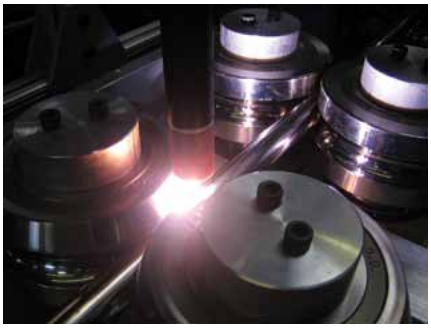
Steel in Love

Decades-Old Company Ventures Into Bikes With New Stainless Alloy



Photos: Danny Codd

To make its MS2 bicycle tubing, KVA Stainless starts with a flat strip of stainless steel that gets pulled into a continuous production tube mill and through a progression of rollers called breakdown rollers. The rollers curl the flat sheet upward into a circle. The number of breakdown rollers is dependent on the size and thickness of the sheet. The sheet of steel in these photos will continue through 14 stations. The next step is KVA's proprietary and patented seam-welded process, which involves sending the tubes through forming rollers to shape the tubing into a precise circle. The final step is to cut the tubing into the desired lengths.

by Trina Ortega

It's not a space-age material; it's been used in modern applications for more than 100 years. Bridges and airplanes are made of it. It's the structure of cars, heavy equipment, pipes and medical equipment—they're all made of stainless steel. So it makes some sense that one company describes the use of its new stainless steel alloy for bicycle tubing as "teaching an old dog a new trick."

The Southern California-based KVA Stainless introduced its patented stainless steel tubing, called MS2, at the 2011 North American Handmade Bicycle Show (NAHBS) in Austin, Texas, pitching among its benefits decreased weight, higher strength and stiffness, and lower cost than competitive materials.

"When people hear the words 'stainless steel' they think of spoons and forks," said KVA's lead engineer Danny Codd.

Indeed, historical uses of this grade of stainless steel have included cutlery. But it also has been used to make turbine engines, petrochemical equipment, surgical and dental instruments, scissors, valves, gears, cams and ball bearings.

Now bicycles are on KVA's bragging list of high-strength, corrosion-resistant industrial products.

"In the olden days of cycling, pre-1975, bicycles were built with steel frames, plated steel spokes and chromed steel rims. When stainless steel spokes arrived everybody celebrated and immediately switched over. Stainless steel as a frame tubing material has held much promise, but until now has been seen as too expensive, too difficult to work with or both; KVA Stainless solves these problems," said Doug Gore, vice president of sales and business development at KVA Stainless.

Depending on the crystalline structure, stainless steels are classified into five different types: austenitic, ferritic, martensitic, precipitation-hardening martensitic and duplex. Austenitic stainless steels—which among other uses are often employed to clad major architectural structures such as the St. Louis Arch and parts of the Chrysler Building—comprise about 70 percent of the stainless steel production.

Martensitic steel contains iron, chromium, molybdenum, nickel and carbon. Its molecular structure is composed of irregularly shaped

crystals, which makes this timeless material hard and strong and gives rise to one KVA manager's favorite phrases: "Steel is real."

Codd—whose recent work includes earning a Ph.D. from MIT—explained an advantage of martensitic steels is that they are highly machinable and can be hardened by heat treatment. But martensitic stainless steel has long had a reputation for being difficult to weld because cracks can form in the heat-affected zone when subjected to mechanical strain or deformation. It can become brittle around the weld, which alters the steel's crystalline structure, according to Codd.

Rolling a sheet of martensitic stainless steel to create a tube was never the hard part; it's why stainless has long been used in one-piece products such as knives and cutlery. "Welding a seam in martensitic steel so the tube became one, homogenous structure was always the issue," Gore said.

After more than four years and countless rounds of testing, KVA found a way to prevent the inherent cracking and weakness. Codd says the way KVA Stainless accomplishes this is through a patented multi-step process that controls the welding process and rapidly make welds without compromising the heat zone.

KVA Production Manager Joe McCrink says the KVA process "can get to the finished product in less steps," saving costs while still increasing the strength.

The company's decision to venture into the bike industry is a step in realizing a vision of McCrink's grandfather and company founder, Ed McCrink: He always had the desire to make martensitic steel more widely used, and one of his pet projects was to design a golf club shaft.

Ed McCrink, now 90, began his career in 1953 in Chicago, where he founded Hi-Temp, one of the largest thermal processors specializing in bright annealing, brazing and heat treating of stainless steels. He also founded Tru-Temp, which specialized in hardening and stress relieving of all types of stainless including plain steel forgings, castings and metal stampings.

"He comes in five days a week, just for lunch really, but he wants to check on things, see what we've dug up for the day," said grandson Joe McCrink.

Since introducing its alloy at NAHBS, the bike business has steadily picked up, McCrink says. The company now has a full section on its website dedicated to framebuilding, with tubing info and sizes, a photo gallery, FAQ, prices and ordering instructions.

Independent framebuilders are proving that this new alloy deserves a try. More than 100 custom builders have used the MS2 steel and Ellis Cycles, Six-Eleven and Cory Rosene Hand Built Bicycles earned awards for their KVA Stainless creations at this year's NAHBS. Some riders are agreeing that steel is still the way to go. They describe the material as having "good energy transfer" and "great bump absorbancy" and being "responsive" and "crisp."

"One European builder talked about how much he enjoyed the speed of the material. It really has a tendency to surprise people with how stiff and responsive the material rides. It's not just a plush ride; it has a more spring-tempered feel," McCrink said.

KVA's MS2 has a high tensile strength. According to Gore, it is twice as strong as titanium with a frame weight comparable to high-end aluminum. Ideal applications include silver brazed, lugged construction, and TIG-welded frames.

When it comes to the craft of framebuilding, stainless steel can really show off a builder's skill. During the handmade show—set up in a booth across from Naked Bicycles displaying a sleek, beautiful road touring bike—McCrink reflected on the use of martensitic steel in the craft: "Stainless has really become an elegant material. It needs a high level of finish because you can't hide anything."

Bike-builder Cory Rosene, whose 29er made of KVA Stainless tubing won an award at NAHBS this year, says he thinks stainless bikes are simply gorgeous.

"I like using stainless. It is a much harder material to use. It is harder to cut. You have to be very careful when brazing; it has to be very clean," said Rosene, who builds bikes out of his garage in Tuscon, Ariz.

As a newbie to the show, he displayed only the one bike and he talked profusely about how humbled he was to be among so many masters of the trade at NAHBS.

But it was that single mountain bike, the one he'd built for his brother who "didn't know what he was getting," that won him the NAHBS award for Rookie of the Year. He used a mish-mash of materials but KVA Stainless produced the tube set and fork blades.

Rosene said one of the best things about the KVA MS2 stainless is that it is readily available. "Some materials can take six or more months to ship. When the material is not available, it can be frustrating."

Plus, the KVA guys helped him with some special requests—different types of bends and extra-long sections. "They were so cool and patient with me," he said.

Rosene likes to use new and different materials, and working with MS2 helped him push his imagination and skill, especially since stainless steel is a tough material to work with.

"My hands were bleeding, my thumbs were sore, I would tell myself I'm not going to work on a bike for a long time … but we'll see. This bike has really come together very well," he said, adding: "Stainless is sexy."

Aaron Dykstra of Six-Eleven admitted he went through a lot of miters when building his NAHBS award-winning track bike. He hand-miters everything versus using a mill and uses steel as a way to challenge himself.

"I am really trying to not limit myself to one option," Dykstra said. "With stainless, you really come to understand the importance of a good miter. It's like earning your stripes."

The track bike was a mix of old and new. He used KVA Stainless tubing and incorporated some vintage 1980s Cinelli lugs and late '70s dropouts. His Best Track Bike award for 2011 followed on the heels of his 2010 Rookie of the Year award.

McCrink and Gore say they have loved working in the bike industry, and KVA is doing what it can to get to the end consumer. The company has launched an effort to sponsor local race teams by donating tube sets, fork blades, chainstays and seat stays. They are supplying the Boston-based Geekhouse with tube sets for the Rodder Racing Team to compete in cyclocross races. Builders at Firefly Bicycles also are making cyclocross bikes with KVA Stainless tubing for the Boston Bicycle School Team.

Because steel is a readily available material and has been used for decades in other industries, McCrink likes to think of it as "an old dog with a new trick."

"I guess you could say that a lot of new technologies make their way through the bike industry first," he said. "It's a great platform for us to show what the material is capable of. There is a lot of demand on a bike frame; it has to carry a 250-pound rider going uphill for an hour. That demand is pretty incredible. There's no better way to show off the pure strength of the material than the cycling industry."