Power Quality for Sustainable Manufacturing

Power quality is frequently overlooked as a component of sustainable manufacturing. Correcting power quality improves a facility's environmental footprint directly by reducing electric energy use, and indirectly by reducing scrap and asset failure. Power quality is also an important consideration for renewable energy installations. Many energy efficiency measures have hidden power quality impacts that must be detected and mitigated to achieve the maximum sustainability improvement possible.

Power Quality Improves Energy Efficiency

Most electricity is generated from fossil fuels, so reducing electricity use reduces a facility's carbon footprint. Power quality events such as voltage sags, low power factor, and harmonic distortion increase heat losses in motors, transformers, electronics, and numerous other industrial devices. These heat losses draw additional energy from the utility. In hot climates, the building's air conditioning load is also increased, resulting in even more electricity use.

Power Quality Reduces Asset Failure

Poor power quality is a leading cause of failures in electrical and electronic devices. Replacing failed assets requires manufacturing a replacement and transporting it to the customer site. All manufacturing requires energy, and most energy generation has associated carbon emissions. Many manufacturing process pollute in other ways, and the raw materials for manufacturing deplete resources. Transportation likewise has a significant carbon footprint.

Power Quality Problems Increase Scrap

Power quality events are a leading cause of unplanned manufacturing downtime. Unplanned downtime often damages in process products, which must be scrapped. Disposing of scrapped products often has an environmental impact, particularly in the rubber and chemical industries. Even if scrap may be safely disposed of, resources and energy are wasted in manufacturing the scrapped products. Improving power quality is a great way to reduce scrap, and reducing scrap is a great way to reduce environmental impact.

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Energy Saving Technologies May Impact Power Quality

Energy saving technologies such as variable frequency drives (VFDs), LED lights, and electric vehicle chargers area large par of the fight against climate change. Many facilities are upgrading their equipment to reduce their carbon footprint and operational cost. Energy economizing technologies are both more likely to cause power quality problems, and more vulnerable to damage thereby, than the technologies they replace. Neither sustainability nor fiscal benefits will be fully realized if power quality is compromized.

Denison Technologies' gateways and monitoring service are an excellent addition to all industrial efficiency upgrades. Our products will detect power quality anomalies before they affect operations. Further, Denison Technologies offers full energy monitoring services to track usage in real time. Tracking electricity usage is often the first step to reducing it.

Power Quality Reduces Tech Waste

Failed assets are considered tech waste, or e-waste. Tech waste is commonly processed in developing countries with lax safety, health, and environmental standards. Improper tech waste processing leads to heavy metal pollution and unsafe working conditions. Transporting tech waste overseas contributes to the air and water pollution of shipping. Landfilling instead of reprocessing tech waste contributes to groundwater pollution. Most materials in tech waste biodegrade slowly, if at all. Landfilling tech waste instead of reprocessing increases the resource depletion of manufacturing new devices. Many waste hauling services will not accept tech waste as part of the municipal waste stream.

Power Quality and Renewable Energy

Renewable energy sources can't always match the capacity and demand response of fossil fuel sources. Reducing total energy use is therefore critical to the ongoing transition to 100% renewable and carbon neutral energy. Small scale renewable energy installations often feature inverters, battery chargers, controllers, and similar electronics. Good power quality increases the lifetime of these electronics as it does all others.

Renewable utilities are more susceptible to voltage sags and swells, which are a leading cause of asset failures and unplanned downtime. Power quality monitoring will verify the presence of such events, and set the stage to install remediation technology.

Solar and battery installations must convert DC to AC using inverters. Inversion may introduce harmonic distortion to the AC waveform, which may damage powered equipment. If a renewable energy installation compromises power quality, the full environmental and financial benefit will not be realized. Denison Technologies' assessments and monitoring are an ideal compliment to renewable energy installations to ensure the maximum sustainability improvement.

Peak and average electricity demand are analyzed during Denison Technologies' assessments. Most industrial operators are familiar with the demand charge on their electric bill. High peak demand impacts renewable energy installations. The renewable generation may be sized for the expected peak demand as opposed to the average demand, increasing its cost to acquire and possibly its cost to operate. If the renewable generation is not upsized, storage batteries are required. Storage batteries have their own environmental concerns, and are an additional expense. If neither upsizing nor storage batteries are implemented, the plant will require utility power during high demand periods, and will not achieve 100% renewable status. The best way to reduce these effects is to reduce peak demand. Denison Technologies' sustainability reports include strategies to reduce demand and integrate renewable energy sources.

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