Up to 70 percent of unexplained downtime is caused by power quality problems.

Chances are that your facility is affected

Irregularities in your facility’s power are often a hidden source of unplanned downtime. Poor power quality can have a negative impact on both the performance and the life expectancy of electronic components used in many discrete and process applications. From transients to voltage sags, the Allen-Bradley power quality portfolio consists of plant-wide to individual process- and machine-level products that help you identify and mitigate power issues – to increase your uptime.

<table>
<thead>
<tr>
<th>Power Quality Events</th>
<th>Definition*</th>
<th>Symptom</th>
</tr>
</thead>
<tbody>
<tr>
<td>SAG</td>
<td>Variation below nominal RMS voltage of 10-80% with a duration of a half cycle up to one minute.</td>
<td>Controller faults and systems crashes, Chopped or damaged relay coils.</td>
</tr>
<tr>
<td>SWELL</td>
<td>Variation above the nominal RMS voltage of 10-80% with a duration of a half cycle up to one minute.</td>
<td>Data loss, Hardware damage.</td>
</tr>
<tr>
<td>TRANSIENT</td>
<td>Momentary non-sinusoidal changes in voltage or current (less than one cycle).</td>
<td>Data loss, Lower life expectancy of electronic components.</td>
</tr>
<tr>
<td>OVERVOLTAGE</td>
<td>Steady state voltage or less than 100% nominal voltage for one minute or longer.</td>
<td>PC memory loss, Equipment damage or shutdown.</td>
</tr>
<tr>
<td>UNDERTENSION</td>
<td>Steady state voltage or more than 100% nominal voltage for one minute or longer.</td>
<td>PC, or controller data corruption, Data loss, Damaged relay coils,Erratic equipment behaviour.</td>
</tr>
<tr>
<td>INTERRUPTION</td>
<td>Complete loss of live power.</td>
<td>System crash, Unplanned shutdowns.</td>
</tr>
<tr>
<td>HARMONICS/NOISE</td>
<td>Harmonics/Noise are non-sinusoidal voltages and currents that are the result of non-linear electric load. Harmonics/NRSE impact the waveform, creating complexity and non-uniformity to sinusoidal electrical circuits.</td>
<td>High levels of harmonic distortion can cause overheating, failure of electronic equipment, incorrect readings on meters and faulty operation of protective relays.</td>
</tr>
</tbody>
</table>

Identification: We can help find out how power quality is affecting you.

The first step towards improved performance is understanding the power quality issues that are affecting your production and control equipment. Power quality events are usually brief – they may not even cause your lights to flicker – making them easy to overlook and difficult to diagnose. Some events are triggered by severe weather patterns; more localized events can be caused by new or existing equipment within a facility. Yet, these easy-to-miss events can wreak havoc on production. Monitoring solutions can be applied to identify power disturbances impacting your entire facility or specific areas and equipment. This information can be used to analyze the root causes of power quality issues.

Mitigation: We can help you improve your power quality.

Once you know how power quality events are affecting your production and you’ve analyzed the monetary impact, it is time to consider how to fix the problem. Mitigation strategies can be facility-wide voltage sag correctors, which correct the most common and brief voltage sag events, to uninterruptible power supplies or surge and filter products to protect specific sensitive and critical equipment.
Identification and Analysis
Products for diagnosing power quality issues

Power quality problems can originate from both inside or outside your facility. Rockwell Automation provides products that enable you to evaluate incoming power as well as perform in depth analysis at specific points within your facility.

Power quality events are is not easy to detect. An effective monitoring solution is the first step toward understanding how much of your down time, and its associated costs, can be attributed to power quality issues.

i-Sense®/i-Grid® Intelligent Network
The i-Sense voltage event monitor is ideal for analyzing the feed into your facility with limited investment. Voltage quality data is viewed on the i-Grid cloud-based application, which means, there is no software to install-, or maintain.

Instant event e-mail and text notifications will keep power quality data at your fingertips.

PowerMonitor™ 5000
Measuring current and voltage, the PowerMonitor 5000 calculates an extensive array of power quality information to help you understand issues coming into and throughout your facility. This information can be incorporated into your power management system for detailed analysis and resolution.

PowerPad™
The PowerPad enables mobile power quality metering for real time monitoring and analysis. This hand held product is ideal for auditing your facility’s power quality issues.

This information can be immediately analyzed to determine if there are issues or if permanent monitoring is required.

Side-by-side comparison proves value of addressing power quality

In a major automotive engine plant, automated equipment and assembly lines were mysteriously shutting down 12 to 20 times a year. Plant managers suspected poor power quality. Because of the serious impact on productivity, discussions reached the governor’s office, and the utility company was asked to install premium voltage. Utility officials explained that the premium feed could cost millions and would not solve the real problem – voltage sags. Four i-Sense intelligent voltage sensors quickly confirmed that voltage sags were the true cause of the problem.

A ProDySC dynamic sag corrector was installed on an assembly line, and unscheduled downtime stopped – for two years and counting. By contrast, other lines, not protected by a DySC product, maintained a projected average of 12-20 events per year.
DySC® Voltage Sag Protectors
Solutions to Voltage Sags

The DySC is a scalable, battery-free solution that protects devices from voltage sags and short interruptions that account for the vast majority of events impacting production.

DySC products are 99% efficient and virtually maintenance-free.

Industrial UPS
Fast Recovery from Power Failures

The 1609 is uniquely designed for the industrial market to provide back-up AC power to the control cabinet. The 1609 will bridge dips, sags, or brief losses of power.

If necessary, the 1609 will provide enough time to facilitate a safe shut-down of your industrial PC, PLC, data logging HMI, or any other critical device in the control scheme.

Surge and Filter Protection
Designed to Meet Industrial Protection Requirements

Any load switching that creates a spark has the potential to produce damaging transients within your system. These transients can destroy equipment if not addressed. Motors, drives, contactors, and capacitor banks switching are just a few examples of transient sources.

Surge and filter protection products are crucial for protection against internally generated transient and high frequency noise.

Mitigation
Now that you’ve located the issues, apply the remedy at the source

Once you have determined the impact of power quality on your production, Rockwell Automation brings expertise and Allen-Bradley products that can mitigate the problems and help you avoid the consequences associated with power quality issues.

Down time reduced 30-50% – profits up accordingly

An international producer of food and beverage products faced major challenges caused by voltage sags: 10-15 major voltage sag events a year were causing stoppages on aseptic lines, where lost sterility required an eight-hour chemical re-cleaning and re-sterilization process after each power event. On a bakery line, ovens lost product and were a fire safety concern.

Initially, the company suspected automation failure. When efforts to correct this proved unsuccessful, Rockwell Automation installed i-Sense intelligent sensors, revealing the precise correlation between downtime and voltage sags. A MegaDySC to protect the entire process and five smaller DySC sag correctors resulted in a 30%-50% reduction of total downtime, with significant and substantial gains in productivity, efficiency and profit.
### Power Issue Sag Under/Over Voltage Interrupt Harmonics Transients Frequency

#### Products to Identify and Understand Power Quality Problems

<table>
<thead>
<tr>
<th>Product</th>
<th>Sag</th>
<th>Under/Over Voltage</th>
<th>Interrupt</th>
<th>Harmonics</th>
<th>Transients</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>i-Sense*i/i-Grid</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
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<tr>
<td>PM 5000 M5</td>
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<tr>
<td>PM 5000 M6</td>
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<td>PM 5000 M8</td>
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<tr>
<td>PowerPad</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

#### Products to Mitigate Power Quality Problems

<table>
<thead>
<tr>
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<th>Sag</th>
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<th>Interrupt</th>
<th>Harmonics</th>
<th>Transients</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1609-B,-D UPS</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>✓</td>
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<tr>
<td>1608 Mini DySc</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>1608 Pro DySc</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<tr>
<td>1608 Mega DySc</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4983 Surge Protector</td>
<td>✓</td>
<td>✓</td>
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<td></td>
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</tr>
<tr>
<td>4983 Filter</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td>✓</td>
</tr>
</tbody>
</table>

*i-Sense can correlate power issues to external i-Sense monitors through i-Grid Intelligent Network. **Handles interrupts up to five seconds in duration. See technical specifications for details.

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