

Tachi-S - Cars Seats Tested

The auto industry and its suppliers devote inordinate amounts of time and attention to making sure we can take our cars for granted. And because of these unceasing efforts, we do. For 50,000 miles, and sometimes for 100,000, few of us give no other thought our cars than gasoline, oil and windshield washer fluid.

But seats are, well, just seats, right? Not so fast.

In this world there are standards for everything -- including the durability, safety and ergonomic support of car seats. Even rear seats. And where there is a standard, there are companies to certify that products meet those standards. One such company is Tachi-S Engineering USA, a wholly owned subsidiary of Tachi-S Co. Ltd., a major supplier to automakers around the world.

As in any other business where strict standards apply, certifying car seats has become exacting. So much so that Tachi-S recently bought a portable coordinate measuring machine (CMM) to make sure the measurements were correct, to simplify verifying them and, in general, to speed up the whole process.

Tachi-S Engineering recently re-established its lab and testing facilities in its new design and engineering center in the Detroit suburb of Farmington Hills, Michigan. Although only four men work in the seating laboratory, they certify all Tachi-S's prototypes through production seats.

U.S. automakers have a high degree of confidence in their seating suppliers and the industry relies on self-certification. The seating manufacturers test their products and certify their results to the car companies and, when asked, verify their tests.

The portable CMM has greatly speeded up these tests and certifications, opening up new opportunities for Tachi-S in this highly competitive business. The arm has a 9-foot reach and an accuracy of plus or minus 0.002 inch. The machine weighs a mere 14 pounds.

Seating manufacturers put their products through several tests, each of which presents its own challenges. The most important of these is checking hip points, also known as H-points. "On humans and on seat-testing mannequins, the H-point is the center of the hip joint," explained Gunn Hurite, manager of test sales for Tachi-S. From H-points, designers of car interiors calibrate just about everything in the way the cockpit envelops the driver. This runs the gamut from the height, angle and positioning of the seat itself to the locations of the steering wheel, floor-mounted shifters, the driver's instrument panel controls, anchoring of the shoulder and lap safety belts, and even the placement of the accelerator and brake pedals. In small cars this also means assuring sufficient space for foot and ankle movement plus clearance for the knees.

The portable CMM is also used in anchor-pull tests to measure various deflection points of the seat and its anchorages. To make sure front and rear seats will stay put in a crash -- and fulfill their assigned energy management role -- they are stressed as in a 30 mph collision. "We use the arm to measure the deflection points and anchorages in 3D space before and after each test," said Tom Kralik, lab manager for Tachi-S. "With the old methods, it was very difficult to measure the deflection point movement precisely or easily. With the arm it's a breeze." Old methods, he noted, required preselecting points and using scales to measure metal stretch around deflection point. "It was a very tedious, time-consuming job," Kralik added.

Another portable CMM role, Hurite noted, is to measure final contours of the seat and then overlay data on original drawings. Measuring a soft surface such as that of a seat is a challenging task for any touch-probe machine, regardless of whether it's portable or bolted down. Working with the arm and a machine-vision company, Tachi-S is exploring replacing the arm's touch-probe with a laser. A current hurdle to overcome is the low reflectivity of most seating materials: this presents a challenge to machine-vision systems. Lasers of various bandwidths are being tested by a representative on the Tachi-S account, Paul Marinos of MariForm Ltd., also in Farmington Hills.

Previously, using a conventional CMM, two front bucket seats and the rear bench seat for a given car took eight to ten hours. "With the portable CMM we are four to five times faster," Hurite said.

Tachi-S first got into this type of certification work with the Hummer, the civilian version of the Army and Marine Corps HumVee light truck. "It was big and roomy so getting into the right places to make the measurements wasn't too bad," Hurite said. "We used traditional magnetic blocks, scales, height gages and squares."

In mid-1997 Ford asked us if we could do H-pointing on some of their smaller cars -- quite a different matter considering the size of the Hummer. Seeing an opportunity to get into a new and growing part of the testing business, Tachi-S said yes. The automaker provided very little guidance, Hurite recalls. "They didn't tell us what to buy or how to go about it. Looking back now, we're not sure they knew. They just told us what they had to have in the way of results."

Would Hurite and Kralik do anything different with the portable CMM a second time around? "Yes," Hurite replied, "we'd get the machine sooner."

The arm's capability for checking recorded dimensions against a computer-aided design (CAD) file is a major benefit for Tachi-S. This is especially useful in checking seat surfaces during durability tests. Over the life of a car, the driver will get in, sit down, buckle up, unbuckle, swing his or her feet out and get out of the car thousands of times. Furniture designed for this much wear and tear is usually made of steel.

"We have to make sure the seats are still within design tolerances after all the cycle testing," said Kralik. The padding can't be collapsed or compacted, the springs can't sag or stretch, and the frame can't be distorted. With the portable CMM, Tachi-S digitizes the before and after points and creates an overlay which can be compared with the original CAD file. IGES is used for up-loads and down-loads.

Reverse engineering also helps support Tachi-S's own extensive seat manufacturing operations. Tachi-S Engineering jointly owns Setex which supplies Honda in Ohio, TechnoTrim which has several cut and sew plants, and Hyperion which supplies GM's Saturn unit in Tennessee. Tachi-S also provides engineering support for one of the parent companies joint ventures, INSA, which supplies Nissan in Mexico. Together these businesses employ over 3,000 people in North America.

The portable CMM is also a plus in the more formal tests required by European carmakers. European car makers do not accept the U.S. self-certification practices. They require a witness to be present at the tests. "The arm speeds up the process and makes it easier for the witness to verify that the test measurements have been properly carried out," Hurite said.

Hurite summarized, "the portable CMM adds another dimension to our business, opening up some additional testing and checking opportunities for us. And that's important to us because, as a testing lab, we have to be as versatile as possible." Would Hurite and Kralik do anything different with the portable CMM a second time around? "Yes," Hurite replied, "we'd get the machine sooner."