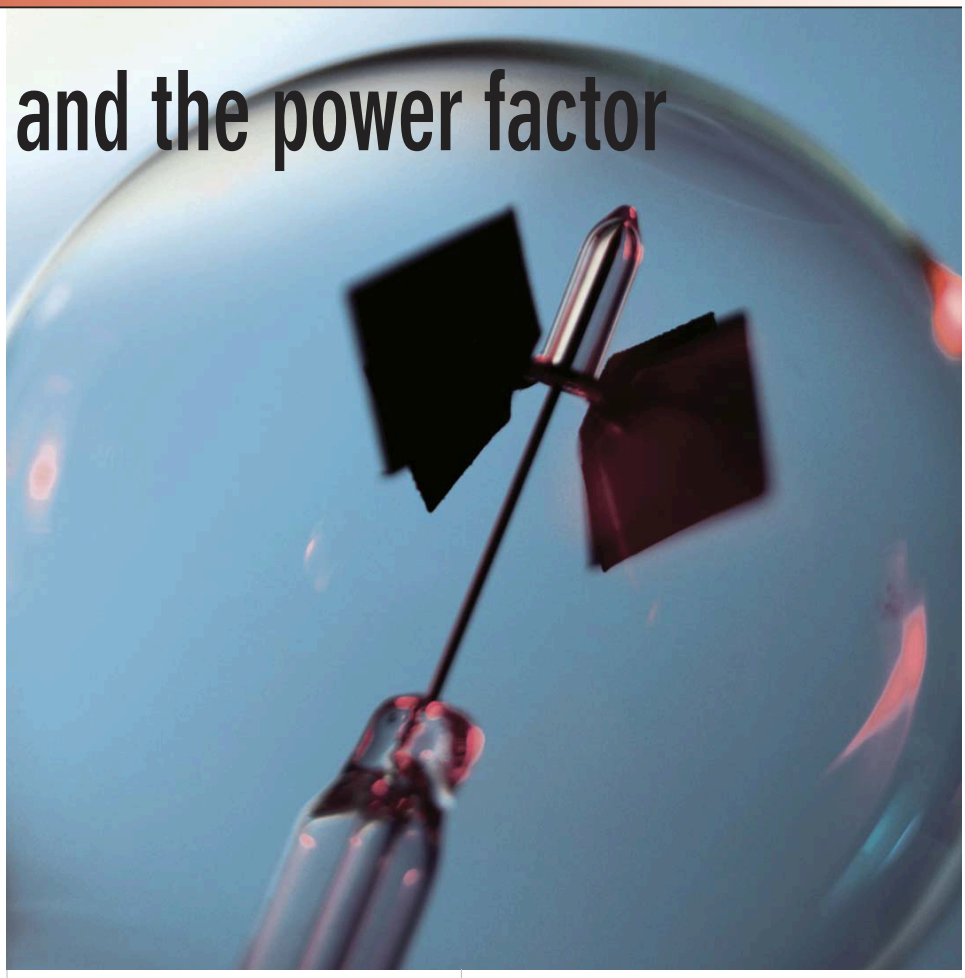
Power quality and the power factor



Leon Wasser, MBA, P.Eng.

Electricity is often one of the largest single expense items for manufacturers. Despite this, because utility costs are often viewed as largely fixed expenses, corporate energy conservation strategies are not given the priority which they deserve. Given that most manufacturers operate on rather fine operating margins, even a small reduction in power expenses can have a massive impact on a company's bottom line.

As noted recently by Perrin Beatty, president of the Canadian Manufacturers' Association, a 10 per cent reduction of a manufacturer's energy consumption can often translate into the doubling of profit margins for a manufacturer. Plastics manufacturers ought to become more conscious of their utility expenses as the price of electricity continues to rise at accelerating rates, and especially at their opportunities for savings.

All of the electrical power consumed in a manufacturing plant falls into two categories: resistive loads and reactive loads. Resistive loads are those which involve the direct use of power to generate light and/or heat, such as incandescent lights, electric ovens or drying units. Reactive or inductive loads convert the electricity, using it in a more sophisticated and energy efficient way.

The motors and compressors of the plant's manufacturing equipment as well as the base building's HVAC system constitute major inductive loads. Computers, fluorescent lights and HID lights are also reactive loads. Depending on production processes, reactive loads may constitute a significant proportion, or even the majority of a plant's power consumption.

Power factor is the ratio between apparent power expressed in kilovolt-amperes (KVA) and real power expressed in kilowatts (KW). Power is generally supplied by Canadian utilities to their customers at close to 100 percent power factor.

Reactive loads in manufacturing plants reduce the plant's power factor. Plants with higher proportions of reactive loads have a lower power factor.

Every manufacturing plant's power consumption is unique, although there are some commonalities within industry sectors. What is almost universal, however, is that manufacturing plants as a whole have a far lower power factor than any other category of buildings due to their intense application of mechanical equipment required for production and packaging processes. Many manufacturing plants typically operate in the range of power factors of 65 to 80 per cent, but it is not unusual to see far lower power factors in plants with a small number of large mechanical loads.

Historically these losses have been viewed as inevitable power inefficiencies, but recently, new technologies have emerged which can recapture and recycle the previously wasted lost power factor back into the building's power stream, to allow the building to operate at near 100 per cent power factor. This technology is called power factor correction and power quality improvement.

Power factor correction and power quality improvement allows plants to extract the maximum latent power supplied by the utility by restoring a building's power utilisation ratio to almost 100 per cent. Power quality improvement is a highly sophisticated technique which filters out a variety of power wave anomalies caused by the presence of inductive loads including broadband harmonics, voltage imbalances and current imbalances. It reinforces the main primary power wave so that it can be effectively used by manufacturing equipment.

Through power quality improvement, all three phases are restored to equal amplitude and balanced phasing. The system also filters out and deals with the power surges, transients, sags and other problems that most buildings experience at some time. In addition, by eliminating these power wave anomalies, motors, compressors and other inductive devices can operate more optimally, reducing over-heating and premature wear-and-tear and failure.

Also, because so much of production equipment is microprocessor-controlled, and these control chips or devices are often very sensitive to electrical fluctuations, plants can significantly reduce accidental circuit trip-outs which can shut off a vital piece of production equipment. The installation of a power quality improvement system will correct these extraordinarily costly and disruptive power problems and reduce unnecessary production interruptions.

These systems are installed in a building's electrical room where the main transformer is located, and are installed in parallel to the power supply so that no power interruption is required during installation and operation. A computer-controlled power factor correction system like PowerCon's PowerKure system then dynamically and continually adjusts the power supply to the building to increase the building's power factor to almost 100 per cent while recycling power anomalies to reduce both KW peak demand and KWh power consumption.

It is time for plastics manufacturers to turn their attention far more seriously to energy conservation. Such measures can often constitute the difference between corporate profitability and survival, and financial losses and failure in our fiercely competitive global marketplace. The benefits of energy conservation are permanent as are the benefits of good corporate citizenship, and these in the end, are the real objectives of sustainability.

Leon Wasser is vice-president of business development, PowerCon Optimized Power Solutions Inc. (www.powercon.ca). He can be reached at leon.wasser@sympatico.ca or at (416) 473-4614.