UNIVERSAL POWER FACTOR CORRECTED POWER SUPPLY

THE FOLLOWING INFORMATION DECRIBES THE IMPROVED PERFORMANCE BENEFITS OF THE NEW

"HALCRO POWER FACTOR CORRECTED POWER SUPPLY".

If you own any audio amplifier other than HALCRO, then your whole audio systems performance is suffering. This is due to it using standard peak rectification power supply technology, which was invented more than "100 years ago"! Also new CE laws introduced on 2nd January 2002 make the new HALCRO technology compulsory in European (CE) markets.

A very important consequence of Power Factor Correction (PFC) is illustrated in the following analysis for continuous power output available from an amplifier. You will, I'm sure be interested by this analysis!

The maximum power output available from an amplifier is directly limited by the maximum power available from the wall plug, but is also highly dependent on whether the power supply is PFC or the standard peak rectified type.

Consider the following example where the mains circuit breaker is rated at say 16A and the mains voltage is 110V r.m.s. (e.s.r. = 0 ohms). In this example the power available from such a power source is 110V x 16A = 1760W. A typical efficient B-class amplifier is about 70% efficient at best at full power, just below clipping into a purely resistive load. (N.B. 99.9% of amplifiers are actually class B even though A or AB status are claimed quite falsely by 99% of manufacturers!)

So in this example, for an efficient power factor corrected supply, the power available from the amplifier output is 1670W x 70% = 1230W continuous, if and only if the amplifier is highly efficient, the load is resistive and the amplifier is running just below clipping.

However, for peak rectified power supplies, the r.m.s. input current is roughly double that of a PFC supply for the same power output. So in this example, for a peak rectified supply instead of PFC, the power available from the amplifier output is 1230W/2 = 615W continuous, if and only if the amplifier is highly efficient, the load is resistive and the amplifier is running just below clipping. Much less!

Now, here is the really subtle point! The more powerful an amplifier, the lower this figure because the more powerful the amplifier, the lower the efficiency at low powers. This is because, for more powerful amplifiers, more of the voltage drop is taken up by the transistors!

For example, consider an efficient amplifier,which can deliver 500W into 8ohms, 1kW into 4ohms and 2kW into 2ohms. This must be considered a powerful amplifier. This must have a supply rail of at least +90V and -90V for perfect output transistors. To be practical though, the rail will have to be more like +95 and -95V.

Now let's work backwards. If the mains outlet is 110V at 16A, then at most the whole amplifier may draw 110V x 16A = 1760W continuous for a PFC supply, and for a standard peak rectification supply, this is about 880W. This means that if say the power supply is 90% efficient, then the maximum power delivered to the amplifier electronics from the power supply is 1580W from the PFC supply and 790W from the peak rectified supply. Therefore the maximum continuous mean current that the amplifier may draw is 1580W / (95V x 2) = 8.3A for the PFC supply and 4.2A for the peak rectified supply. Thus the peak current drive from each of the 95V rails is pi x 8.3A = 26A for the PFC supply and 13A for the peak rectified supply. This translates into 500W into 8ohms, 1kW into 4ohms, 676W into 2ohms for the PFC supply; and 500W into 8ohms, 338W into 4ohms, 169W into 2ohms for the peak rectified supply!

Compare this to an efficient amplifier, which can deliver 250W into 8ohms, 500W into 4ohms and 1kW into 2ohms. This must have a supply rail of at least +63V and -63V for perfect output transistors. To be practical though, the rail will have to be more like +65 and -65V. Assuming the same conditions above, the maximum continuous mean current that the amplifier may draw is 1580W / (65V x 2) = 12.2A for the PFC supply and 6.1A for the peak rectified supply. Thus the peak current drive from each of the 65V rails is pi x 12.2A = 38A for the PFC supply and 19A for the peak rectified supply. This translates into 500W into 8ohms, 500W into 4ohms, 1kW into 2ohms for the PFC supply; and 500W into 8ohms, 728W into 4ohms, 364W into 2ohms for the peak rectified supply!

This is not purely academic. For example, suppose the loudest signal on a C.D. is 1 seconds worth of an organ note; this will be effectively the continuous rating just below clipping. N.B. for a real loudspeaker, which is not purely resistive, these figures will be much worse. E.g. consider the high power amplifier driving a 2 ohm load which is say 45 degrees reactive,

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then the continuous output power will drop from 169W to an amazing low 85W! Even if the circuit breaker was 40A instead of 16A, this figure will be 530W assuming each amplifier is running of different 40A circuit breakers. However, if the same amplifier were to use a PFC supply from separate 40A circuit breakers, the output will be the full rated 2kW.

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