

A creative approach

How a truly creative approach enabled Brunel Surveys to deliver a large and challenging survey on-time and within budget.

Working closely with KOREC Professional Services and the client, Dorset Council, Peter Worthington, Survey Manager of Brunel Surveys combined data from a boat and trolley mounted mobile mapping system with Trimble R12i GNSS positions and scan data from a Trimble SX10 Scanning Total Station.

In a recent article in CES magazine, the CICES President considered two interesting concepts, the 'uncertainty of success' and the notion of risk (including financial risk) when it comes to the adoption and investment of new and innovative technologies on projects. Whilst he was predominantly referring to construction projects, it's also an interesting point of view when applied to the take up of technology and untried methodologies within the survey industry.

Progressive mindset

Whilst there are some companies happy to deliver tried and tested results using existing instruments and methods, there are also businesses that are gaining a competitive advantage through a more enterprising approach. One such company is Swindon based Brunel Surveys.

Operating nationally, the company has established an excellent reputation for both its niche solutions for challenging surveys and also as a business that has the skill set, technology and manpower to take on large and complex infrastructure projects.

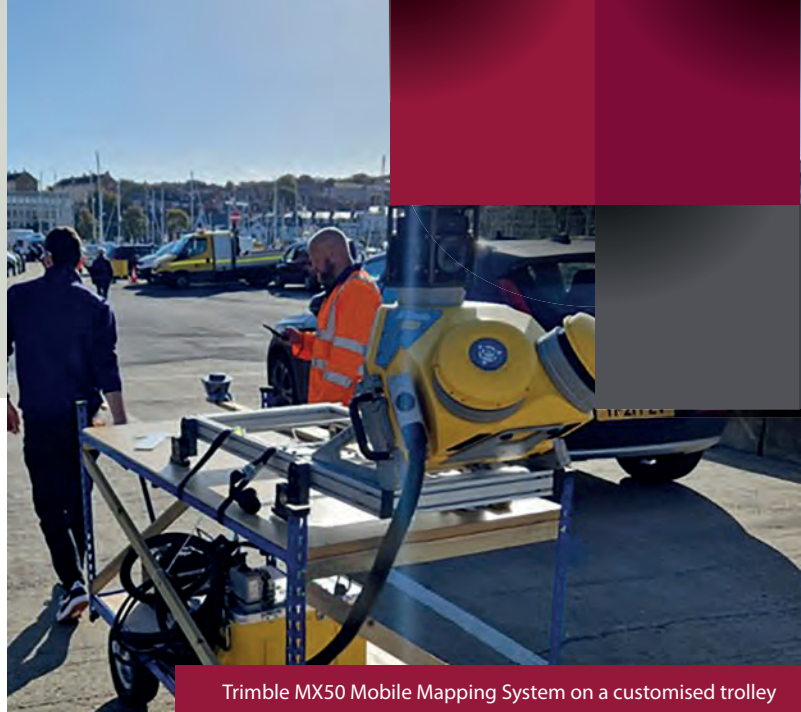
In particular, the company works with its clients to fine tune how they approach a job to ensure that the best results are delivered using the best solutions. A recent project undertaken for Dorset Council on the Weymouth sea front is a perfect example of how this can be successfully achieved and how tenders can be competitively priced through the adoption of new technology and methodologies.

Weymouth Harbour site challenges

The Council is currently undertaking investigations and research towards a business plan for the Weymouth harbour and seafront area. It will identify future construction and building projects, which will increase the area's flood resilience and protect properties.

Following a tender process, Brunel Surveys was contracted to undertake a topographical survey of the beach, the harbour, a nearby nature reserve and the harbour wall. The wall needed to be surveyed from both sides and the client originally requested a point cloud generated by static 3D scans for this aspect of the work.

However, the site presented a number of challenges that Brunel Survey Manager, Peter Worthington, analysed before presenting his solution and submitting the tender document:



Trimble MX50 Mobile Mapping System on a customised trolley

Trimble MX50 Mobile Mapping benefits for this project

- The MX50 uses GNSS positions along with LiDAR technology which means the point cloud could be tied in with Brunel's National Grid topo survey. It was mostly a perfect match and any deviation was less than 25mm.
- Lightweight and simple to install and operate so the MX50 unit could be moved quickly from boat to trolley and easily managed via a tablet or mobile phone.
- Generates an accurate, colourised point cloud with good detail and panoramic imagery
- Fast, entire harbour wall survey was completed in a single day
- Dual head system delivering excellent coverage with a single pass, even in busy areas
- System runs off a standard car battery for flexibility, compactness and easy deployment



Typical point cloud data



Peter Worthington on board the boat with the MX50

The topographical survey of the harbour and nature reserve would be fixed to the National Grid using centimetre accurate Trimble GNSS equipment. However a point cloud generated by a 3D laser scanner cannot be scaled accordingly. If they had used static scans for the harbour wall, although the precision would be good, the scale factor would have been an issue with a mismatch of around 400mm over 1km.

Although a large job, all the site work would need to be completed within a two-week time period if it was to be tendered for at a competitive price.

Weymouth Harbour is a busy area with scooters, pedestrians, traffic and high buildings which would dictate how the area could be surveyed safely and accurately. Even scanning from the other side of the wall would be problematic due to boat traffic.

It was important to capture as much detail as possible of the 2km long harbour wall from both sides, despite the boats.

"I really feel that we were able to deliver to the client the very best results using the best solutions.

It's also important to have a reliable partner and we'd certainly use KOREC Professional Services again."

Peter Worthington, Survey Manager, Brunel Surveys

Knowledge, experience and planning

For Peter Worthington, key to submitting a successful tender would be Brunel Survey's niche experience in creating solutions that provides the client with exactly what they need, within their parameters, but in the most efficient way possible.

Harbour wall survey: Peter felt that although using a 3D laser scanner, as requested by Dorset Council, would provide the high level of detail required, this gain was offset by other problems. Namely that the point cloud could not be scaled to fit the topo survey and overall accuracy would be lost using stitched scans.

Additionally, the level of boat traffic and the amount of time the scanning would take would also be problematic. He therefore investigated

“New methods do bring an element of risk but I also feel that these risks can be mitigated by careful planning, by using past experience and by checking each element of the process carefully.”

Peter Worthington, Survey Manager, Brunel Surveys

other solutions including the SLAM technology that he had used on previous boat surveys and static scanning from a boat neither of which were feasible for this job.

Following his research, he therefore suggested mobile mapping as the solution. Although it might not have the same accuracy as the 3D scans, the level of detail collected would still be excellent and he felt that there would be a far bigger risk of using a point cloud that couldn't be scaled and consequently having a mismatch with the topo survey than in using the mobile mapping system.

As a Trimble user and long standing KOREC customer, he contacted the KOREC Professional Services Team (providers of a mobile mapping and data processing service). Working with KOREC's James Tindall, it was agreed that a Trimble MX50 system would be mounted on a boat for one side of the wall to be mapped from the sea and then mounted on a trolley to map the other side.

A quad bike had to be dismissed due to the number of pedestrians in the harbour area. Instead, a special trolley was constructed and tested at Brunel Surveys head quarters and a local Captain commissioned for the boat survey.

On the day of the survey, the MX50 was mounted onto the boat by KOREC and operated on-board via a mobile phone app. The boat was carefully navigated along the shallow water and the data quickly collected. The system was then mounted on to the customised trolley and further data collected shoreside. The entire survey of the wall took just one day. The Trimble MX50 was particularly suited to these two surveys for a number of reasons. The MX50 is lightweight and therefore easy to deploy on both the boat and the trolley which was further assisted by the versatile power setup. The MX50 is also a dual head system which means it got excellent coverage even in a busy area.



Scans were undertaken at control points using the SX10



Using the Trimble R12i GNSS with TIP technology

Topographical survey: This was an extensive survey that included many different aspects including a nature reserve, the harbour, beach and also footpath levels etc. Whilst the Trimble S6 Total Station could be used in quieter areas, the need to avoid pedestrians and dogs meant that having tripods around the area would not be workable. Peter's solution was therefore to set up a single base station in a safe place and use two Trimble R12i GNSS rovers. Although the data generated would not be as precise as total station data, the overall accuracy would be good.

Peter verified this by also using a Trimble SX10 1" Scanning Total Station. At each control station he used the SX10 to carry out a small scan which he could use to verify the accuracy of the GNSS

Brunel Survey's Trimble equipment used on the project:

- Trimble MX50 Mobile Mapping System (provided by KOREC Professional Services)
- Trimble S6 Total Station
- Trimble Base Station
- 2 x Trimble R12i Rovers featuring Trimble TIP Tilt Compensation Technology for accurate point measurement without precisely levelling the pole
- Trimble SX10 Scanning Total Station

Data from each of these sensors was combined into a single data set



Typical examples from the point cloud



The MX50 is extremely easy to deploy on different vehicles

data. If there were buildings in close proximity which might compromise the GNSS signal, the SX10 was again used.

Using the R12i rovers enabled the data to be captured far faster than with total stations thanks to the Trimble TIP Tilt Compensation Technology for accurate point measurement without precisely levelling the pole.

New methodology - was it worth it?

The data was processed by KOREC Professional Services in Trimble TBC which also automatically selects the centre of each of the targets that were scanned, assigning coordinates. This enabled the topo and mobile mapping data to be accurately matched and combined into a single data for the client.

Peter reports that the whole job was completed on time with just two weeks on site and two weeks in the office and that the client is extremely pleased with the results. The colourised mobile mapping data was checked frequently and found to deviate no more than 25mm from the topo survey and overall was mostly a perfect match.

Peter concludes, "Working with Dorset Council and KOREC Professional Services, I really feel that we were able to deliver to the client the very best results using the best solutions. Was there a risk involved? With any new methodology there is an element of risk but I also feel that these risks can be mitigated by careful planning, past experience and by checking each element carefully. At Brunel Surveys, we specialise in this niche approach and because our methods can be far faster than those specified by the client we find that we can often tender competitively and provide a better solution.

As with all these things, it's important to have a reliable partner and KOREC Professional Services has proved to be just that."

CONTACT US

Please do get in touch for further information on any of the products or services mentioned in this case study, a demonstration, support or just a chat about your requirements.

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