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Wim van der Hoek Award 2006 recipient: Erik Manders

“Constructor is the linchpin in hardware design”

In 2006, Erik Manders was the first winner of the Wim van der Hoek Award. He received this ‘Constructors award’ for his graduation project, “Design of a Human-like Robotic Eye Unit”. He now is a principal systems architect mechatronics at ASML. This interview was conducted in 2020, when he was a senior architect mechatronics at Philips Innovation Services. He is happy that the award is still presented every year. “It is good to assess young talents’ construction skills with design principles.”

Erik Manders showing the trophy he received in 2006 as the first winner of the Wim van der Hoek Award. The trophy was made by the Joint Technical Service of the TU Eindhoven: a typical VanderHoekean design of a flexure hinge design for hysteresis-free movement of a parallel optical slit.

MTS, HTS, TU

Erik Manders (Rijkevoort, 1978) followed the technical training route for the profession of mechanical designer. “I was more attracted to tinkering than secondary school. I was busy with mopeds and later I worked part-time with gearboxes, among other things. That’s why I went to MTS (secondary vocational education, ed.) in 1995, where the curriculum included a lot of drawing and workshop. With 15-20 hours of drawing per week, on the shelf and already a bit in AutoCAD, I started to enjoy school again. The logical step was to continue with mechanical engineering at HTS (higher vocational education, ed.), at Fontys, and I started to enjoy it more and more there. During my internship at Tegema, I got to know The Devil’s Picture Book (*Des Duivels Prentenboek*, DDP) through my supervisor Peter Keulers.” In DDP, Wim van der Hoek had collected images of designs that showed defects; hence the ‘devils’. He used this to illustrate the correct way of designing machines and high-tech devices: light and stiff, statically determined, free of play and hysteresis, with clever application of friction, and so on. “That’s how I really learned to construct based on design principles. I was better at the theory than I thought and suddenly I was at the TU (University of Technology, ed.) in Eindhoven. There, Nick Rosielle (from the department where Van der Hoek was a professor until his retirement, ed.) hammered home this way of thinking even more and that happened in an attractive way, with guest lectures by PhD students and designers from companies, who explained how they had arrived at a design, where the crux lay and what design choices they made. In this way, they showed snapshots from the book each time and I picked up on Van der Hoek’s way of thinking.”

Draughtsman, designer, architect

In 2005 Erik Manders graduated on an assignment at Philips CFT (Center for Manufacturing Technologies), then called Philips Applied Technologies. “After that it was time to start working and I stayed on. I started as a mechanical designer and progressed to lead engineer; now I’m a senior architect mechatronics. My scope has become a little broader. As a designer you work on a mechanism or submodule, as a lead engineer you have complete responsibility for a submodule or a small module. Now, as an architect, I sometimes manage large projects for a large module, with teams of dozens of people from us, the customer and suppliers. Then I work with a number of lead engineers who in turn have junior engineers under them. I see their work and brainstorm with them, but I actually don’t design enough myself anymore. I do try to look at the 3D CAD model every day. I spend a lot of time in meetings, managing and coordinating, although with a technical hat on, and working on spec negotiations and documentation, for example. Of course, I do think along when there is a problem, such as recently with torsional stiffness. Then you go through the solutions from DDP again, with the design of, for example, a tube, an extra diagonal or a ‘hat brim’. In that sense, we are still building on Van der Hoek. If you have made progress in that area, at some point it is simply in your DNA. Take statically determined design. Sometimes we do make a construction overdetermined, but we do that consciously and we take the consequences into account.”

Linchpin role

A while ago, Manders was the mechanical architect for a new X-ray system at Philips. “I made the blueprint for that and it was then worked out in India. In that project I also had the role of designer. The great thing about that is that you’re not only busy with ‘number crunching’ and filters (i.e., calculation & simulation and control engineering, ed.), but that there’s also a lot of creativity involved. As a lead engineer you’re actually a kind of linchpin in a hardware development project. You talk to the mechanical designers for the different submodules and also with technologists, such as a servo expert, an acoustician and a flow & thermal expert. All those technologists think about one field and that comes together with you as the lead engineer who translates that into a correct design. In that role you learn to speak the language of all those different fields and to look at a problem from different angles. That’s what I like about design engineering and is also the reason why I ended up in system architecture. In the role of an architect you, as a conductor, let a complete module come into being and the entire team work on it like an orchestra. That’s fun, but really I think you get goosebumps as a designer, the moment you get ‘it’: ‘This will be the design and this is how I’m going to work it out.’ I sometimes miss that now.”

A possible next career step seems to inevitably lead to management – if a designer at Philips had been ‘promoted’ to a managerial position, Van der Hoek would joke: “He was lost to management.” Manders doesn’t need it: “I’m really a techie and I don’t try to do that much with time and money. I like assessing technology, rather than assessing people. Fortunately, companies now offer more room to advance in technology, within Philips you can progress to fellow.”

Community of practice

Manders now (i.e., in 2020) works at Philips Innovation Services, on the High Tech Campus Eindhoven, which is – initially under the name of Philips Applied Technologies for a while – the continuation of Philips CFT. Wim van der Hoek was involved in the establishment of CFT in 1968 and remained there his entire working life, until 1984. Within Philips, Innovation Services acts as the guardian of Van der Hoek’s philosophy. This is reflected in development projects for high-tech equipment and medical instruments and devices, where his design principles are still widely applied. But also in the designs for consumer products. These must above all be cheap to make, but if, for example, a bearing can be constructed in a smart, DDP-worthy way without play, this prevents a lot of wear and the result is affordable quality.

In addition, employees of Philips Innovation Services provide courses at Philips worldwide. They are also working on setting up a Philips community of practice for mechanical design principles. “We want to share calculation tools and success stories, and review new designs. We’re rolling that out to all locations where they do mechanical engineering, including in America, China and India. In many places, Van der Hoek’s thinking has not yet penetrated.” Manders is a pioneer in this, together with Herman Soemers, technology manager and third-generation textbook author (after Van der Hoek with

DDP and his successor Rien Koster with his standard work “Construction principles for accurate movement and positioning”). Soemers’ book, “Design principles for precision mechanisms”, is now part of the course material.

In 2020, Erik Manders worked as a senior architect mechatronics at Philips Innovation Services in a department that later became part of ASML.

Incentive prize

One of the reasons for all these efforts is that the mechanical engineering courses produce too few designers. “We have a structural shortage of people who are good at design principles. Most of those who come from the TU are currently trained in a very specific, very narrow discipline, while the mechanical design profession is actually broad and revolves around finding compromises between the different disciplines. For every project it’s a challenge to appoint a lead design engineer. That’s why it is great that the Wim van der Hoek Award profiles the design profession and really assesses young talents’ construction skills with design principles.” As was the case with Erik Manders himself in 2006, as evidenced by the jury report: “Through calculations, drawing and designing, he arrived at the design of a humanoid robot eye, a way of working that Wim van der Hoek himself suggested to us.” As far as he is concerned, this incentive prize is now very much needed: “It is good that the award stimulates young men and women at the universities of technology and of applied sciences to learn the broad profession of design engineering. We really need this influx of young people in the companies.”