The Trouble With Mains

THE CLOCKWORK WIND-UP ACOUSTIC GRAMOPHONE AND 78RPM SHELLAC DISC ARE IMPORTANT HISTORICAL PRECURSORS TO OUR CURRENT HI-FI, BUT MAINS ELECTRICITY HAS PROVIDED ALL THE ENERGY FOR OUR HI-FI SYSTEMS FOR MORE THAN 60 YEARS. HOWEVER, INCREASING MAINS POLLUTION POSES A REAL THREAT TO OUR HIGH QUALITY MUSIC REPRODUCTION, AS BEN DUNCAN EXPLAINS.

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In the broadest sense, all high-end music reproduction requires careful management of energy in its various forms. The energies that need perfect handling may be wanted or unwanted, may be acoustic, mechanical, or electrical, including electro-magnetic fields and electrical currents, and the various wanted and unwanted relationships and interactions that occur between these. What is so often overlooked, of course, is the invisible energy, and the quality of that energy, that we must bring into the room, to bring the hardware – and music – into life.

This is nearly always the AC mains supply, because it is by far the cheapest source, and also requires the least management effort. Even after recent steep rises in the cost of UK electricity, making one's own AC power is slightly more expensive, noisy, and (in view of generator exhaust fumes) potentially hazardous. Eco energy is far more costly, maybe by one hundred times with its high up-front capital cost and need for storage batteries, and also a lot more bother to manage.

Avoiding too much power management is important to listening enjoyment, as too is an operating cost that is not out of proportion. When endeavouring to create high quality sound, there are enough other imperfections to deal with without worrying overmuch about whether one is using 10 or 100 watts, or whether there has been enough sunshine to recharge some solar device, since some gear was accidentally left on. The public AC mains supply it is then.

ASPECTS OF AC ENERGY

The fact that the AC supply is public is rarely mentioned or considered. It also has finite impedance, which is tantamount to saying that the energy available is finite, and 'softly' limited. Consequently, the supply quality can be affected by a single user drawing more than his/her notional share; or many users doing likewise to a lesser extent. There are few restrictions on, and no real policing of, what any user plugs into the supply: how much load is placed on it (so long as the supplier can be paid and the main fuse doesn't blow); when that load is on, when it is off, and how often any loading is repeated. It follows that use of the public supply for something as sensitive to power quality as music reproducing equipment, is akin to using the equally public roads. Depending on both skill in social timing and pure luck, you may encounter miles of empty, smooth highway, or the congestion of traffic capacity overload.

The qualities of AC energy are vastly more complicated, than someone with basic electrical knowledge imagines. Compared to audio's wide span of levels and signal frequencies, electrical power engineering appears straightforward enough, with apparently just one frequency and a few voltages. But, the intricacies are immense, especially when abusive loads designed and sold by idiots are factored in.

An example is the TV set. Makers have known full well and for many years that TV sets have represented a dominant load on the electricity system in residential areas, and at certain times of day. An eight year old can figure this out. Yet most makers have persisted in making cheapskate products that have, for the sake of saving costs, used a crude form of switching supply, since Ferguson first did so around 1966. The size of the pulsed current draw may not be any greater than that of a largish hi-fi, but there are ten or a hundred times more TVs in a given neighbourhood, and the mass operation of TV sets has long tended to be focused on particular sectors of day. The overall effect has, in general, seen the harmonic pollution of the supply rising as industrial & commercial pollution falls away during the late afternoon/early evening, then peaking at the main TV watching times, and fading away again around midnight. At which time many hi-fi listeners find that they get better sound. TV manufacturers have not thought through the consequences of actions they know will be substantial, and since TV sets are no longer made in the UK, any opportunity to create better standards for the hi-fi industry is lost.

A basic quality of the public supply is a voltage that would, if pure, reach a peak of 339 volts for the everyday RMS value of 240V. This power-equivalent RMS value is, however, generally maintained to a fair standard in UK, largely staying within a few percent either side of 240V (the supposed change to 230V is wholly illusory Euro-speak). While the supply level is monitored and automatically regulated at intermediate 11kV/33kV electricity substations that occur every