

An Afternoon with Menno van der Veen

Menno van der Veen has made a name for himself in the world of high-performance power and tube output transformers. He is also the founder of the TubeSociety, where he teaches the design, construction, and testing of high-end tube amplifiers. *audioXpress* visited van der Veen for this interview in his home, in the flat lands of the north of The Netherlands.



By
Jan Didden

Photography:
Yeb de Witte

Jan Didden (JD): How did you get involved in the tube amplifier world?

Menno van der Veen (MV): As so many boys from my age group, I started young—at age 14 I was already making money from repairing tube radios. I was also an avid guitar player, and you need an amplifier for that so when I turned 16, I already had my own tube amplifier, built from scavenged equipment. Later, my understanding of the technology behind tubes and tube equipment greatly increased when I went to university to study physics. Guitar amplifiers are supposed to have all sorts of effects and distortion, but I was also asked to provide music at parties where I was invited. And

at those events, you really want a good quality audio reproduction so that introduced me to hi-fi sound.

After university I got a job as a high school teacher, and I started a band, so the story continued. After three years as a teacher, I realized that I wanted something more than repeatedly teaching the same material. I got a job at a newly founded educational institution to teach teachers and we really built that up from the ground in four years' time. I spent 10 years there in total, but halfway through that period I strongly felt that I wanted to go back to designing and researching tube equipment, so I started to lay the groundwork for an independent research and design lab.

Before I started my own company, I had written many articles for several hi-fi journals, so I knew the ins and outs of that world. And later I published my scientific research with the Audio Engineering Society (AES) [1]. We have a very active Netherlands AES section, where I've been a member of the Board, did a term as Chairman, and have been involved in organizing an AES convention in The Netherlands. And, as you know, I still enjoy writing technical articles for *audioXpress* [2]!

When I turned 40, I quit my job to run my company full time. By that time, I had a family to support, so I needed income, and my first contract was to redesign a series of integrated solid-state amplifier modules for a local company, Amplimo. In parallel to that, I started to research tube output transformer technology to accumulate the necessary knowledge to design the best output transformer ever! After a few years I knew output transformers inside and out and I knew what a core does, what windings do, what caused leakage induction, what



Menno van der Veen studied physics and electronics at the Rijks Universiteit Groningen (RUG) and graduated in 1976 as an engineer (Ir.).

determines the bandwidth, all those factors. I published my results with the Audio Engineering Society as mentioned [1]. I licensed my designs to Amplimo and they started to sell my transformers. But then I hit a point that must sound familiar to others in the situation where you have a product that is superior to existing products: the established community feels threatened and starts to resist.

JD: How did that manifest itself?

MV: For example, my transformers were ridiculed by others because they were round (toroidal) and “the best transformers are rectangular”—that kind of non-factual statements. That limited my sales, and I was definitely unhappy about the situation, especially because I really had a very good product! Then I met Aalt-Jouk Vandenhul [another household name in audio in The Netherlands] and he was quite clear: “Menno, you need to expand abroad! If you can make it abroad, The Netherlands will follow.” I took his advice and managed to get in touch with Plitron in Canada, and after a few visits we agreed that Plitron would produce and market a series of “Designed by Vanderveen” tube output transformers. I had all the technical information and measurement and test results. I also had written a few books on tube amplifier design by that time, so everything that was needed for technical promotion of the products was available [3, 4, 5]

So, in the end, I had a very successful product line that was also sold in The Netherlands.

The nice thing about Plitron was that they had their own eager and smart electronic designers, and I felt quite at home there. That led to a research program on “green” power supply transformers. They set up a small group to research that field, with Francisco de Leon and Brian Gladstone and yours truly. The project name was “Clean Power,” and it was in many ways the exact opposite of what I had done with my output transformers! With output transformers, you try to get the bandwidth as large as possible. For these power transformers we tried to get the bandwidth as small as possible, ideally to only let through the mains frequency and block any other noises and pulses. I commuted between The Netherlands and Canada every few weeks, to run experiments and had prototypes made at the Plitron plant. That was a great advantage, to have a complete factory to do your prototypes and testing, and that sped up the whole project. This was in the late 1990s, we worked for two years on it, supported by the Canadian government, we met all eight targets we set ourselves, and we were granted a patent.



Tube amplifiers are still a top choice for many music enthusiasts. Tube sounds significantly different, and Menno van der Veen has devoted a large part of his life to study why, and to design and build ever better tube amplifiers.

JD: What are the technical factors for toroid output transformer designs?

MV: A toroid has the advantage that you can fill the whole core with windings, and that is something you cannot do with an EI or C-core. If you can use the whole core, the winding itself keeps the magnetic field inside the core because it covers the whole core, except maybe a very small spot for the lead-out. In other core types, there are always areas where field lines can escape, so to speak. That leakage induction is an obstacle for bandwidth extension at the upper frequency end. Then, if you place windings on top of each other, you create a large capacitance. So, your output tube, which generally has a high output impedance, first has to charge up those interwinding capacitances and overcome the leakage inductance, before the energy gets to the “ideal transformer” part of the model. In its simplest manifestation that’s a second-order filter. You want to tune that filter for minimum peaking, keeping the Q-factor at 0.7 or below. But you can’t allow the primary capacitance to become too large because then it gets too sluggish, almost a first-order filter. You try to juggle all factors to make the frequency response in operation wide and flat and smooth.

Now if I want to market my transformer, I must explain my measurement conditions, what the driving impedance was, what the leakage inductance and parasitic capacitances are. That is crucial for someone who wants to design an amp based on my transformer. Funny enough, most manufacturers don’t provide that information in their datasheets. When I discussed this at the AES there were many reactions—wow, this guy is telling it all! I even specified the

spread (15%) in those parameters! It also makes a lot of difference whether you want to drive your output transformer from a triode (low impedance) or a pentode (high impedance), and you really must know the transformer parameters to do a successful design and where to use correction networks as needed. I have a full chapter in one of my books about matching the output stage to the output transformer. If you do it right, you can get an almost perfect transient response.

JD: So, you'd use a different transformer for a triode output than for a pentode output.

MV: Yes, I always specify a recommended tube for my transformers. Again, many manufacturers don't do that, which can lead to suboptimal designs.

So, the challenges were the leakage induction, which was the reason I went to a toroid with its 360 degrees winding; and the parasitic capacitances I attacked by devising special and complex winding interleaving. My goal was to design well-performing transformers for a decade below and above the audio band, so from 2Hz to 200kHz! That would make the transformer a neutral circuit element, and after some three years of study and experimentation I reached that goal.

JD: So how would you design a toroid for a single-ended amplifier where you'd need an air gap to prevent core saturation? That must interfere with the 360 degrees winding concept.

MV: It's not much different from traditional cores, but it is a bit more complex. You must cut the core, then polish the two surfaces and heat-treat the core, all while keeping it from falling apart! So, it's involved but it was a known technique already at the time. The winding of the core is then very much the same, again 360 degrees. It was something I had to figure out on myself, with lots of prototyping and testing, which of course costs time and money.

JD: Where can interested readers find your transformers?

MV: Trafco in Belgrade is my current manufacturer, and all available types and data and prices can be found on my website [6, 7]. In

many cases I designed my own amps with my transformers and these are also published as reference designs.

At some point I got in contact with a company that shall mercifully remain unnamed. They said, we make transistor amplifiers, but if you can make a tube amp that's as good or better than ours, we will adopt that! Within a year I had a new tube amplifier and the company agreed that it sounded very, very good. Unfortunately, they then admitted that they could not deliver on the promises that they had made at the start of the project. That of course was a huge disappointment for me, and I holed up for two days in my hotel to figure out what to do next. A complicating factor was that this company also purchased my transformers from Plitron. So, I decided to take my loss, and at a later stage that company became an even larger customer to Plitron, also for the new Clean Power transformers and it turned into a win-win situation for all parties.

JD: Can we talk a bit about what you find so attractive in tube amplifiers?

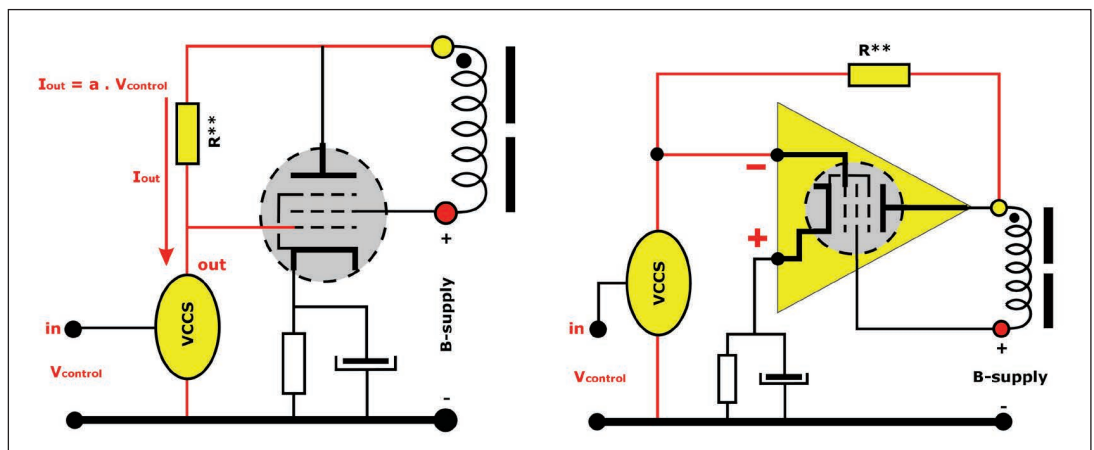
MV: Well, for guitar amplifiers, it's obvious: even under heavy overdrive, it still sounds good! That was an important point at the time; you really could impart your own personal sound to the amplifier with tube circuitry. In fact, you develop that personal sound, and you learn very intensely to perceive all the little nuances of sound and music. Very important!

As far as home hi-fi is concerned, I like the resolution, detail, space, and what I would call "envelopment," that you really can have the feeling you are present at the performance. That is a learning trip, still is, and it still challenges me. My last investigations were about what I called the "Trans" concept, and I have written about that for *audioXpress* [2]. That sort of thing needs time, you need to grow into it, and develop an appreciation, and can I say, love, of tube sound.

JD: Let's talk about your TubeSociety. How did that come about? You probably didn't wake up one morning and say to yourself: maybe I should start a Tube Society today!

MV: I think I was about 60 years old; I had a good business in a very nice historical building in a nice city and was enjoying life.

Menno van der Veen's research on transconductance led to his "Trans" circuit principle.



But I got thinking about the future when I would have to slow down my activities. Who would take over what I had created? I thought that if I started a training course, it would send a lot of interested people my way and hopefully one of them would be a good candidate to, eventually, take over my business! But it is only now, after 18 years of TubeSociety, that there are one or two who have the interest and capability to take over some activities. The path is still unsure, and I don't know yet how it will go forward, but I slowly start to step back from the day-to-day running of TubeSociety. We're experimenting a bit in this 2023-2024 year to see how we could do it.

JD: A tube is physics, and physics involves math. How do you handle that in TubeSociety with people with different levels of formal education?

MV: I try to avoid heavy math, but explain how things work, in essence, and if you understand that you also know how to modify and adapt things to your own needs. You need some math of course but that is then to support the understanding you have, the feeling you have on what to change and in which direction, whether it needs a big change or a more subtle one.

You can perfectly explain the workings of tubes without extensive equations. Once the understanding is there, you start to introduce some simple relationships between terminal voltages and currents, and if you do it right, even people with basic algebra skills have their "aha-moment" where things fall into place. That's a large part of my satisfaction with TubeSociety!

In the second part of the course, we start to build our design, including a PCB for those who want to go that route, or using point-to-point wiring methods. That building process is important to develop a feeling on how to put a piece of equipment together. As I see it, stuffing a PCB is not audio; you need to understand what it is you are putting together.

It is important that you start with point-to-point construction, to get a feeling for layout issues, where the currents flow, what to keep close together and where to respect a distance. That helps enormously once you start laying out a PCB, even for a different circuit; the principles are always the same.

When new students join TubeSociety, they dream of the amplifier they want to build. They don't dream about electronics, they dream about how the enclosure will look, where the buttons are going to be, and whether they will be black or shiny gold!

Of course, you need to follow that dream, build the enclosure etcetera, but then you get to the inside. How to logically lay it out, how to route the wiring. And always keep in mind that at some point you may need to service or adjust your equipment, so keep it clean and clear because over time you will forget details. If, for instance, you have a pair of electrolytics, orient them the same



Menno van der Veen presenting at the TubeSociety. The TubeSociety was founded in 2005 and holds events every two weeks, on Saturdays.

way, if you don't do that, after some time when you look at it you start to wonder if one of them is the wrong way around! Simple things that make your life so much easier.

JD: It's an interaction, isn't it?

MV: Indeed. I remember reading an article, where they were running additional wiring to compensate for existing wiring to cancel hum pick-up! I say, make sure you get it right at the beginning, learn about grounding, and if you run into a problem, back up and do it again. That's learning; don't try to cover it up later.

And I must say, I enjoy teaching, imparting knowledge and understanding to people who are genuinely interested. And I also enjoy the direct contact with

like-minded people, no Zoom meeting can replace that! I always feel energetic after a day of teaching.

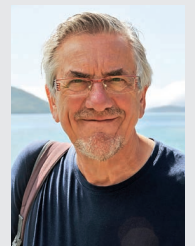
But the biggest satisfaction I get is at the end of the course, when I publish the report, and I ask someone: did you expect to be in that report with the amplifier that you are holding, that



It was a full house during this TubeSociety meeting.

About the Author

Jan Didden has written for *audioXpress* since the 1970s and he is the magazine's Technical Editor. He is retired following a career with the Netherlands Air Force and NATO. He worked in logistics, air defense, and information technology. Retirement has provided him with the time to finish all the audio projects that have piled up for decades. Many of his projects are documented on his website linearaudio.net. Jan is also known as the publisher and managing editor of the twice-yearly bookzine *Linear Audio*, which he published until 2018.

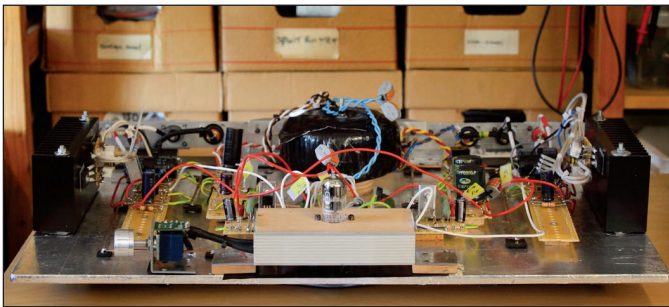




Two Trans-PP monoblock amplifier by Hans Gubbens, a TubeSociety student realization.



Annemieke van der Veen, Menno's wife, entertaining students during a TubeSociety meeting.



An OTL amplifier project from a TubeSociety student.

sounds so good and that you designed and built? And then you see the realization sink in about what they accomplished, and that is priceless!


JD: What type of people join TubeSociety?

MV: There's only a few below the age of 30 because in that situation, you are busy with building your career and family and whatnot. Most are older, up to 80 years, and anything in between. Many are looking for a meaningful activity instead of hanging around the house. But all approach the course with intensity and involvement, which is necessary to learn something new and do it well. Once in a while somebody starts to build a career in it. But all eventually get involved in modifications and new projects, it becomes an intense hobby. Students come back after one or more years because they want to deepen their understanding, or they are just interested in the DIY project for that year.

JD: You told me that some of your previous students are getting more involved in developing the courses. Does that change the TubeSociety's character?

MV: In a way it does. With the increased use of solid-state parts in our tube amplifiers, there also comes an increased use of a circuit simulator and automated PCB layout tools. I've always been a bit careful about putting too much trust in a simulator. Especially if you are starting to learn audio electronics, you can build up simulation circuits that are doing wonderful things, only to have it fail when you build it. Not because the simulator is wrong, but because you didn't take all relevant factors into account, or you didn't ask the right questions. Spice doesn't tell me which node to probe to fix a problem; it is my experience and knowledge that tells me where to look in the circuit to diagnose a problem. But if you know what you are doing, a simulator is a powerful tool.

Second, I also decided to leave the whole process of PCB design to one of my previous students. It is a specialized area, and I decided not to embark on that adventure. This time, I learn from them as they grow!

JD: Menno, thank you very much for this talk and the fascinating insight into your unique TubeSociety. Your students are very privileged to be a member. I personally am looking forward to your future articles in *audioXpress*! 

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