

A NEED FOR SPEED



MotoCzysz Rules the Racetrack with BOXX

The Isle of Man (IOM) TT, located on the famed island in the Irish Sea, is home to the most difficult and dangerous motorcycle racetrack in the world. It is also where, for two weeks each year, the motorsport's major players—both manufacturers and riders alike, come to prove that they belong among the motorcycling elite. Their machines snake through 37.7 miles of narrow, winding, roads punctuated with dizzying curves and lined with trees, hedgerows, homes, and fans, in a death-defying quest to exceed average speeds over 100 miles per hour. “Death-defying” is not hyperbole. In fact, throughout its history, over 230 IOM TT riders and spectators have lost their lives during the annual race. And it is here on this track, (as well as others) that MotoCzysz has chalked up numerous victories, earning the attention of the motorcycling world.

An award-winning Portland, Oregon design firm, MotoCzysz was founded in 2003 by designer Michael Czysz, a man dubbed “a latter day Leonardo DaVinci” by Cycle News Online, and “the most creative motorcycle designer working today,” by Motorcyclist magazine. From inspired engineering to bold design, Czysz reveals a passion for speed and fierce commitment to innovation that infuses all aspects of his company. For example, in 2006, MotoCzysz made the surprising transition from petrol-powered motorcycles to the new frontier of electric motorcycle racing—a move that appeared to be paying off in 2009 when the IOM played host to the first ever all-electric motorcycle road race. MotoCzysz arrived with their state-of-the-art E1pc bike which was out in front when an unexpected electronic snafu sidelined the vehicle, preventing it from completing a full lap. Undaunted, the team returned with rider Mark Miller in 2010, winning the race now known as the TT Zero (“zero” meaning “zero toxic/noxious emissions”). The following year, rather than settle for an upgrade of their victorious E1pc bike, Czysz and his design team started from scratch, creating a new machine that was 50 lbs. lighter and nearly 50

percent more powerful. Heralded for a more compact, single-battery design and innovative inboard suspension configuration (inspired by Formula 1 cars) the third-generation 2011 E1pc, ridden by Michael Rutter, clocked an average speed of 99.604 mph, winning yet again. Miller came in second on a companion E1pc.

The biggest triumph yet however, arrived in 2012 when MotoCzysz' latest edition E1pc, with Rutter on board, took first place and became the first electric motorcycle to lap the Mountain Circuit at over 100 mph, even hitting 150 mph on a famed section of the lap known as Sulby Straight. The honors didn't stop there. MotoCzysz rider Miller also broke the coveted 100mph barrier, taking third. With three consecutive first place victories (not to mention a second and third) MotoCzysz is now the winningest American motorcycle manufacturer at the IOM. At present, the design firm is engaged in preparation for Isle of Man TT Zero 2013 and also hoping to create an aerodynamic bike capable of breaking the current world land speed record of 215.96 mph. “It's always a big push to get there,” says senior engineer Nick Schoeps, referring to the Isle of Man TT. “As races approach, there is always more to do and of course, we want to win. Sometimes the line gets blurred between business and racing.”

MotoCzysz conquers the track not only through high performance and technology, but also with inspired design and industry-leading innovation. The engineering team is at the core of the company's success, and in addition to their reputation for building meticulously engineered machines, they are also unique to the industry as an in-house unit that designs and fabricates most of the components used in their motorcycles and D1G1TAL DR1VE™ products. Over the years, innovative MotoCzysz designs have garnered attention from major vehicle manufacturers like Segway, who hired the firm to modernize the look and performance of their renowned personal transporter. MotoCzysz innovation has also helped to forge significant technological partnerships with companies like Dassault Systèmes SolidWorks, Bunkspeed, NVIDIA, and BOXX Technologies.



SIMULATION DRIVEN DESIGN

In fact, it was NVIDIA who offered MotoCzysz an opportunity to pilot their Maximus technology used in a series of computer workstations from BOXX Technologies. 3DBOXX workstations featuring NVIDIA Maximus technology combine the visualization and interactive design capability of NVIDIA Quadro® graphics cards with the computing power of NVIDIA Tesla® GPUs into a single system. The Tesla card(s) perform photorealistic rendering or engineering simulation computation, freeing CPU resources to accomplish I/O, running the operating system, and other tasks. The Quadro GPU is dedicated to powering interactive design. Maximus also helps users reduce the need for expensive prototypes by moving their workflow to simulation-driven design—and that was just what MotoCzysz needed.

The firm's engineers continually refine their designs in order to create the most powerful and light-weight components possible. However, as MotoCzysz began to take on more complex surfacing projects, it was becoming clear that a workstation with greater GPU capabilities was needed. The design firm's overclocked, liquid-cooled 3DBOXX 3960 XTREME systems, state-of-the-art when purchased in early 2011, were single GPU systems relying on an older generation NVIDIA Quadro card. This meant engineers couldn't spend the time necessary to render designs at full quality. With only six full-time employees and a limited budget, MotoCzysz had to carefully balance design decisions and cost concerns—all under the added burden of a remarkably tight schedule. "With the older systems," admits Schoeps, "we had to be pretty judicious about our resources."

For example, MotoCzysz engineers had developed a new fairing design (the shell placed over the frame to reduce air drag, as well as protect the rider and engine) only to discover that after actually producing the part, it included surface imperfections requiring additional body fillers. Had they been able to complete a more detailed render during the design process, the engineers could have detected the imperfections and subsequently altered their design before the part went into production. This would have saved time, money, and most importantly on the racetrack—unnecessary weight.

In order to cross the finish line first, MotoCzysz needed a better solution for going from digital designs directly into production, but they also needed a budget-friendly solution that wouldn't deplete existing computing resources. To further complicate matters, although MotoCzysz relies on SolidWorks for approximately 90%

of their project work, they were also investigating other rendering and analysis tools. As it turns out, the team found what they were looking for: the rendering application was Bunkspeed and the hardware solution was BOXX.

BETTER BOXX, BETTER BIKE

In order to upgrade their workflow, Schoeps and his engineering team selected the world's fastest single processor workstation, the 3DBOXX 4920 XTREME. Featuring a six core Intel® Core™ i7 processor overclocked to 4.75 GHz, liquid cooling, and solid state drives, XTREME provides outstanding support and application interactivity for engineering, architectural visualization, motion media, and rendering workflows. "We went to BOXX in the first place because they're the fastest systems we could buy," explains Schoeps, "and BOXX is the only workstation manufacturer that overclocks the CPU and still provides a three year warranty."

Of course, the 3DBOXX 4920 XT also includes Maximus technology: a Quadro K5000 and a Tesla K20, built on NVIDIA's fastest-ever Kepler GPU architecture. "The 4920 XTREME with NVIDIA Maximus makes sense for us is because we can create fully rendered images of a bike before we actually build it," says Schoeps. "A major manufacturer might make several passes, create a physical clay model, and then make further refinements to the design. With our small staff and budget we need to do it all in one pass." In addition, the benefit of real time feedback, as well as the satisfaction of knowing that their design is correct on the first pass, translates into a 20-30% increase in time savings alone.

With the earlier model workstations, Schoeps' team was forced to shut down a number of graphics features and simplify their models in order to make the rendering workflow more manageable. But with the 4920 XT, Maximus allows them to use all the graphics features and create physically accurate renders. This enables them to see every detail and then tweak where necessary—while still in the rendering phase. "That's a huge advantage and something we hadn't been able to do before," he says. Another unfortunate consequence of the simplified design versions was the difficulty of manipulating models at a lower frame rate. Now, when running SolidWorks' Real View Graphics on the 4920 XT, MotoCzysz engineers are able to look at curvatures of a particular surface with no lag. This enables both clients and project supervisors to make design decisions earlier in the process, saving time and money. "Now the large assemblies open with a lot of SolidWorks graphics features on," says Schoeps. "We can rotate and review with a high frame rate and no lag time."

"We went to BOXX in the first place because they're the fastest systems we could buy."

- Nick Schoeps

As for Bunkspeed Pro, still considered a relatively new tool in the MotoCzysz arsenal, the BOXX workstation is also credited for accelerating its adoption. "Bunkspeed's performance on this system has been outstanding," said Schoeps. "I can rotate the model and it updates the design in real time. I can see how the different design features are interacting and how light is reflecting from different angles—all in a high frame rate."

3DBOXX 4920 XTREME also enables Schoeps to multitask, creating a motion animation in SolidWorks while Bunkspeed Pro performs raytrace renderings in the background. This also provides another benefit. "For me," he confesses, "it also breaks up the monotony of always doing surface work."

Most importantly however, the system allows Schoeps to concentrate on engineering. "That's what I like most about the BOXX," he says. "It allows me to be a lazier engineer. I don't have to think about the number of files I have open. I've had as many as twenty or more parts files open along with a large assembly and there are no problems, no lag in performance. It's nice to have the freedom to think about the design, focus on the aspect of the project I'm working on and not think about working on the machine. The machine works for you."

The absence of lag time is just one indication of the speed and performance of the 4920 XTREME. "It really flies. Load time, boot time, a five to ten percent performance increase when opening and closing files—it's so much faster," Schoeps says. "I'm continually amazed at how quickly it turns on. When I used to turn on the

I've had as many as twenty or more parts files open along with a large assembly and there are no problems, no lag in performance.

- Nick Schoeps

old system, I'd go make coffee, come back, and it was ready. 4920 XTREME boots up in less than ten seconds. I had to start making coffee faster."

In addition to the Maximus technology and overclocked Intel Core i7 processors, Schoeps credits the fast performance (and subsequent time savings) to the inclusion of solid state drives.

"SSDs really require a cost benefit analysis," he says. "You pay a few hundred dollars more for SSDs, but how do you justify the cost of hiring another engineer? It makes economic sense to spend the money on the hardware that you rely on every day."

OVERCLOCKED

While MotoCzysZ still manages to take on three to five additional projects per year, the design firm's primary focus is still the E1pc—and winning races. So as they prepare for this year's Isle of Man TT Zero, the improved performance throughout the design and rendering processes has enabled the engineering team to look at each aspect of their motorcycle design from a fresh perspective. "All the tools we add allow us to do more and do our jobs better," explains Schoeps. "The reduction in time provided by the 3DBOXX workstation simply means that we have the opportunity to take more passes and that could mean saving 40 grams from the construction of a specific part or (what Schoeps considers his chief responsibility) do more to keep the rider safe. It's a personal goal. Bikes can hit 200 miles per hour. We've done 170 already."

As for the ongoing MotoCzysZ/BOXX relationship, Schoeps sees a commonality between two unique American companies. "Our engineers want to make the best product possible," he says. "They take great pride in that, and I feel like BOXX approaches their work the same way. They do a great job engineering their workstations." And for Schoeps, the comparison doesn't end there. Like everything MotoCzysZ does, it all comes back to a need for speed. "We're kind of an overclocked company ourselves," he laughs. "Like BOXX, we work fast and cover a lot of ground."

by John Vondrak
Senior Copywriter/Video Editor at BOXX
Technologies



Nick Schoeps is the Lead Engineer at Motoczysz in Portland, OR. Nick's diverse engineering background and systems-thinking approach streamlines the design process of Motoczysz products. Recent accomplishments include consecutive wins at the Isle of Man TT-Zero races, a product re-design of Segway's i2 personal transporter, and development of the Motoczysz Digital Drive product line. Previously, Nick pioneered Fuel Cell technology at Adaptive Materials Inc. where he set world record flights for small UAVs. He holds a BSME from The University of Michigan in Ann Arbor.

Links:

www.MotoCzysZ.com
www.nickschoeps.com
www.boxxtech.com
www.nvidia.com/maximus
www.solidworks.com
www.bunkspeed.com

