

# Having the best of all worlds

Leighton Davies makes the case for combined GNSS in a hybrid positioning system, both on and off-site



Robotic total stations and RTK GNSS receivers have been preferred instruments for positioning professionals for more than 20 years, and are commonplace for those conducting stakeout and measurements.

Selecting the appropriate instruments for the job at hand is crucial to overall project success, and in many cases the choice will come down to a GNSS receiver or a robotic total station. However, there are significant benefits to combining these technologies into one connected unit, which ultimately results in accelerated productivity on site and increased accuracy.

This combination, or hybrid system, gives a concurrent and constant communication between the GNSS receiver, total station, field computer and software – enabling complete oversight of a project.

## Best of all worlds

Using a hybrid system makes perfect sense in many scenarios, and offers users a choice between GNSS or total station measurements as they wish, instantaneously. Due to the minimal weight of the system (less than some GNSS rover pole set-ups alone), there isn't a noticeable physical difference between using a hybrid system and a lone GNSS rover. However,

users will certainly notice the convenience of the efficient reacquisition of the prism, and the savings in time in the field - whether surveying or just staking out.

Many hybrid systems are backwardly compatible to previous generation total stations. This means that for a relatively small investment, a robotic total station owner can upgrade to the hybrid system with the simple addition of a GNSS receiver and software upgrade, and vice versa. That said, it is most cost-effective to invest in the combined total station and GNSS, with bundled packages often working out to be better value.

Additionally, the hybrid system is particularly popular when it comes to an educational space, as it gives students the opportunity to use the two core technologies that they will use in the field, as well as teaching the differences between GNSS and total station measurements more effectively. As the dual functionality has become more viable, it's important that future users are educated and made aware of the tools at their disposal.

## Dual benefits

On site, the ability to alternate between GNSS and total station measurements

confers a significant benefit, allowing users to change their approach where suitable and when needed. The improvements in the performance of modern-day GNSS receivers, combined with the fact that we can now track multiple satellite constellations, ensures that GNSS measurements can be made in challenging locations.

It is often surprising where a fixed position can now be obtained, compared to just a few years ago. Obstacles such as tall buildings or trees are no longer necessarily an issue. However, in those areas that cannot be measured with GNSS, you can simply press a button when using a hybrid system and switch to total station measurements.

Hybrid systems offer additional compatibility, and can be paired with any common network GNSS correction service, or a local base station. You can further boost RTK correction via a cellular connection, with solutions such as Topcon's Magnet Relay service. This offers correction data to up to 10 GNSS rovers from a single subscription, with the correction broadcast over the internet. It automatically connects a mobile base receiver over double the distance, ensuring that teams on the ground have a fail-safe solution for dynamic project site conditions.

Robotic total stations and GNSS



a very speedy setup.

**Software enhancements**

It's not all about the hardware though. Although improvements in the size and form of surveying hardware have made a hybrid setup much more viable in recent years, it is ultimately the software that has enhanced the user experience and facilitated a combined approach.

Functions and co-ordinate geometry calculations are now available in the field, which until recently, would have had to be made in-office and sent to site, prolonging the process. Customised reports can be created, stored as a PDF, and e-mailed to the client directly from the field, revolutionising the way teams work.

When using a complete software workflow solution, such as Topcon's MAGNET software, AutoCAD drawings can be imported and orientated for easy stakeout, using the enter plan and drawing transformation functions. The enhanced functionality on offer and the intuitive, problem-solving nature of the software design enables far greater productivity for surveyors and engineers, whether situated in the office or out in the field.

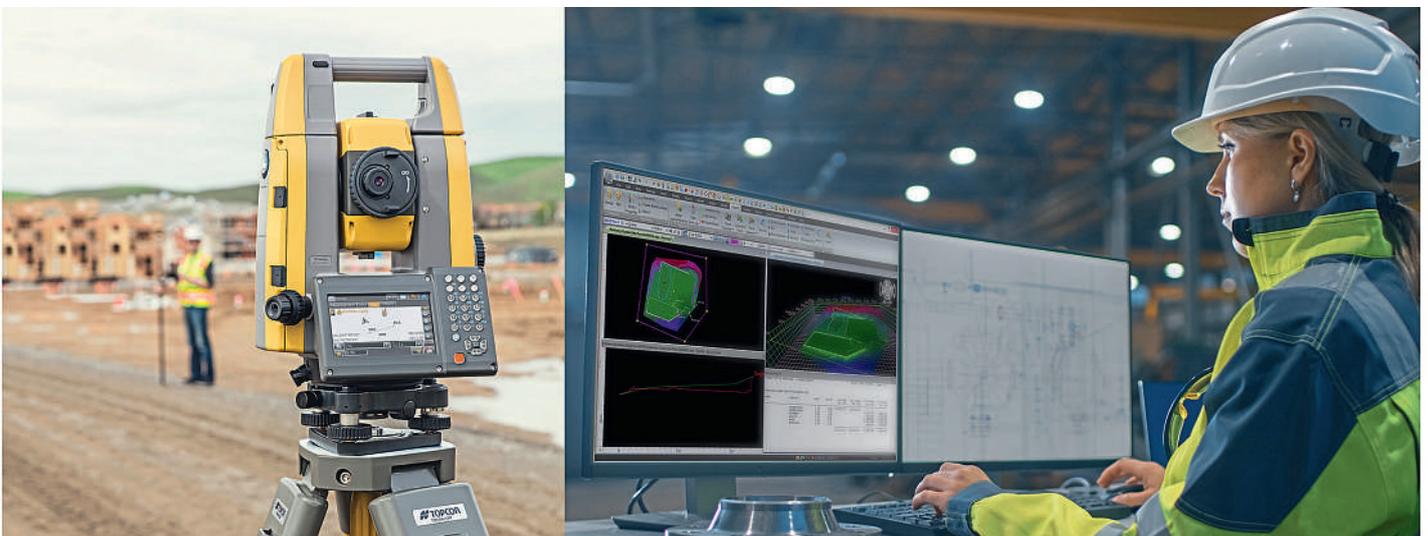
No matter what the file type, from a simple csv to the increasingly ubiquitous ifc files, the process is easy and ensures no data loss. Real time connectivity to the office from the field ensures that if there are design changes and updates to the data, the field crew are alerted and will be working with the latest version, ensuring that no time is wasted.

receivers complement each other and work well together - a hybrid system is more than just a sum of its parts. As the GNSS receivers are mounted on top of a prism, with a connection to the instrument, the total station is typically aware of where the prism is. If prism tracking is lost, it can be reacquired very quickly with the press of a button. A message is broadcast to the instrument telling it exactly where to look,

ensuring that difficulties locking on to the prism are a thing of the past, saving a lot of time and headaches for project teams.

By using three or more GNSS control measurements it is possible to correctly orientate your total station on the same co-ordinate system as the GNSS receiver. It's also possible to localise the receiver and total station using the same method if local co-ordinates are being used, which makes for

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TOPCON's flagship GT Series ultrasonic robotic total stations (the GT200 is shown here on the left), integrates GNSS technology for hybrid positioning, and is easy to use with the company's MAGNET field, cloud and office software suite (pictured above right)