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"GETTING RID OF A THORN IN THE SIDE"

Some messages from readers of my column with direct requests for information of a certain type and occasional talks with well-known qualified pro audio trade members aroused an impellent need to get rid of a "thorn in the side" I've put up with for too long, sometimes out of politeness for the people I speak to, other times through disarmed desistance when faced with people who seem sincerely convinced of what they're saying, and occasionally even for purely mercenary commercial reasons.

Of course I haven't got it in for anybody in particular; the "thorn" in question is only due to the realization that, in spite of all the effort made in recent years by a lot of folk (myself included), "word of mouth" culture still hasn't been eradicated to make way for real culture with a capital "C", which must at all costs be put into practice in all the countless branches of acoustics if we want to have ensure the audio trade a clearer, more certain future, particularly in the pro field.

It's unforgivable to keep using the same senseless language that was used (due to a complete lack of a specific culture) when talking about numerous technical topics twenty or thirty years ago. A language that definitely doesn't enable anyone to form an objective opinion, based on real knowledge of technical issues, which is in fact the only way to make correct equipment choices to suit one's actual needs.

Information divulged by trade magazines has recently been better than in the past, specific books can be easily found and some of them, in spite of being in English, are perfectly understandable, even by those who don't know the language well, thanks to plenty of designs, diagrams, etc.

Some serious manufacturers divulge a lot of technical information, often more than the commercial info, a large number of "workshops" are held in various occasions in major cities, trade fairs host an increasing number of specific conferences and numerous courses for sound engineers and technicians are now held regularly in some towns in Italy.

Nevertheless, in spite of all this, I've heard some of the most stupid questions and had to listen to some of the most ignorant statements (in the etymological sense of the word) from the very people who in one way or another use all these specific means of information, regarding basic technical questions, the understanding of which is at the root of any decisions which have to be made in the pro audio world.

The most recurrent of them all recently drew my attention and led to this "outburst" on my behalf, already expressed a few years ago in other authoritative pages (1) for similar reasons. Here they are:

"How many thousand Watts does the system have to have?"

"My system has ten thousand Watts"

"You'll need fifty thousand Watts to amplify that venue."

"How many Watts are the cabinets?"

"How many Watts has the PA?"

"I want a 20,000 Watt system"

...and so on.....

I've always been sorely tempted to reply sarcastically to these statements and questions, but have always managed to resist, convinced that the other person was in good faith and deserved a clear explanation rather than a snide remark.

I've therefore decided to bring up the matter again, in the hope of helping to eliminate once and for all a technical falsehood that contaminates the trade and causes confusion on the market with often irreparable damage, in terms of image and money, for those who take these senseless statements or the replies to the questions seriously.

Maybe somebody's now thinking: "What exaggerated criticism for an innocent, even if incorrect, use of technical terms!"

The person in question will however take care to avoid explaining, in good or bad faith, that, by means of communication based on the incorrect use of terms which make a big impression, because they're not well known and apparently very technical, big evaluation mistakes are caused in whoever's listening, resulting in consequent damage, and risk leading to something described in legal terms as "false pretences" if not even "fraud".

In fact, for the large majority of audio trade members, the "number of Watts" of an audio system is nowadays a yardstick of its quality, or at least of its suitability at professional level and therefore very often, if not always, this parameter is the deciding factor for its purchase.

All this seems rather like medieval obscurantism, which left the "plebs" in their ignorance in the Middle Ages and allowed the ruling class at any given time to abuse of its power.

This mustn't happen nowadays, in the age of Internet in countries like Italy that claim to being technically advanced.

If they want to show they're serious, it's the ethical and professional duty of all sales staff or technicians to give the people they deal with sufficient objective elements to form their own opinion, even if they don't expressly request it or aren't able to assimilate it due to lack of knowledge on the issue.

I definitely don't intend being a moralizer, but a lot of factors have convinced me the time is right for everybody to do this, helping to divulge correct information which, when all's said and done, will be beneficial to the trade's growth.

But, after this preamble, let's analyze the technical issues my statements are based on. First, it's best to remember the exact meaning of the frequently abused word "Watt".

"A Watt, abbreviated as W, is the unit of measurement of power (P), just as centimetres or inches are the units of measurement of dimensions. Power is an electric or acoustic quantity used in the transfer of energy or the definition of the operating limits of a piece of equipment. In other words, it's the rate, quantified in Watts, at which energy is used (in this case transferred from the amplifiers to the loudspeaker enclosures) to carry out any given work: for example heating an iron or moving a loudspeaker means using a certain electric power which is expressed in Watts."

These units of measurement are adopted in the context of the SI modern decimal metric system, derived from the original "**French *Système International d'Unités***", found in every country in the world, apart from some English-speaking countries such as the United Kingdom and United States, in which adaptation is nevertheless slowly under way.

Now, having clarified the meaning of Watt, reading the phrases shown above once again, anybody can understand that they're meaningless when referring to the performance of a pro audio system - "hot air" as somebody might say.

In fact, what's the meaning for example of a phrase like: "**This system has 10,000 Watts**"?

For one thing, a system can't **have** Watts, as it's not an active subject able to "possess" anything; at the most, considering that a system is intended (quite rightly) as a combination of amplifiers and loudspeaker enclosures, it could be said the latter can "receive" the Watts that the amplifiers connected to them supply.

Are the Watts in question referred to the sum of the useable power that each enclosure is able to accept without damage with acceptable distortion levels, or the sum of the maximum power fed out by the amplifiers connected?

Therefore, are 10,000 Watts obtained by summing the maximum undistorted power of the amplifiers used?

And in this last presumption, preferred by many salespersons to impress inexperienced clients with increasingly higher figures, what load or impedance is this power referred to?

Everybody knows, or should know, that an audio amplifier is a generator of constant voltage, whereas the power (Watts) varies according to the load or impedance connected to its output(s).

This means that 10,000 Watts on 8Ω (the typical impedance of a loudspeaker enclosure) should theoretically be doubled on 4Ω and actually quadrupled on 2Ω, even if in fact this doesn't happen, as the theoretical amplifier can't in fact be built.

Without going into the reasons here, it can however be seen that, on average, a good amplifier increases its power by 50% when the load's impedance is halved. Therefore, taking an example from the quoted phrases, the same audio system, could "have" 10,000, 15,000 or even 22,500 Watts, depending on the impedance of the loudspeaker enclosures involved: 8, 4 or 2Ω. (not to mention RMS and PEAK Watts, etc., which would confuse the figures even further).

Which of the three conditions is referred to in the "power of the system" taken as an example?

Does anybody perhaps state the impedance of the enclosures that make up the system, or of each individual channel and the relative powers, to enable the total power to be found?

The question's rhetorical, of course - nobody does!

Continuing in this direction, it seems clear, no explanation will be found for the declared power of our hypothetical system, just more confusion.

Let's consider that the Watts declared are referred instead to the sum of the maximum power that our system's enclosures are able to withstand individually during use, without damage or unacceptable distortion.

This logic could make the incriminated phrases seem more correct; but this assumption will also founder miserably in the total lack of replies that should be obtained to the following questions:

Under what conditions do the hypothetical system's enclosures withstand this power?

According to which norms - DIN, IEC, AES or EIA?

For what bandwidth is this power withstood?

What is the power in question?

For how long?

Is it average continuous RMS power with a sinusoid signal?

Is it perhaps continuous RMS power, but with a music signal?

Maybe it's PEAK power, with a music signal?

Many more questions of this type could be posed, revealing a large amount of doubts, but the uselessness of these mental gymnastics seems obvious and couldn't lead to any conclusion, due to a lack of sufficient information.

It's therefore impossible to give any meaning to the incriminated phrases even this way and, once again, the power stated for our hypothetical system has no reference that could give the slightest indication of its performance.

But there's more (a lot more) to say to stress just how wrong and absolutely ridiculous it is to talk about Watts when referring to an audio system, as is unfortunately the bad regular practice (to use a euphemism) in the pro audio trade.

From the two unsuccessful attempts to understand the meaning of Watts, attributed to a hypothetical audio system, at least one indisputable fact seems to emerge; the declared power in this meaningless list of phrases, corresponds to the sum of that referred to the capacity of the individual enclosures to accept it or referred to that fed out by the individual amplifiers (part of the system) on a load which isn't indicated.

In other words to establish or give an impression of the performance of the system (incredible!), in one case a power datum is given in Watts (which is meaningless, because it doesn't refer to anything), which in turn would be the result of a virtual sum of the power accepted by all the enclosures that make up the system, or rather of each section that makes up an enclosure, whether it's two- three or four-way, with or without sub woofer, etc. In the other hypothetical case, the sum given is that of the maximum power that each amplifier would feed out, being connected to the same aforementioned sections, which make up a professional loudspeaker enclosure.

In both cases, presuming for a moment that they can be taken into consideration, it seems that the power declared for the system hasn't in any case the slightest connection with the performance it's capable of: calculating a sum in this way, to use the first understandable comparison that comes to mind, is like summing the power fed to a refrigerator, washing machine, dishwasher, vacuum cleaner or air conditioner, then boasting of having a 10,000 Watt home; *ridiculous, isn't it?*

In an audio system, which must reproduce the entire useable frequency band, from the lowest frequency reproduced by the subwoofer to the highest reproduced by the tweeter or horn, according to the number of sections that make up the enclosure, the performance is established, in terms of maximum sound pressure, in conditions of acceptable distortion and safety for the loudspeakers, by the weakest section of the enclosure or combination of enclosures that make up the system.

So if we really want to continue the heresy of using Watts to assess the performance of the system, we should at least only indicate the Watts of the weakest channel of the set-up: but which one?

According to the brand, model and configuration in question; two-way, three-way, four-way, with or without sub, with several high, mid, low, mid-low sections, etc., we'd finish up having to indicate dozens and dozens of different values from system to system, even only for the weakest channel, in spite of the evident simplification of the number of elements to be taken into consideration.

In short, it seems clear that the "Watts" can't in any way give sensible indications of an audio system's performance in this case either.

At the most, if we really want to find some use for this list of phrases at all costs, I officially suggest that these Watts should indicate the average absorption and therefore average consumption of electric power of the audio system they're referred to, or rather the amplifiers which are an integral part of it.

I think nobody will disagree that in this case we'll at least have a clear indication for the technicians who'll have to supply the power for the audio system as a whole and certainly at least they'd be able to put together an adequate electrical system or choose a sufficiently powerful generator.

Some folk could be completely disorientated at this point, when faced with the discovery and demonstration that the "Watt", the most frequently used yardstick referred to for evaluating and choosing a sound reinforcement system, no matter what brand, is in fact absolutely meaningless and its use in such a generalised manner gives rise to "figures of speak" without any sense.

Take for example the musicians and entertainment agencies that send out the so-called technical "riders" and the rental firms offering Watts left, right and centre.

I'd like to ensure them that, once this incorrect practice has been eliminated, they'll be the first to benefit and I suggest they make a small effort to adapt and take advantage of updated and much more relevant indications of the "performance" or useful identifying attributes of audio systems for professional sound reinforcement.

Which ones?

In the next article, I'll do my best to pick out some to consider (for each type or size of system) as references, thanks to which practical performance when using a professional sound reinforcement system will be able to be compared in an objective manner, enabling professionals to evaluate and choose according to their needs.

I don't intend finding more or less qualifying merits for any type of sound system rather than others; I'm not interested in causing a jumble of biased opinions among trade members. I intend picking out accepted objective elements for judgement that are sufficient to enable simple evaluations and coherent choices.

To do this, since I'm definitely not the repository of the truth, I'd like to expressly ask all those who understand and agree on the usefulness of clarification for the benefit of the trade (manufacturers, consultants, technicians, operators, etc.) to send me their opinions, ideas and suggestions.

I don't know if my request will have good results from a numerical point of view, but I think it should, due to the issue's importance and the interest it should arouse. If this isn't the case, I'll continue as before, suggesting my solution to the problem covered in these pages, convinced that, at least for reasons of civilization and culture, if not of a technical nature, it must be faced and solved.

References

- 1) "Single-point frequencies, gnomes, elves and other stories", Italian AES Journal, November 1997.

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