

## **Medical equipment**

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Tackling the power quality issues of modern medical equipment

## **Food and beverage production**

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The challenges of poor power quality in the food sector

## **HVAC systems**

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Keeping your systems cool when things get hot



# Power quality | in the medical sector

*You may have seen a lot more people checking in at A&E or taking selfies from their hospital bed recently. It's not that all your Facebook friends have suddenly been under the weather, it's just that hospital patients and visitors are now allowed to use mobile phones on site without fear of interfering with medical equipment. However, hospitals still have a long way to go to reduce power quality issues. Steve Hughes, managing director of REO UK, explains.*

Power quality problems can be just as severe in medical environments as they are in industrial ones. For example, MRI scanners emit large amounts of electromagnetic radiation, so care must be taken around them. Patients must remove jewellery before entering the scanner and hospitals must use radiofrequency (RF) shielding to prevent electromagnetic radiation from causing interference in nearby medical devices.

*“Non-medical equipment typically causes the most electrical interference”*

Hospitals in the UK typically follow procedures to reduce the interference caused by medical equipment and comply with regulations such as EN60601, a European standard that outlines the basic requirements for medical electrical equipment in hospitals. This standard covers the safety, essential performance and electromagnetic compatibility of such equipment. However, despite the care taken over medical equipment, it is non-medical equipment that typically causes the most electrical interference problems.

Commercial off-the-shelf (COTS) equipment is often used in hospitals alongside medical equipment. This equipment, such as commercial PCs, can result in electrical interference and subsequently have serious effects on medical equipment functionality. For example, there have been reports of cases where critical medical equipment such as defibrillators failed to work because of interference from secondary equipment, such as ambulance radios.

The rise in portable and handheld devices used to monitor patient vitals increases the number of devices in



*The number of electronic devices in hospital environments is increasing, which can lead to electrical interference.*

hospitals and, with more devices used, the risk of electrical interference rises. Such devices are susceptible to changes in power quality, which affects the quality of data received. Electromagnetic interference (EMI) causes surges and spikes in power,

*“Facilities managers can use MITs to allow electrical equipment to pass the EN60601 standard for hospitals.”*

which has an impact on both the data collected by medical equipment and the way devices interact with each other. If decisions are being made on the basis of potentially incorrect data given by the equipment, this could prove dangerous for the patient.

To protect patients, hospital managers must consider all of the equipment used in their hospitals as a whole, rather than only focusing on the interference caused by powerful medical equipment.

Fortunately, facilities managers can use medical isolation transformers (MITs), such as the REOMED range, to allow most Class I equipment to pass the electrical side of the EN60601 standard and become safe for use in hospitals. The onus for the medical compliance lies with the owner of the equipment, but this pragmatic approach can help to cut costs.

The transformers allow safe galvanic separation between the primary and secondary electrical circuits, which limits the electrical leakage and, as such, the interference to other devices. This means that COTS equipment, as well as portable and handheld devices, can be used in hospitals alongside medical equipment without compromising patient safety.

Thanks to increased EMI awareness and protection, we can now use our mobile phones around medical equipment. As useful as the public may find it to keep up to date on social networks, facilities managers have a bigger task ahead. To minimise equipment failures and increase patient safety, hospitals must take steps to reduce electrical interference from all medical and non-medical equipment used on wards.

# Power quality | in the food chain

*From powering microwaves to keeping fridge-freezers running, electricity plays an integral role in the food chain. Yet even before products reach the hands of consumers, a constant supply of reliable power is required to ensure that food is produced safely and properly. Here, Steve Hughes, managing director of REO UK, explains how electrical engineers can protect food manufacturing plants from power quality problems.*

The food industry has changed significantly in the last two decades. Due to fluctuating consumer demand and tightening legal requirements, food manufacturers have been required to invest in new means of operating effectively. This has typically involved plant managers investing in new technologies, ranging from more efficient equipment to digital data collection software.

there are many new pieces of equipment being installed to improve process efficiency and product quality.

In particular, plant managers are turning to packaging equipment that uses laser microperforation to control airflow and extend shelf life. This equipment uses lasers to create very small and evenly spaced holes in packaging in a consistent and efficient fashion.

equipment is not performing properly, it is unlikely that the food packaging will be as breathable as it should be and this leads to inaccurate best-before dates and a possible risk to consumers.

To address this problem, electrical engineers must ensure that the equipment has an effective switch mode power supply (SMPS) that can handle the unique demands of the application. This can be challenging, as every operating situation is different and off-the-shelf power supplies may not be suitable for a particular set up.

The best course of action is for electrical engineers to consult a power quality specialist that can provide an effective solution. REO UK, for example, designed the REOTRON SMP due to customers requesting a product that could make laser perforation equipment reliable.

This SMPS uses specialised control algorithms on capacitive loads so engineers can maintain voltage and current accurately, leading to a lower project reject rate. It also features liquid cooling that can be easily connected to the existing liquid cooling systems used by most lasers.

The REOTRON SMP can also be connected to remote monitoring modules such as the REODATA-GSM. This provides performance data that plant managers can use to determine if and when maintenance is needed. As with the other data that plant managers must collect during the production process, electrical engineers should install effective power line communication (PLC) filters to remove harmonics that occur due to data transmission and high frequencies on power networks.

With these power quality problems addressed, food can be monitored effectively as it moves safely along the production line and arrives in stores with a good shelf life.



*Food packaging machines that use microperforation require high accuracy and a stable power supply.*

For example, the alarming number of food recalls in recent years has led to a legislative push for better traceability of ingredients.

This particularly came to the fore after the infamous horsemeat scandal of 2013, which significantly damaged the public's perception of the food industry.

As such, manufacturers must now keep comprehensive data on every part of an ingredient's journey, which is only possible with data collection software.

However, this is not the only way that food production facilities are changing. In addition to the rising prevalence of data-collecting sensors and software,

Each of these developments is good news for consumers, who have more assurances of product quality and freshness. However, they pose a challenge for electrical engineers tasked with ensuring high plant power quality as few plant managers immediately consider upgrading power supplies when specifying new technology.

For example, laser microperforation equipment uses high frequencies that significantly hinder the performance of conventional power supplies. This means that usage of the equipment causes power quality problems, including voltage fluctuations that result in decreased laser power output and an unpredictable performance. If the

# Power quality | in heating, ventilation and air-conditioning

*Most people can remember a time when they've walked into a room and seen one person dressed for the arctic while the person next to them looks like they're in the Bahamas. Although disagreements over heating like these have led to fights in some offices, for most businesses poor power quality in HVAC systems can do more damage financially. Here, Steve Hughes, managing director of REO UK, explains how to keep your HVAC running cool when things get hot.*

Power quality is a term that many people use but few fully understand. Typically associated with a stable supply of mains electricity, power quality covers a range of problems, including the continuity of the supply of electricity, fluctuations and spikes in voltage and current, as well as transients or harmonic currents.

*“The popularity of SMPS has created power quality problems in HVAC systems”*

For years, power quality was a problem almost exclusively reserved for industrial applications. When manufacturers began using non-linear, switched, devices like variable speed drives (VSDs) to control the speed of a motor driving a conveyor belt, they had to pay attention to the effect these devices have on the mains supply.

The use of switch-mode power supplies (SMPS) results in harmonic currents in the electrical supply. Here, the current waveform expands to accommodate multiples of the fundamental 50Hz frequency. This means that the device using power is not only consuming more electricity — sending energy bills through the roof — but it can also cause motor windings and transformers to overheat and lead to inefficiency and possible breakdowns.

In recent years, the popularity of SMPS in computer systems and laptops, as well as in phone chargers and consumer electrical equipment, has created a power quality problem in HVAC applications. Combine this with the fact that most buildings, offices and residential and commercial facilities have some form of heating, ventilation and air conditioning (HVAC) it is easy to see the scale of the problem.

Poor power quality can damage HVAC components including heat exchangers, fans, pump motors, condensers and furnaces, reducing their lifespan and raising energy costs.

Facilities managers responsible for a building's HVAC system are also obliged to meet industry standards such as EN61800-3, which specifies the limits of electromagnetic emissions, immunity

According to the standard, a PDS rated at less than 1000V can be installed by anyone in domestic premises. This is already causing problems as the demand for apartment buildings grows.

Apartment buildings typically use more sophisticated building management systems, with electronics controlling the heating, lifts, extraction, doors, telecoms and internet-over-mains connections,



*SMPS' in computer systems has increased domestic power quality problems, which damages HVAC components.*

levels and testing methods for power drive systems (PDS) — the parts of a VSD that control driven equipment.

The standard identifies four categories where PDSs can be used in one of two environments. The first environment looks at domestic premises, low voltage networks, houses, apartments and residential buildings.

The second looks at industrial buildings and those supplied by a dedicated transformer such as factories and plants. Depending on the category, the standard either lets anyone install the PDS or requires installation by a professional contractor.

all of which can be compromised by poor power quality, ultimately hampering the user's experience.

To enable facilities managers to use drives properly in their HVAC system, REO UK has developed an entire suite of products dedicated to eliminating power quality problems in HVAC applications. The REO Unity range comprises electromagnetic compatibility (EMC) filters, mains chokes, output chokes, sinewave filters and powerline filters.

So, the next time you feel like wearing your shorts to the office, make sure your HVAC system is running as cool as you look.