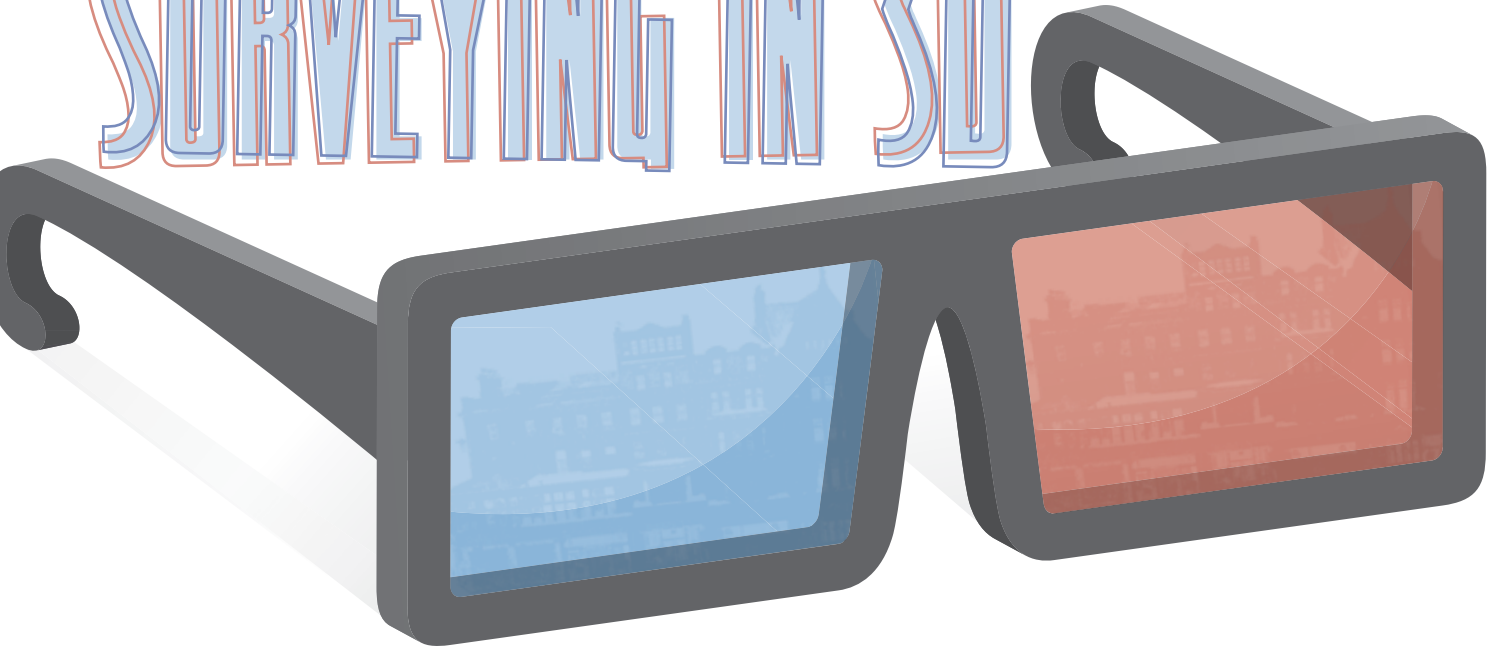


SURVEYING IN 3D



Staying on top of technology can be a challenge for even the most successful firms. But when a company is founded on the principle of using only “the most up to date and sophisticated technology,” it can’t afford to be a bystander.

That’s why Loy Surveys Ltd. based in Glasgow, Scotland, has prioritized visionary thinking. The 25-year-old chartered land survey firm embraced com-

puter-aided surveying, robotic survey instruments, and GPS and GNSS technologies as they became commercially available. When laser scanning first emerged, the firm got its foot in the door by subcontracting scanning services. “It was always going to be essential that we purchase; it was just a question of when,” says Jim Loy, managing director, noting that the firm was watching closely for the ideal combination of market opportunity, technology maturation and affordability.

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In 2009, when Leica Geosystems introduced the ScanStation C10, Loy Surveys decided the time was

right to make its move. “Not only was the technology a significant step ahead of previous scanners, it provided us an excellent entry point into scanning,” Loy says. “Being both faster and lighter, it was ahead of the game and looked to be the pacesetter for the next few years. The fact that everything came in a single manageable package and did not need cables, external batteries and laptops to operate it meant it fit perfectly into our flexible working system.”

The firm already had projects in the pipeline that would benefit from the new scanner’s capabilities. The only question was whether clients would recognize the advantages. There was one way to find out. With the new equipment ordered, the firm scheduled a site visit at Grangemouth Refinery on Scotland’s Firth of Forth—the first commercial job for the new laser scanner.

A Matter of Time

Loy Surveys was tasked with surveying three cooling towers at the refinery to identify any movement, shape change or deformation in the tower structures. Previously, this work had been carried out by other firms using total stations to survey points at set heights along a number of meridians around each tower—a risky and labor-intensive job that can take two or more days per tower. Scanning seemed like an ideal fit.

Steven Ramsey, Leica Geosystems HDS technical manager, met the Loy Surveys crew onsite with the new scanner. Ramsey had been involved in the testing and development phase of the C10 and would be working closely with the crew to demonstrate the instrument’s capabilities and answer any questions that might arise.

A NEXT-GENERATION SCANNER HELPS LOY SURVEYS STAY ON THE CUTTING EDGE.

BY SCOTT MACLEOD

The crew scanned each tower by placing the scanner over known control points and reference objects. A total of five overlapping positions scanned in a 30 millimeter grid were used on each tower. "By using the ScanStation C10, we were able to survey the three towers over two days with the survey time for each individual tower taking approximately two and a half hours," Loy says. "Not only is this a massive savings in site time, but we were also able to record infinitely more data on each of the cooling towers."

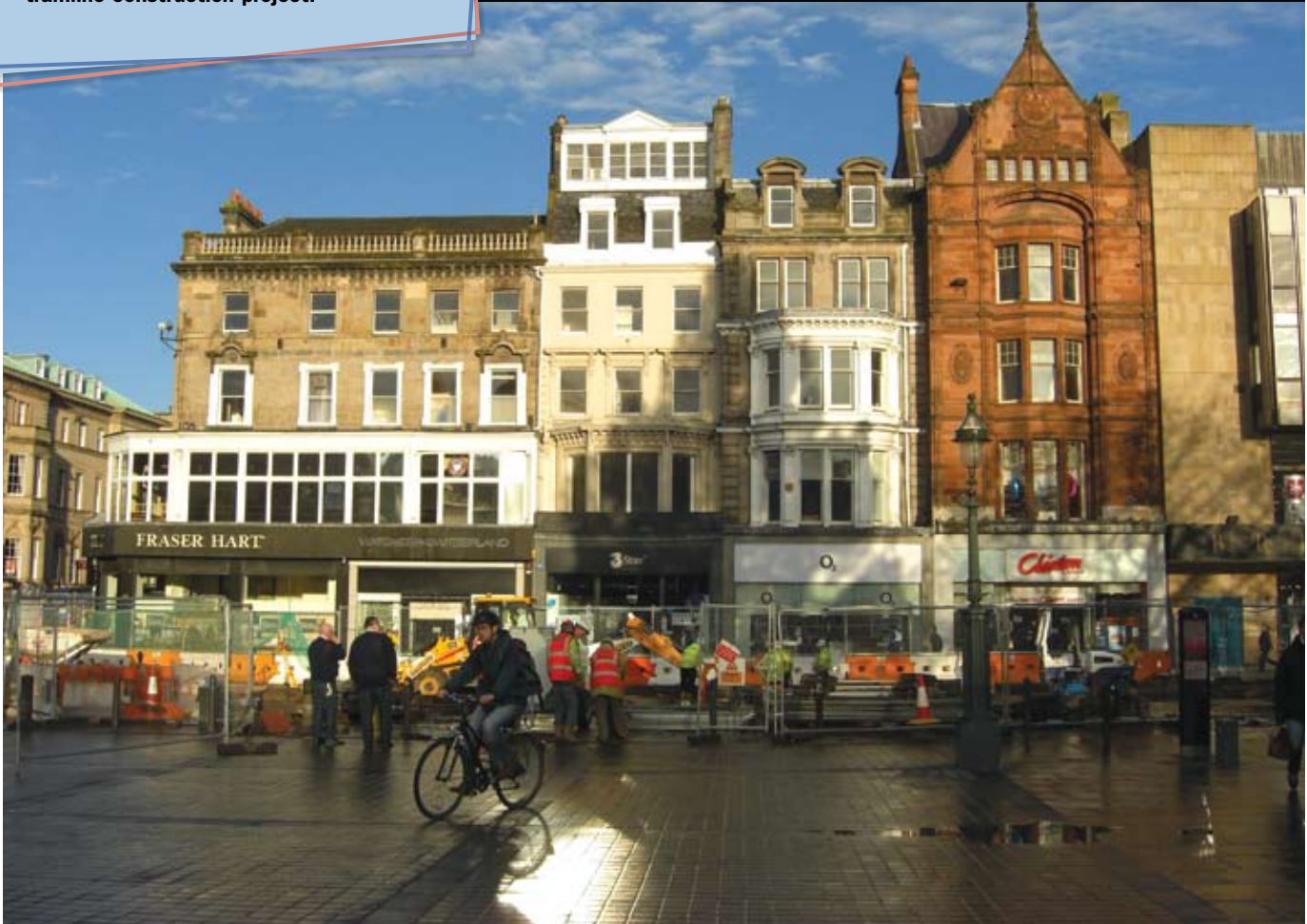
Importing and registering the individual scans with the Leica Cyclone 7 software proved straightforward, and in less than an hour of office time, the team had a 3D model of one of the towers.

The next step of the process was a bit more complex. Previous surveys of the tower had all been done with total stations, and their results had been represented as 2D drawings. To create a comparison between these surveys and the

scans, the team had to manually select individual points from the scanned model and recreate them in a similar 2D format. This step required additional processing time. However, the scans provide tremendous value for future work at the refinery.



Loy Surveys scanned Edinburgh's Princes Street adjacent to an ongoing tramline construction project.



In the Princes Street project, the crew worked from confined spaces.



The project involved surveying 80 meters of building elevations up to five floors high. Using a total station in conjunction with measured building survey (MBS) elevation software, the work would have taken close to two weeks to complete. With the scanner, the project was finished in one day. As with the cooling towers at Grangemouth, the firm was able to collect a level of detail that was previously outside of its capabilities.

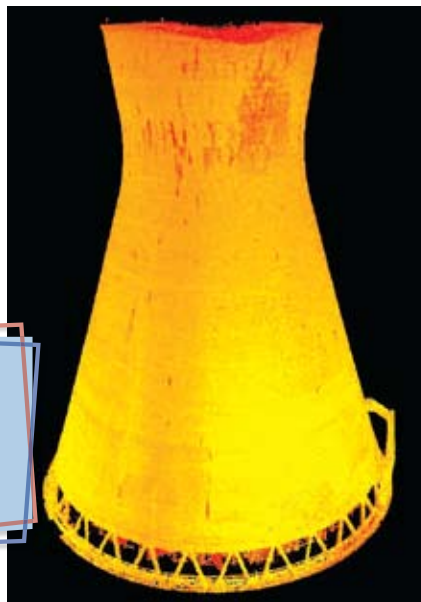
Being able to carry out the work quickly was a significant advantage. “As one of Edinburgh’s main thoroughfares, Princes Street is always busy,” Loy says, “but with work for the new tramline network turning much of it into a construction site, the areas from which we could work were rather confined. The scanner and an early morning schedule allowed us to collect the information with minimal risk of disturbance from the tram work and pedestrians—something that would have been tiresome and difficult to avoid had we needed to be onsite for a couple of weeks.”

Producing the requisite 2D drawings from point clouds can take as much as or even more time than conventional survey fieldwork, but the firm found a solution to this challenge, as well. “Being new to working with scanners, we are still in the learning stages and continually developing our experience at creating drawings from the point cloud data,” Loy says. “While we get up to speed, we have begun a relationship with a couple of design houses that we can call upon to assist and create drawings for us.” And there’s a side benefit: Outsourcing some of the processing work frees up more time for the firm to pursue 3D surveys.

“When we return to survey these towers in the future, we will have the current 3D scanned model from which we will be able to make comparisons in a fraction of the time,” Loy says.

Soon after the refinery project, the firm was commissioned to survey several adjacent properties—including street-facing elevations—on Edinburgh’s Princes Street adjacent to an ongoing tramline construction project. Scanning was not specified for the surveys, but Loy Surveys decided

to use the scanner both to gain experience with the equipment and to compare scanning processes with traditional methods.



Loy Surveys’ first project with the ScanStation C10 involved scanning three cooling towers at Grangemouth Refinery on Scotland’s Firth of Forth.

Scanning New Markets

Having the scanner has allowed Loy Surveys to gain work outside of its traditional survey markets. One area of interest is heritage surveying. The firm recently scanned Dounreay Castle on Scotland’s north coast, one of the few remaining examples of a 16th-century Scottish Laird’s castle. The building has a fortified L-shaped design that is typical of the Scottish lowlands but unusual in the



Full point cloud data and elevation drawings provide a historic record of Dounreay Castle.

northern region. Due to its architecture and history, the castle was designated by Historic Scotland as a scheduled monument. However, the castle is in ruins. The roof is missing, walls are leaning and some sections are in danger of collapse.

The site houses several nuclear research establishments. All reactors have been shut down and the facilities are being decommissioned, but the security and monitoring controls on the site make physical restoration of the castle impossible. Instead, Dounreay Site Restoration Ltd. approached Loy Surveys to conduct a 3D scan of the castle as a means of preservation by record.

No one was allowed within 10 meters of the castle due to its dilapidated condition, so only exterior surveys were possible. "The ability to scan the castle meant we could record it quickly and efficiently at relatively low cost (compared to physical restoration), and at

the same time remain at a safe distance from the structure," Loy says. Security protocols limited the amount of time the survey crew could spend on the site at any given time. Still, within two days, the crew had collected a total of 11 scan positions with an overlapping grid of 8 to 10 millimeters or less—enough information to see and record the individual stones within the coursework.

Loy Surveys presented the client with the full point cloud data providing a record of the castle in its current state. These data, along with 2D elevation drawings of the castle, will be kept by Historic Scotland for future use and reference.

Continued Education

Loy Surveys is convinced that scanning is becoming mainstream in the surveying profession. "We are aiming to reach an ideal position where we will carry out the scanning, register the data and then pass the

raw point cloud data straight to the client so that they can then use the data as they see best," Loy says. "This has huge benefits for both us and our clients. For us, it means there is less office time and, accordingly, more survey time, which boosts our productivity. For our clients, it means the ability to get full 3D surveys in a fraction of the time and at an affordable price."

Loy admits that many clients still aren't in a position to accept and use full point cloud data, but he says the situation is changing—largely because of the proactive efforts of surveying firms with scanning capabilities. For its part, Loy Surveys hosts road shows to demonstrate the capabilities of scanning technology—which it calls Rapid 3D—to current and prospective clients. "This not only allows us to demonstrate the direction we are moving in, but also provides clients with a clear picture of the types and amounts of data that are available and encourages them to look toward incorporating our Rapid 3D surveys into future work," Loy says.

Additionally, as the architecture and design software packages improve the ability to import and work with point cloud data, the number of clients that will be able to take advantage of these data will continue to increase. In fact, in some cases, clients are driving new applications.

"Having put the C10 to use, we easily see the huge advantages to be gained through the ability to complete highly detailed Rapid 3D surveys in record time," Loy says. "Although we are new to scanning and still have much to learn, we have no doubt that we made the right move at the right time." 🌐

Scott Macleod is senior surveyor for Loy Surveys (www.loy.co.uk). For more information about the ScanStation C10, visit www.leica-geosystems.us.