

Design matters

Vertere's Touraj Moghaddam is a man on a mission to make the world sound better. In an exclusive interview, he tells **David Price** how and why...

Touraj Moghaddam is one of hi-fi's great characters – not just for his affable, charming manner, but for his passion and expertise. As soon as you meet him, it's hard not to be bowled over by his wide-eyed sense of wonder. Despite having played a leading part in the successful British hi-fi company Roksan for over a quarter of a century, he retains an infectious enthusiasm for the appliance of science in making things sound better. Now fronting his new company Vertere, Touraj is still beguiled by the process of designing products, and indeed the philosophy of hi-fi in general.

DP: Is your hi-fi world analogue or a digital?

TM: Vinyl is a media that as soon as you improve something makes your record collection new again. The unfortunate thing about analogue is you can't get to the original recording made at the studio – it's always a copy – but you can continually improve it.

It has a very long heritage, it started many decades ago, and people have been perfecting it for a long time. There are advantages in systems where you are refining it constantly, sometimes these can outperform new, novel ideas. Look at the early days of CD, it was a real disaster – very good marketing but no substance behind it, but today Compact Disc is not that bad.

The advantage you've got with digital is that there isn't any reason why you can't have at home what you have in the studio. With analogue it's impossible, unless you nick the tape! That's the only way, because as soon as you start copying it, it's gone. With digital, the same thing happens, although people think it's just a matter of numbers, it isn't.

In a way, a digital signal is no different to an analogue signal, it may have constant amplitude but it has infinite frequency – you're still dealing with a waveform with all sorts of anomalies that come in.

With analogue, although you'll never get to the mastertape, you have the advantage that your starting point is better than with digital. Most of the errors are either background noise or self-induced by the signal – it's like you're driving fast down a winding road, though you might cut the corners, overall you've got the right turns at the right points.

With digital you've got to digitise the signal and this process has its overshoots, undershoots and errors, but this time it is not related to the signal causing the machine to do something wrong. Therefore, the things that you do wrong may bear no resemblance to the road, then you would go off the road and come back on, go in the wrong direction and come back on the road – so you're pretty muddy! It's a simple analogy but highlights the point that the nature of your defects is quite important.

DP: So you're saying an analogue system predisposes itself to working, providing you



Whether designing hi-fi or just kicking back and relaxing, Touraj Moghaddam is never far from a stack of vinyl!



Music is never far from the centre of things; Touraj spends long hours listening...



HIS STORY

Touraj Moghaddam started Roksan with fellow Imperial College graduate Tufan Hashemi on 9 August, 1985. He'd previously owned a Linn LP12 turntable, but felt there was something wrong with its sound. While an engineering post-graduate working on a wind turbine project in his fifth year of research at Imperial, he decided to re-engineer the turntable to work in the way he wanted – and ended up with a radically different design. Instead of using a sprung, suspended subchassis it used a novel plinth design and motor installation that allowed a very firm control of the platter speed. He showed the deck to friends, one of whom was Roger Macer at Sound Organisation, who famously said, “are you serious about making this, because if you are – as soon as you've got one, I want to know.”

Touraj duly took the deck into full production, and Roksan grew very quickly, challenging the (then) hegemony of the Linn Sondek by offering a more focused, precise sound. Christened the Xerxes, it was named after a Persian king. In 1991, the TMS statement turntable was launched, and Roksan launched a range of loudspeakers using a novel sprung tweeter mounting. Amplifiers and compact disc players followed, and the company has a very wide range of products. As this month's group test shows, they're still very accomplished!



keep pretty close to the signal. The errors in the analogue system are sympathetic errors, which don't really detract as far as the human auditory system is concerned, from the music?

TM: Sure. Analogue may not exactly give you the dynamics and the amplitude that is there, but it's still working and the errors that are there are related to the music. When CD first came out, they found that despite the fact that the noise floor is so much below an analogue noise floor, but because it's random it causes psycho-acoustic effects that are unpleasant. So the solution was to dump normal noise on top of this to bury it, to dither it so that you're not disturbed as much as you were before! It still is there, that non-linear noise, and it may be that this non-linear noise is what causes some of the unpleasantness of digital. So in the digital domain, you've already put the seal of approval to normal analogue noise!

Music is an art form, which probably communicates feeling more than any other. And because of that, just having numbers at the other end, isn't enough. Because how these numbers are related to the final analogue waveform, that's crucial. You still have that barrier of how is this translated from that media to this media, and the more 'brains' you've got in the system, the more problems you actually introduce. Most DACs are processors, they're computers doing many things and there are issues that may not be immediately visible buried within your clocks and your data.

DP: It's a fascinating point because there are still a lot of people who think 'bits are bits'...

TM: Absolutely, there's nothing wrong with getting all the bits at the other end, but it needs to be correctly translated at the end! And how it's translated. Take jitter for example – there are so many different types, it encompasses millions of things. It's like saying “there are corruptions”, but what kind of corruptions? You can have clock jitter, data jitter, power supply jitter – but how do you know exactly where it's coming from and how to deal with it? I mean,

The weakest link is very important. If you don't design in that way, you can throw money and time away...

you've got CD players for example, which have orders of magnitude less jitter, but they don't necessarily sound better. I'd be sitting there thinking, “wait a minute, I've sorted out all this jitter, but it doesn't sound better!”

DP: I've often wondered why transports don't sound the same, and why jitter alone doesn't account for those sonic differences...

TM: If you take a transport and make it lower jitter without affecting other things, it will

probably sound better. But even like-for-like, we have had systems where we tie down the jitter to a certain point but you're not doing certain things with the machine and you find that it's not actually making things sound any better. Then for the same amount of effort and energy and money you put that in some other areas of the machine, and you can make it sound better. What I mean is that jitter is not the be all and end all.

DP: Because jitter is an aggregate term of digital errors...

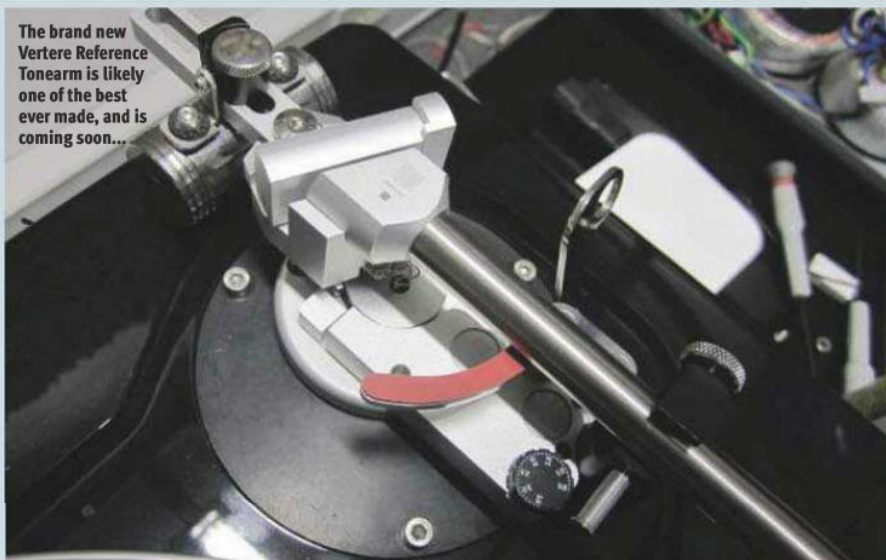
TM: Yes, you need to know which errors – not just that it has jitter. The point is you've got to find the weakest link. With jitter you've got a multitude of sources that this thing can come from – and there's no point in addressing one source if you ignore another. So you think, “do I need to address something that's not necessarily the weakest link?” You should go back and address the other things first, and get them all up to the same level.

DP: Going back to your car driving down a winding road example, you're saying that it's not just about having a powerful engine? You're saying that jitter in a way is absolutely valid but it's only one aspect of a whole system...

TM: Exactly. In the way it works, a CD player isn't that dissimilar to a record player, although your starting points are different – with a record ▶

FEATURE VERTERE INTERVIEW

The brand new Vertere Reference Tonearm is likely one of the best ever made, and is coming soon...



player you're measuring the groove, and the stylus knows where the groove is, so you can – by indexing back to the stylus – measure that groove quite accurately. With a CD player, because there's no physical contact with the media, you need a servo system to track that data, and this has a huge bearing on things. As you're servo-ing, all your power supplies are changing – you can see all the modulations that come on to the power supply, the noises that are generated. Then you have to look at,

There's no point in having an aircraft where the wings are strong, but the fuselage collapses every time you fly!

for example, the lens, which needs to be light, so it gets barbecued by external vibrations! You have to then isolate the transport. Some of these considerations may have an effect on jitter, but not necessarily on the way we measure it now. You look at a clock, for example – where is this relative to the D/A convertor and the servo controller IC, because all these things are locking on to a clock. And here, even if you can't measure the jitter accurately, they may still have an effect on the sound.

Our ears are our monitoring system, our measuring machine – and our ultimate one is our 'ear meter'. A head of a nut or a bolt on a Formula 1 car being rough or polished may have an effect on lap time, but I can guarantee if you roughen all the nuts on my car it wouldn't make any difference! It's a totally different level to what the other one is working at. So you then come back and say this is the thing we all use at home, and what is important here?

DP: So the art of doing digital well is to get everything to a certain level, rather than push too hard on one aspect and forget others?

TM: For sure. The weakest link is very important. If you don't do it that way, you can throw money and time away. It's a chain, you

want every link welded the same, shaped the same, marked the same. It will always break on one link, but you want to go to an extent when you're almost breaking all the links. There's no point in having an aircraft where the wings are so strong but the fuselage collapses every time you fly!

When you look at vinyl replay, I was almost certain that the weakest link was the tonearm. With my new arm we went all out and yeah, it was a weak link – a bigger one than I thought it was. But you don't know that until you go all out. That gives you the platform for all the other possibilities. The motor on a turntable is another weak link, by far the weakest...

DP: It always amuses me how turntable manufacturers make a big deal about various aspects of their lovely new designs, and then you find it's running a cheap little motor found on 100s of others! Direct drive seems an interesting way to go, is it the answer?

TM: Well it's a motor! If you can design a direct drive motor beautifully, one that's so noiseless, why can't you put it outside? Don't couple it – there'll be less noise! Then have the belt, you have a lower frequency, you can filter more things out. You can argue that the belt can have a varying tension and whatever, but then the Xerxes addressed that 25 years ago – you had the motor on a bearing and it would take up any undulations on the belt, and it would keep a constant tension. So why stick the motor on the platter again? The motor is the culprit – it's where you get the music and all the crap that goes with it! And unfortunately if you switch it off you get no music!

DP: And funnily on a digital disc system it's the same principle in a way, isn't it? The motor and the servo together...

TM: Sure, absolutely. They get you the information, but what they need to do to get the information is what screws up everything. That's what you've to look out for – the weakest links! Only then can you get the balance right.

VERTERE

The story started about six years ago, when Touraj Moghaddam started doubting the cables he'd been using as a reference. He'd previously thought that while interconnects change the tonality of the music, they didn't have a profound effect on the signal. Experimentation led him to the realisation he was wrong. The 'very high quality' microphone cable he'd always used didn't seem right. "Maybe we need to look at this, maybe this is a weak link", he remembers saying.

He then "looked at what is already being addressed and what is not being addressed" with cables, and came up with his own specification which he got made. "The first time I put them in my own system I was shocked by how weak this link actually was", he says. Touraj then set about tailoring his hand-made cable for a variety of applications – from tonearm wiring to preamplifier cables, to speaker leads. He took into consideration everything from impedance to noise floor, and started making some by hand to give to "close hi-fi friends". They proved very popular so he decided to design some that could be machine made; the Pulse B, Pulse R, Pulse C and Pulse X were doing "80 percent" of what the originals did, which gave "really good" results.

Vertere isn't a cable company *per se*. Touraj says there is a lot of great hi-fi manufacturers



out there, doing some really fine products. For this reason he doesn't feel the need to launch a wide range of products simply for the sake of it. Rather, he seems to be interested in gaps in the market, spaces where he believes things aren't being done as well as they could be. For this reason he's now working on a high-end tonearm – possible the best and most expensive ever made. The Vertere Reference Tonearm sports a titanium arm tube and headshell, aluminium bearing assembly cover and stainless counterweight (with tungsten carbide insert). The bearing system is novel and the arm sports an inbuilt cueing light. Price is said to be over £20,000, so don't expect to retro-fit one to your Rega!

