-Line contactors are available in 15A and 150A versions. The addition of overloads for motor starting applications create Semi F47 compliant starters.

**F-Line contactors**
are Semi F47 compliant and are perfect for high-load applications. F-Line contactors range from 160A - 780A. The addition of overloads for motor starting applications create Semi F47 compliant starters.

**K-Line contactors**
are also available in 6A, 9A, and 12A versions. The 6A and 9A devices with 24VAC and 120VAC coils are Semi F47 compliant, including use with auxiliary contact blocks.

**Prevena safety relays**
have a broad range of contact configurations, are specifically designed for use in safety applications.

**Zelio Logic**
is an economical smart Relay to ensure your basic automation needs.

**Phaseo DC power supplies**
are new from Square D. Their narrow design saves panel space and all models din rail mount.

**Reactivar ESP**
The Electronic Sag Protector (ESP) approaches the power line conditioning problem from a unique perspective.

**ATV28 TRX Drives**
Achieves SEMI F47 Compliance
Recent independent testing conducted on the Altivar 58 TRX drive controllers, verified that the product line of AC drives meets the SEMI F47-0200 standard.

Equipment must continue to operate normally during sag events occurring above the yellow line in the boxed area.
Advanced Process Control

**APC** is essentially collecting data from the manufacturing equipment, and analyzing that data in real time.

- The benefits are:
  - Increased yields.
  - Reduction of equipment MTTR and improvement of MTBF.
  - Reduction in the number of non-product wafers.
  - Reduction in time taken to detect errors which results in less WIP exposure.
  - Minimisation of run-to-run and wafer-to-wafer variation.

Closer integration with MES/APC resulting in increased operational efficiency.

**At Work in the Fab**

Deploying effective APC solutions for maximum benefit requires a sophisticated and industrially-hardened data integration architecture capable of collecting a vast amount of process data and insuring the data is delivered to APC applications in a robust and timely fashion.

Schneider Electric's Microelectronics Engineering Services (SEMES) team has worked closely with a leading semiconductor manufacturer to develop an APC-enabling data integration architecture based on standard, industrially-proven automation hardware products from Schneider Electric.

This architecture has been proven to greatly reduce the time-to-deploy and increase the supportability of manufacturing-worthy APC solutions as it has been deployed by our SEMES team on over 200 APC applications in both 200mm & 300mm fabrication facilities.

In addition to our automation services, our SEMES team also provides a full range of consulting services including custom application development, training, support, and project management to guarantee your APC applications realize the full benefit achievable by deploying APC in your wafer fab.
Advanced Process Control

Arc Detection
Schneider Electric’s arc detection solution for semiconductor manufacturing tools is a perfect example of how our SEMES team is able to develop a custom APC application to address our customer’s most critical needs. When one of our semiconductor manufacturing customers was experiencing significant wafer damage due to electrical arcing within their process chambers, our SEMES team drew upon Schneider Electric’s vast experience in Secure Power applications to develop a monitoring system which can detect microsecond electrical discharges within the plasma processing environment. By monitoring the power delivered to the process chamber by RF generators as well as electrostatic chuck and DC power supplies, our arc detection system can immediately alert the manufacturer of wafer-damaging process conditions and stop the manufacturing tool before significant wafer and yield loss can occur.

Schneider Electric’s arc detection solution can be applied to any plasma process tool susceptible to arcing such as Physical Vapor Deposition (PVD), Chemical Vapor Deposition (CVD), and Plasma Etch process tools.

DSP-based Online Monitor

Vacuum chamber
Some references around the world

Schneider Electric Services
From product and equipment to projects management, Schneider Electric can deliver the competence of our professional engineering and services teams utilizing our long-standing experience in the fields of electrical distribution, network control and automation, combined with our expertise in complete and coherent electrical control and automation systems.