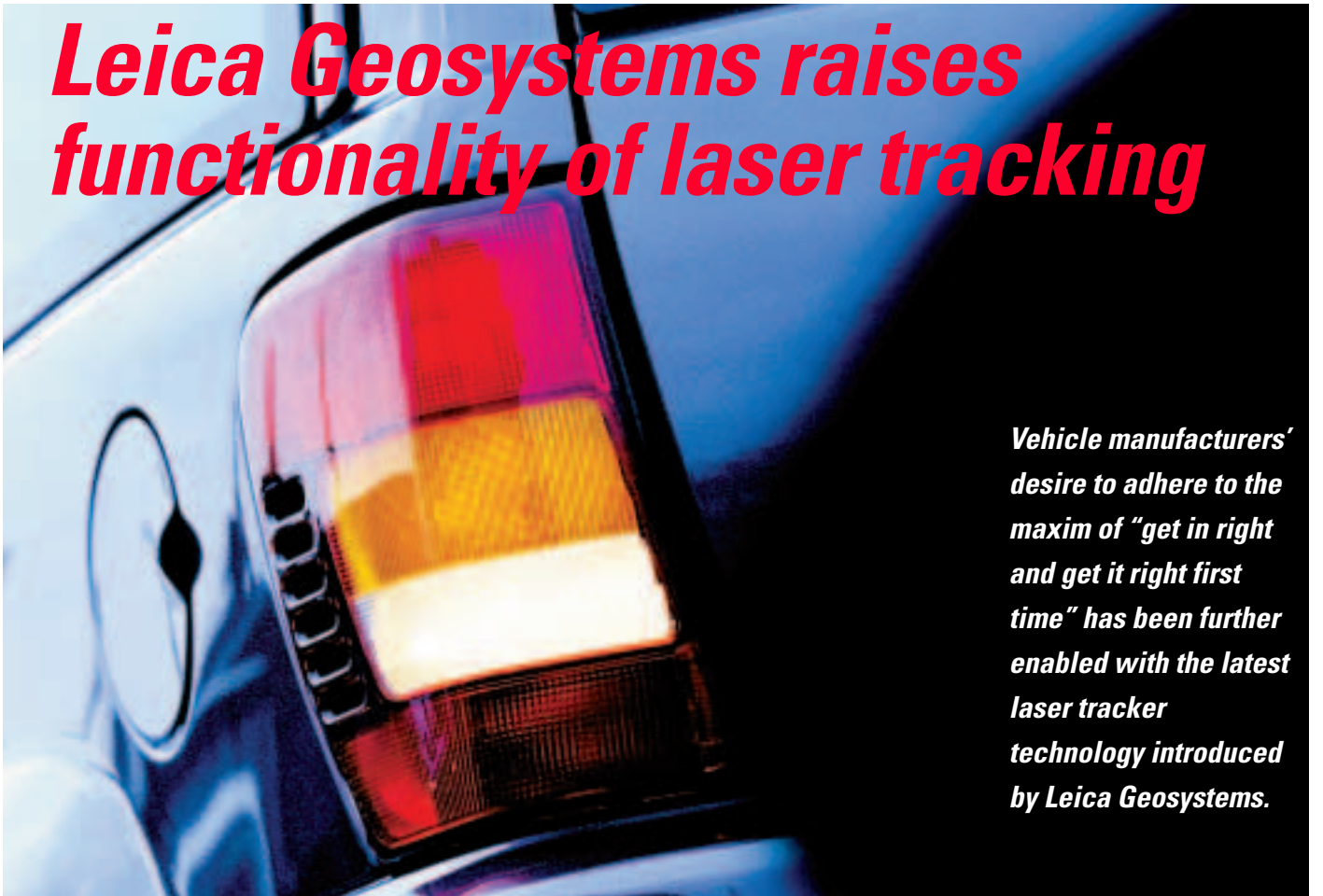


# *Leica Geosystems raises functionality of laser tracking*



*Vehicle manufacturers' desire to adhere to the maxim of "get in right and get it right first time" has been further enabled with the latest laser tracker technology introduced by Leica Geosystems.*

A world leader in laser technology and three dimensional measurement solutions, Leica has combined tracker technology with photogrammetry techniques, creating a measurement system that makes it possible not only to determine the position of a point of measurement, but also the spatial orientation of any arbitrary object. The process involves the use of a high-speed camera, installed on the laser tracker in conjunction with a handheld probing device (the T-Probe), containing the diode array and a reflector. While the laser tracker determines the exact position of the reflector, the camera determines the position of the diode array in the photogram and, from that, computes the spatial orientation of the probing device. With six degrees of freedom the shape and orientation of any arbitrary object in space can be measured in real-time with a rate of more than 100 Hz.

The introduction of the new measuring process brings two decisive functional enhancements to laser tracking. The first is that it allows measurement of geometries to be made with Leica's ultralight handheld device, the armless and wireless T-Probe. The second is that in future the laser tracker will be combined with Leica's handheld scanner, the T-Scan, to enable objects to be digitized easily and quickly. In this respect Leica's Tracker

LTD800 and LTD700 laser trackers have been developed with special attention to these functional enhancements, making it possible to measure the six degrees of freedom of the end effector of a robot, in real-time and during its motion.

According to Nicholas Bloch, Vice President Global Marketing and Communication, Leica Geosystems Metrology Division: "The T-Probe is essentially a first-of-a-kind accessory to the market-

leading Leica laser tracker series. It will offer engineers and metrologists previously unheard-of flexibility and freedom by allowing them to measure and inspect also deep inside components and tools with undiminished accuracy."

Functioning with a Leica laser tracker, the compact T-Probe can easily inspect and accurately measure virtually anything, anywhere. It offers measurements accurate up to 0.1 mm in a volume equivalent to that of a full-size car. Bloch believes that the T-Probe "is destined to become a critical new success factor for the automotive and related industries worldwide. Leica already has a pre-order log for a dozen installations, particularly in the automotive sector."

Looking at the applications of the new technology, Bloch adds: "In general, the systems of measurements are employed for compari-

**Measurement of geometries is made with Leica's ultralight handheld device, the armless and wireless T-Probe.**



son of the reality with the design (measurement of the form and the position), or for the translation of the reality into design data (Reverse Engineering). While in the automobile industry the design data for almost all the products are now commonly available in CAD format, it is clearly recognizable that this is now increasingly becoming the standard also in the aviation industry.

"If the design data is available in digital form, for on-site work, the measurement systems must be in a position to retrieve or store the necessary data from the network of the firm via intranet. Also, this general trend in the industry requires that the systems of measurement be seamlessly linked with CAD programs and that they have open interfaces that make them intranet enabled.

"In case of laser tracker and laser radar, these requirements were given major

reliance upon contemporary measuring technology, from prototyping through to volume production. At General Motors' Opel international technical development center (ITEZ), which sets the production standards for all of the company's manufacturing plants, a state-of-the-art Leica laser tracker is used to provide precise measurement of welding operations.

Epitomizing current trends in measurement technology, no longer do Opel's engineers have to bring the work piece to a static measuring system (as in the past) but simply move the measuring device to the product, thereby saving time and cost.

In fact, there is often no alternative. Part of Opel's ITEZ responsibility is to plan, develop and construct welding lines for new models, prior to them being built in the actual production facilities where the cars will be made. The problem facing engineers in such



*The compact T-Probe can easily inspect and accurately measure virtually anything, anywhere.*

ment, known as Nivel20. This enables "horizontalised" measurements to be carried out - which is very important on welding lines, where two or three machines often run simultaneously and, over a period of years, it is possible for one corner of the framework to sink slightly. Thus, before installing a new welding line into the framework (for a new car model), an essential part of the installation procedure is checking to ensure that all four corners of the frame are still at the same height and perfectly aligned, a process that the laser tracker carries out with guaranteed precision.

Generally, with laser trackers it is awkward if the laser beam is broken, either by movement or being covered by an intermediate body, as the tracker would lose sight of the reflector and the whole system would then have to go back to its starting-point. In the past, were this to happen, the laser beam had to be directed to this reference point, from where the whole process could be started again. However, were this to happen today, starting the procedure from scratch is not necessary as the Leica tracker features an additional camera that searches for the reflector entirely inde-

**"The T-Probe is essentially a first-of-a-kind accessory to the market-leading Leica laser tracker series. It will offer engineers and metrologists previously unheard-of flexibility and freedom by allowing them to measure and inspect also deep inside components and tools with undiminished accuracy."**

priority during development. Both the systems have open program interfaces that are intranet enabled via TCP/IP. With Leica's own new application software, known as Horizon, a complete integration of the measurement systems is now possible with the CAD environment. The analysis of the measurements takes place in real time and the generated reports are presented in a form compatible with the internet browsers."

#### **Laser tracking – not a fixed asset**

In practical terms, the automotive industry, at both OEM and key supplier level, is placing ever-greater

instances is that the welding lines can be up to 12 meters long and fixed immovably in place. "It is in situations like this where mobile measuring technology really pays its way," says Olaf Wienke, the Leica support engineer responsible for commissioning the system at Opel. He adds: "The user places the reflector on the points to be measured and triggers a remotely-controlled measurement. At the same time, the exact spatial co-ordinates of the measurement point are stored in the system."

With an accuracy of 10 micrometers per meter, the Leica laser tracker used by ITEZ boasts an additional compo-



**Toyota production engineers will use the LTD800 laser tracker for quality control, to bridge the gap between as-built vehicle and nominal design data.**

pendently and, with the help of the system's absolute distance meter (ADM), allows the measurement process to carry on as if never interrupted. Wienke explains that: "This additional functionality can be very useful in a complete welding facility, with many moving parts, where it could be relatively easy for the laser beam to be interrupted." Marrying the tracker to Opel's software system created no problems as Leica

also supplied its Axyz software, a type of operating system for optical measurement devices. Wienke describes how the package works: "This software allows us to operate the tracker and to check the measurement data. The user can calibrate the system, perform measurements or program commands and the program makes it possible to transfer data to the software system in use - in this case, Metromec."

To ensure that operators maximize the potential of its laser tracker, Leica includes in the cost of the package a five-day basic training course, during which participants are introduced to the principles of optical co-ordinate measurement techniques and the use of laser trackers.

**Rod Harman**

## ***Success with carmakers continues***



Leica Geosystems leads the industry with more than 1,300 tracker systems installed worldwide in some of the toughest, most unforgiving industrial environments. The company's success with carmakers continues with a raft of recently won contracts. The Ford Motor Company has purchased eight Leica laser tracking systems, which will form the metrology foundation for a variety of manufacturing applications, from assembly to tooling processes. The decision to

standardize on Leica followed a major benchmarking exercise by Ford of the metrology systems currently available in the marketplace.

Toyota Motor Manufacturing North America has also turned to Leica to supply a laser tracking system for high precision inspection and measurement operations at its production facility in Erlanger, Kentucky. Toyota production engineers will use the LTD800 for quality control, to bridge the gap between as-built vehicles and nominal design data. The LTD800 delivers the fastest measurement cycle in the industry for high point density (3000 points/second), and the longest measurement distance for large volume work (40 m). In addition to the LTD800, Toyota also plans to utilize Leica's new T-Probe to provide on-demand inspection and measurement.

In Europe, Leica has delivered two LTD800 laser tracker systems to DaimlerChrysler to help ensure the quality and precision of industrial inspections and measurements at the Mercedes-Benz plant at Rastatt, southern Germany. According to Nicholas Bloch, one of the key reasons underlying the decision to purchase the systems was the possibility to upgrade to the portable T-Probe function - which operates with Leica's LTD800 and LTD700 laser trackers - and to use it for precision measurement and inspection of just about anything, anywhere. "The DaimlerChrysler decision shows that we are moving more and more strongly into the automotive sector - thanks largely to the previously unheard-of advantages offered by the T-Probe. The new system represents that increasing rarity in today's ever-changing high-tech industries - a genuine technological revolution, which will fundamentally affect the way users do their job and how they perceive suppliers' commitment to innovation.

"Based on this technological break-through, we now expect to considerably expand our market share in those sectors that depend on state-of-the-art precision measurement capability - particularly the automotive industry."