Trimble territory

Working in one of the most corrosive environments in the world, with average temperatures soaring in the high 40s, Trimble handles the Namibian challenge with unsurpassed equipment and unrivalled after-sales support.

Trimble provides positioning solutions, enabling professionals in engineering and construction, surveying, fleet management and field service to be more productive by revolutionising their work processes. Trimble uses GPS, lasers, optical, as well as wireless communications and application specific software to provide complete solutions that link positioning to productivity.

CEN visited a Trimble client in Namibia to hear what they had to say about the system they are using, in one of the most arduous climates on the planet, where machines and systems have to be rugged and reliable and downtime is not an option.

Trekkopje Projects

As a fundamentally earthworks-focused company, Trekkopje Projects works within both mining and construction sectors. With a variety of projects under their belt, from building heap leach pads, berms and ponds to smaller-scale road building projects, they also offer crushing services, as well as heavy equipment transport, within the 40 to 60-ton range. In 2007 the company secured a contract with Trekkopje Mine, working on a new uranium extract. The mine used

Pads on a uranium mine showing the necessity for accurate levelling over an extensive area, made easy with the Trimble systems.

the heap-leaching process for extracting the mineral, so required extensive and precisely level surfaces (pads) for the mine tailings.

Lance Enslin, Operations Manager, Trekkopje Projects explains, "While the pad surface be exactly as per design, with a consistent two percent drop it had a tolerance of only five to ten millimeters. What was critical however, was maintaining the levels as per design as the pad was built." The pads in question covered a staggering area of approximately 280 000m^2. This required highly accurate levelling throughout.

Tradition vs Trimble

Lance continues, "The first pad was levelled using the time-honoured conventional method, whereby, two fixed levels are pegged either side of the site, by a Quantity Surveyor (QS). A piece of gut-line is secured and held taut between the two fixed points, thus assuring that at any point along that piece of line, the height of the gut-line will be constant. A person with a 'dip-stick' (a rod or stick with a pre-determined mark indicating the required height, ascertained by the site Supervisor or QS) then measures the height of the gut-line at regular, pre-determined intervals, to ensure accuracy of the levelled surface." It is evident that using this method is not only time intensive, but there is a possibility of human error coming into play, requiring ever-present supervision, making the process labour intensive too. This is further exacerbated if the QS has to be called out again to correct any anomalies, which in turn impacts on project costs; all the while with machines standing idle, impacting on overall productivity.

"The cycle is endless and," says Lance, "our reputation is also on the line."

According to Lance, using the laborious 'dip-stick' method to build the midi-pad took the QS "About fourteen days to just place the pegs," charged at an hourly rate, so the cost was considerable. It was around this time that the company started investigating other levelling methods in which to expedite the surveying process. He comments, "We are very loyal to Caterpillar Namibia (all Trekkopje Projects' equipment is from this OEM) and they put us onto Trimble's distributor for South Africa, CLM Positioning Solutions."

Once CLM assessed Trekkopje Projects' requirements, they purchased the Trimble GCS900 3D Grade Control System as well as a Trimble TSC2 Controller running SCS900 field software – and a GNSS Base Station, designed for single site GPS reference station setup.

The GCS900 system is a cutting-edge earthmoving grade control system that puts design surfaces, grades and alignments inside the cab, checked by the operator on an easy-to-read onboard monitor screen providing rapid access display. The system accurately positions the blade or bucket in real time, significantly reducing material overages and dramatically improving productivity and profitability on any project.

It is extremely flexible and can be used on excavators, dozers, motor graders, compactors and scrapers and with its CAN-based design, the GCS900 can be easily moved from machine to machine, as needed.

Lance explains, that owing to the small size of their operation, it made economical sense to use one system shared between three CAT machines: D5N, D8R (bulldozers) and a 140H grader. All machines are equipped with their own Hydraulic Kits and Harness', which makes the swop of machine control components (GNSS receivers, masts and display unit) easy and quick to complete.

"Even our operators, who were initially sceptical about using 'a robot' as they called it, are now more than happy to use it as they can see how easy and accurate it makes their workload."

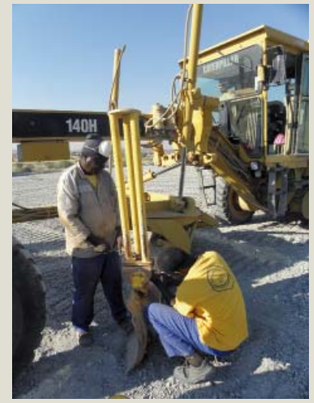
How the system works

As the Trimble system operates via satellite, an initial fixed base point of reference on the ground must be established from which all the resulting positions of machines and rovers are based. A correction signal from the base is used by the receivers on the machines to provide the realtime elevation of the pad being constructed. This is displayed on the control box inside the cab from where the machine operator can easily see where he needs to grade the material to fit the design.

The machines use the signal from the base station to guide them, not only in horizontal position but in elevation as well. As the areas are so large the supervisor needs a method to check what the machines are doing and what volume of material is being laid. He can perform these tasks using the SCS900 software on the TSC2 controller. The software works exactly like the machine by comparing the actual position against a surface model at all times, not just individual points. He adds, "I thought there was no way that I could learn how to use this computer-driven measuring system,

The Trimble GCS900 is swopped out between the bulldozer and the grader, taking just under 30 minutes for the entire exercise.

Loosening a couple of bolts. >



Adding the final strut. >

The only thing left to do is fit the monitor onto its bracket, plug in its cable, set the machine name and the system is up and ready to run. >

< The system fitted to the bulldozer.

< Fitting the system to the grader with extension masts.

< Putting the Trimble SPS882 GNSS Smart Receiver in place.

∧ The grader, now with the system fitted.

Below left: GNSS Base Station

Designed for single site GPS reference station setup. Note permanently positioned rod/peg directly below the satellite antenna, which will serve as the control point of reference for all measurements taken on site.

Below right: Trimble TSC2 Controller

Rugged, adaptable hand-held controller with easy-to-use interface for a range of site control applications – measuring distances between points, surface areas, volumes calculation and recording daily progress.

Once the height requirement has been loaded onto the system, only material that must be removed will be taken away, leaving material that already complies with the specification untouched. This can be seen in this image as the grader scrapes away the excess, leaving the correctly graded level intact.

but within a very short time I had mastered the basics of the Rover, and with CLM's ongoing, constant support, a mere phone call away, I was up and running competently within days and what makes it so easy, is that it is icon-driven."

The system is well suited to the non-surveyor and the Trimble SCS900 Site Controller Software was designed from the ground up for contractors carrying out measurement and stakeout for earthworks, highways, landfill cells and mining.

Lance continues, "The machine control was fitted on the 140H grader. While the 'dozers and dam scrapers worked on bulk earthworks, moving the material to a rough configuration, and what we referred to as the 'Trimble grader', viz the one with the machine control in place, followed behind doing the precise cutting."

He is enthusiastic about the system and comments, "I cannot believe how long we went without using this system! Even our operators, who were initially sceptical about using 'a robot' as they called it, are now more than happy to use it as they can see how easy and accurate it makes their workload."

Challenges and benefits

Lance emphasises the Project Designer, AMEC (a focused supplier of consultancy, engineering and project management

The manual, 'dip-stick' method not only requires overseeing and monitoring to obviate human error, but it ties up more than one worker in an effort to obtain a reading for each single measurement.

With the 'dip-stick' or manual surveying method, markers are often trundled under a piece of equipment, requiring a QS to re-establish the correct positioning and height as in the picture below.

Without a Trimble system, removing a corner peg becomes a logistical challenge as it has to remain, untouched, often for weeks and months on end, till the last stage of the final cut, as each time it is moved, a QS has to be on call to ensure that the integrity of its position is re-established.

services to the world's oil and gas, minerals and metals, clean energy, environment and infrastructure markets) imposed specification tolerances on the project so fine that room for error or compromise was not ever a consideration.

He adds, "Because of our geographical position and the shortage of Surveyors in the region, it became difficult to secure a Surveyor to come and do the grade checks for us, to ensure that our machines were in fact cutting the correct levels. So while we waited for him to arrive on site, we had machines and workers standing idle, unable to continue."

Once the surveyor completes the as-built survey, it is submitted to the designer (AMEC) who compares it against the design. They may then decide, for example, that the intervals of measurement need to be closer, so the entire surveying process has to be re-done, resulting in added surveying fees and once again, machines and workforce left waiting for the re-work to be completed.

However, by using the new system, time surveying on the project was dramatically reduced by about ninety five percent, resulting in faster job cycles, with time used more productively and less time wasted waiting for surveying and grade checking. With the site plan and grade information displayed in the cab, operators can finish jobs faster and thus uptime and productivity is dramatically improved, and although a Surveyor or Engineer is still required to verify measurements, there is very little or no re-working required.

According to Lance, the Italian Site Engineer, under contract from AMEC UK for the project was "really impressed with the results. He said that the build was the best he'd seen in Africa, by way of quality and accuracy on the project."

What appealed most to Lance, was: "at last I had the power at my fingertips and I no longer had to rely on the availability of a QS!"

Productivity should not be limited by time constraints and in the absence of frequent re-working on-site, the Trimble system has ensured that costs are minimised and yields are increased.