What are the most commonly used solutions for solving power quality problems?

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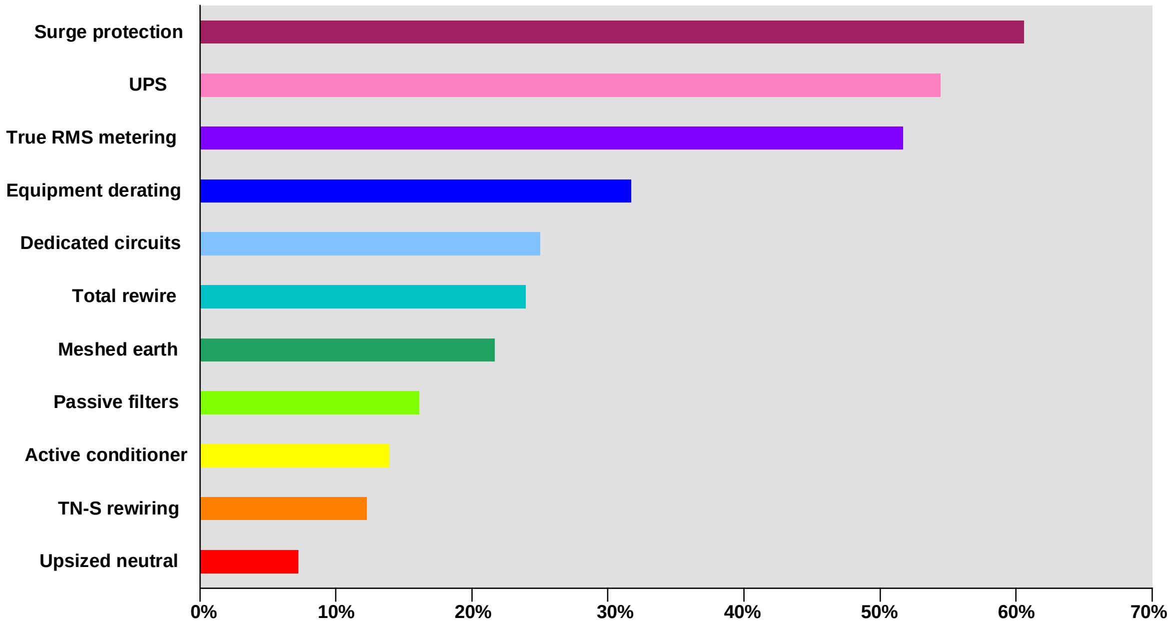
The survey involved 1,400 sites in 8 countries and it lists the most prevalent solutions used for solving power quality problems, in terms of % adoption rate.



Surge (transient) protection was the most frequently used. Passive filters came out 8th in the survey which is very surprising considering how they are so widely accepted and fitted by industry in general.

Below are brief explanations of the terms used in the table:-

Surge protection: In the LPQI survey this proposed earthing for protection against lightning and between interconnecting equipment. In a new building this may be the ideal solution however in an existing industrial installation it would not be so practical. The fitting of surge protection devices, which are readily available in the marketplace, would probably be the most sensible approach in such cases.

UPS: These are widely used and understood by most PC owners. Hardly surprising that it comes second on the list but not coming first indicates the significance of surge protection.

True RMS metering: Not the most obvious remedy but if wrong current readings are not taken incorrectly rated equipment will be installed. It is only possible to read the effective current made up of the fundamental plus harmonic currents with a true RMS meter.

Equipment derating: Transformers and motors do not like harmonic loads. The increased heating generated by harmonic pollution can lead to a number of problems. Often derating is often the easiest option but not necessarily the best long-term solution.

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Dedicated circuits: By connecting heavy loads to the distribution transformer, there is less likelihood of generating harmonic pollution or surges on start-up. Loads sensitive to harmonics should also have their own supply circuit. Multiple cables can be used for harmonic loads rather than a single cable which would be prone to heating due to neutral currents and not so efficient because of the "skin effect", caused by the 7^{th} harmonic and higher.

Complete rewiring: Often (in about 24% of cases in the survey) adopted because original wiring is not capable of supplying modern loads. Obviously this is a disruptive, expensive and drastic solution but it reduces the risk of fire and stoppages. Zoning is another method that is employed for reducing the likelihood of power quality problems. This involves classifying loads in terms of continuity, safety and EMC considerations, so that each group has its own specific wiring and earthing methods.

Meshed Earth: This provides a low impedance path to earth for a wide range of frequencies. This earthing technique also creates a large number of potential current loops but because there a large numbers of earth connections the current levels are not critical.

Passive Filters: Often line filters are fitted to reduce harmonics; however they do provide a number of other benefits which include protection against surges (transients); power factor correction; soft-starting and ride-through during supply voltage sags. Filters can be fitted on individual loads or used centrally depending on individual site requirements.

Active Conditioners: Tend to be expensive and but can be very effective when applied selectively. They offer other advantages such as tolerance waveform distortion and ride-through during dips, sags, brownouts and drop-outs. Having active PFC boost circuitry makes it easier to design power supplies which will cope with a wide range of supply voltages.

TN-S rewiring: In many countries TN-C used to be widely used. The 'C' indicates that the neutral and earth are combined in a single conductor. A system with a completely separate earth and neutral ('S') is much better for EMC.

Neutral upsizing: A number of single phase harmonic loads will create a high current in the neutral due to accumulation of triplens. This can be up to 1.7 times the effective line current. In such instances it is advisable to upgrade the neutral conductor.

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