Power Quality

February 2006

REO-USA

Why is power quality becoming such an important issue?

There is a challenge for electronic designers to run at the highest possible clock speed. As an example of this Illinois University recently claimed the record of switching a transistor at 509 GHz and furthermore, they have an ultimate goal of making a 1 terahertz transistor in the future. This does have practical applications in the creation of faster computers, video games, secure wireless communication systems and rapid analogue to digital conversion for radar an other electronic combat systems.

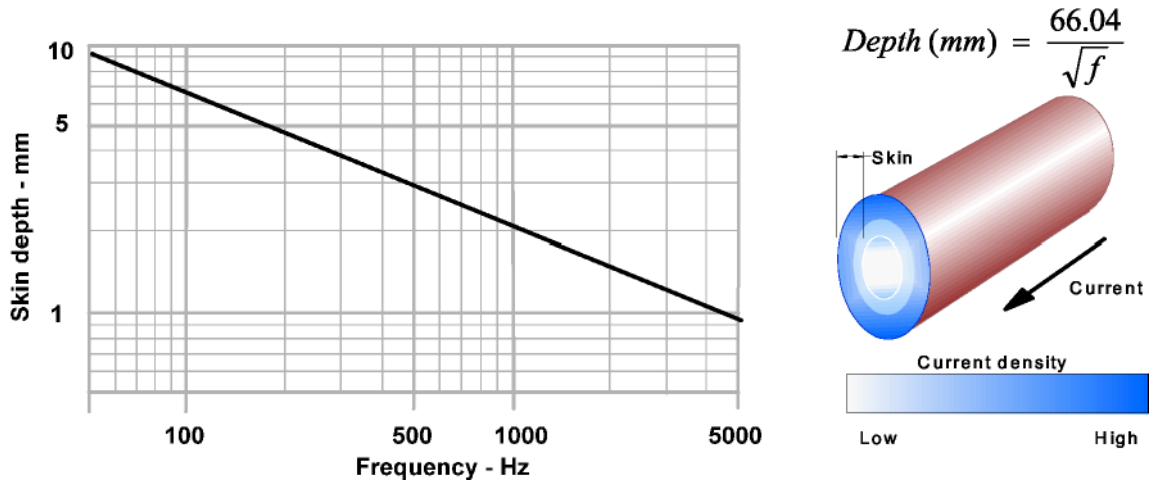
At a more commercial level the use of higher speed in switch-mode power supplies, has many advantages. The components become much smaller, especially inductors and transformers which are often the bulkiest and heaviest items. Consequently, most appliances today such as TV's, refrigerators, air-conditioning equipment, low-energy lighting and computers invariably use a switch-mode power system. In the industrial sector nearly all variable speed drives operate on the switch-mode principle. Another big advantage of the switch-mode power supply is that it is a simple matter to make it self-regulating. In other words; if the supply voltage drops, the mark-space ratio is adjusted and so the supply current rises. The output voltage remains constant thus ensuring a consistent supply to the load.

All of these factors impact on power quality. The smaller, faster electronic devices do not have the same immunity to abuse from the electrical environment that their predecessors did. What is worse they also contribute to the growing proliferation of EMC disturbances and in so doing jeopardizes their own ability to function correctly.

The general rise in current has multiple implications. Many safety trips are designed to release at a current limit and so the main power supply could shut-down even though in theory it has sufficient power capacity.

Switching of any description generates harmonics (high frequency current wave-forms that are multiples of the mains or fundamental waveform). So these are hidden currents that are wasteful and can accumulate to very high levels.

What is more, higher currents create higher losses (I^2R) and also higher frequency currents cause the skin effect in conductors, which can also create losses or de-rating.



The "skin effect"; the higher frequency the more current tends to flow in the outer layers of a conductor. This becomes significant at the 7th harmonic (350Hz) and above.

Furthermore, eddy current losses in transformers and motors can increase. The net effect is that there is a higher probability of power failure, equipment loss, fire caused by overheating, component failure or malfunction of electrical equipment.

Stricter controls over power quality will be enforced to coincide with the continuous drive forward for more sophisticated electrical equipment.

3250 North Post Road, Suite 132
Indianapolis, IN 46226
Phone (317) 899-1395 Fax (317) 899-1396
www.reo-usa.com info@reo-usa.com