HOW SANTA CRUZ BICYCLES IS RACING TO CUTTING-EDGE COLOR WITHOUT PROTOTYPING

SANTA CRUZ
CASE STUDY

CUSTOMER PROFILE

Santa Cruz Bicycles, founded in 1993, caters to mountain and trail riding enthusiasts with over twenty high-performance models plus a full line of women's-specific bikes. The company has a core team of 80, committed in their quest to build the perfect mountain bike. Almost everyone in the company knows firsthand the need for fast, high quality renders throughout the product development cycle – from design and engineering through to product marketing. In a competitive marketplace, Santa Cruz Bicycles dramatically improved their workflow with an NVIDIA multi-GPU configured Lenovo ThinkStation and color-calibrated Lenovo ThinkVision monitor.

CHALLENGE

The team at Santa Cruz Bicycles relies on PTC Creo to design CAD models and Bunkspeed Pro to render photo-realistic images – but was facing significant performance limitations due to hardware constraints. Bunkspeed allows the designers to test various bike colors, see how light reflects off of different colors and paint textures, and experiment with logo placement, generating photo-real prototype images. Logo placement is particularly important as a majority of their marketing efforts are focused around capturing racers using their bikes at various competitions—and having the logo in view and easy-to-read is key to that effort. Color is also a key deciding factor in purchase decisions in the high-end bike market, and Santa Cruz Bicycles is known in the industry for their innovative color choices. Since color is so important, having the ability to quickly and easily generate photo-real renderings of hundreds of different colors and finishes in Bunkspeed is essential.

With Santa Cruz Bicycles' previous single-GPU workflow, designers experienced slow iteration times, forcing them to compromise quality to work more efficiently on their CAD models in PTC Creo. Designers also compromised on less

Color concept for Nomad, a carbon fiber trail bike with 160mm of travel and 27.5" wheels. This concept was made prior to having physical samples produced. The final production version exactly matches the rendering.

than real-world color accuracy on standard-issue workstation monitors. Standard high quality monitors generate great images, but their color varies from monitor to monitor, and replicating the exact color on the screen in physical products is impossible to achieve. Thus for both key design and color decisions, Santa Cruz needed to rely on costly physical models to examine their options at full fidelity. Often a flaw would only become visible with the physical model, since the only way to work efficiently was to reduce the number of high resolution renders generated – thus causing major delays in the development process. Ultimately, slow render times meant that decision-makers often only had a handful of choices to look at, and not enough detail to feel confident without manufacturing a physical model.

Product design manager Geoffrey Casey explains: "With our old hardware, I could only work with pretty crude, simplified designs, and couldn't get a true sense of the color, lighting and reflections. Our renders could help with minor aesthetic decisions, but for bigger decisions

we would have to ship physical bikes with varying color samples in from China to evaluate the color and to physically experiment with logo placement. The ability to use PTC Creo and Bunkspeed to their full potential along with the color calibration capability of the Lenovo monitors allows us to do everything digitally, saving time and money throughout the design process."

SOLUTION

Santa Cruz Bicycles implemented powerful hardware to optimize their workflow, including Lenovo D30 ThinkStations built to handle the multi-GPU configuration of an NVIDIA Quadro K5000 and a Tesla K20, and a Lenovo ThinkVision LT3053P 30" color-calibrated monitor. The multi-GPU workstation configuration combines the industry-leading graphics capabilities of Quadro GPUs, the computing power of Tesla GPUs, and Lenovo's top-of-the-line D Series ThinkStation to significantly scale performance, increase speed and handle major design challenges. The Lenovo monitor delivers 2560 x 1600 resolution, a color depth of 1.07 billion colors, color calibration capability, and a shading hood that all combines to give the Santa Cruz Bicycles team full color consistency and accuracy.

Lenovo ThinkVision 30" monitor

Now designers can render in Bunkspeed in full raytrace mode, generating photo-real 3D results, and test color, lighting and reflection options at full fidelity. These are crucial improvements, allowing designers to tweak the material properties of the paint to get just the right color blend – no physical models required. Beyond time savings, the ability to render at full complexity (1,694,000 polygons for a single bike frame) means that designers have much more speed, flexibility and interactivity in the design exploration phase – giving decision-makers about 80 options per week as opposed to just 1-2 options per week with the old hardware. This virtually eliminated the delays in the product development cycle that the team regularly faced before.

"Having the rendering capability to accurately represent matte versus glossy paints and review at a high level of

Color concepts the V10 downhill bike, ridden by Josh Bryceland as he clinched the UCI World Cup DH overall championship.

detail is a game changer," explained Casey. "On our old systems, trying to get an accurate depiction of the lighting and reflections and shadows would take days and days of tinkering. But now with our NVIDIA GPUs and Lenovo ThinkStation I can render everything in minutes. We're known for having crazy innovative color options for our bikes so this increased speed plus improved image quality on the monitor gives us much more flexibility to truly see the wide range of colors and how the light interacts with each one."

"Bunkspeed has great functionality that we couldn't make full use of before," continued Casey. "It's important for us to be able to iterate quickly, but with so many components to incorporate, even just a textural change in the paint could have a major effect on the render timeline – but with the NVIDIA Quadro GPUs it only takes a few minutes instead of a few days."

> "The Lenovo ThinkStation with a multi-GPU configuration and color-calibrated monitor lets designers raytrace at full fidelity, testing materials and reflections to get the right color blend – no physical models required."

IMPACT

The multi-GPU configured Lenovo ThinkStation with ThinkVision monitor substantially improved performance – and that in turn enabled a more collaborative workflow.

"Previously our best option for meetings was to print out dozens of renders of various bike models and various colors – but people felt very removed from the design process," said Casey. "It was hard for people to visualize everything in 3D and give meaningful feedback. But now since we can iterate and view so quickly with photo-real image quality, the company CEO can interactively review design iterations at my desk, and we can be collaborating, making tweaks and giving feedback in real time. Ultimately it's a much faster

and more inclusive and holistic process now thanks to our new setup."

Another added benefit of the multi-GPU configuration is that in the past, whenever a rendered image was produced using Bunkspeed, the system was locked up and couldn't be used for anything else. With their current workstations, designers can continue making changes in PTC Creo, check email, or do other computing tasks while Bunkspeed renders are being generated in the background. The ability to run multiple complex applications simultaneously improves productivity in a big way.

"At the end of the day, color is what sells a bike," Casey concluded. "It is one of the most important factors in our design. NVIDIA and Lenovo allowed us to leverage the true potential of Bunkspeed to create far more options than we ever could before."

AT A GLANCE

CUSTOMER PROFILE

Company: Santa Cruz Bicycles

Industry: Product design and manufacturing

Region: California

Size: 80 employees

SUMMARY

- Leading mountain bike manufacturer known in the industry for innovative colors
- Upgraded to Lenovo D30 ThinkStations with multi-GPU configuration of Quadro K5000 and Tesla K20 to overcome slow render times and latency issues in Bunkspeed Pro; upgraded to Lenovo ThinkVision LT3053P color-calibrated monitor to view color renderings at full accuracy
- Significantly improved performance including the ability to work with full fidelity CAD models and render and raytrace interactively, eliminating the need to rely on physical models for design and color decisions
- Better performance and photoreal visualization enabled a more efficient workflow where designers can collaborate and iterate in real time

SOFTWARE

Bunkspeed Pro

HARDWARE

- Lenovo D30 ThinkStation with NVIDIA Quadro K5000 and Tesla K20 GPUs
- Lenovo ThinkVision LT3053P 30" monitor

REASONS FOR MULTI-GPU SETUP

- Dual GPU power provides improved performance over single GPU mode, letting designers render models with more complexity and in less time
- Designers can raytrace interactively, letting them see how light reflects off of various paint materials and colors without having to rely on physical models
- Multiple GPUs prevent the workstation from locking up, letting designers edit in PTC Creo or check email while Bunkspeed Pro is rendering in the background

To learn more about NVIDIA Quadro, go to **www.nvidia.com/quadro**

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