

Excavator mounted Trimble 3D Machine Control system is the perfect solution for Fitzpatrick at 1km² earthworks site

When it came to prepping a challenging 1km² site of Kent marshland in readiness for the construction of four enormous warehouse pads, civil engineers Fitzpatrick knew that they had a demanding job on their hands in terms of both the quantity of setting-out required and in meeting stringent environmental requirements.

Close to the Thames, the site in Sittingbourne, Kent, features over 400,000 square metres of car park, four warehouse pads – the largest occupying 95,000 square metres – and a number of tricky environmental considerations including the contouring of ponds, extensive drainage work and the accurate levelling of ditches.

Faced with an earthworks project of this size, coupled with tight time restraints, the Environmental Division of Fitzpatrick saw Sittingbourne as the perfect site to introduce 3D machine control technology into their working practices as an alternative to traditional time consuming setting-out methods.

Already established users of GPS for site surveys and familiar with basic machine control technology, Fitzpatrick and their long standing earthmoving contractors D&M Plant, began an investigation into what systems were on the market and the potential benefits that they could bring to this type of job.

Mark Humphrey, Design Engineer for Fitzpatrick (Environmental Division) explains, "Following our initial research we trialed a 2D system but after two days of setting it up we found it just couldn't deliver the results we needed to get the significant time savings and ease of use that would justify our investment. Upgrading the same system for 3D usage still wasn't providing the versatility we required so we decided to test a more sophisticated 3D system from a different manufacturer, namely the Trimble GCS900."

"We were aware that we would be amongst the first users in the country to adopt this technology on an excavator, but following a visit in March from Trimble's UK distributor KOREC and a speedy installation of the GCS900 onto a D&M Plant Volvo EC460-GC it was clear that this system was going to deliver. Within half a day the driver was up and running and found the software pretty well self-explanatory."

Using the System

The KOREC team fitted four sensors to the excavator, on the boom, stick, and



The Trimble GCS900 mounted on a D&M Plant Volvo EC460-GC

bucket linkage, and a pitch and fall sensor mounted on the platform of the machine. Dual Trimble MS990 integrated GPS receivers were mounted onto the back of the excavator which would receive corrections transmitted via a radio back at the Trimble GPS base station mounted on the site office roof. These positioning sensors are used to compute the exact position of the bucket teeth many times per second. In the cab a Trimble CB430 control box uses this position information and compares it to the design elevation to compute cut or fill to grade. Everything is displayed on the screen in front of the driver.

Back in the office Mark Humphrey used survey software to create the job design, which was then loaded onto a PCMCIA memory card for transfer of the design data to the cab-based control box. D&M Plant driver Vinnie Holton then had the DXF file of the whole site on screen in front of him and was ready to go. "In the cab I have a choice of views including a plan view and cross section so I know exactly where the bucket is in relation to the design. The flashing light bars and audible alarms are particularly useful and I tend to use them even more than the screen. Even changes in design are no longer a headache. The

new data is just uploaded by memory card into the cab. I'm now working in a virtually stake less environment and can get on with the job with no need for a banksman. Excavating time is slightly longer than before but using this system I know it's 100% right first time. There's no need to get out of the cab to replace knocked over stakes and with no one around, it's a safer environment to work in. Work is now continuous, not the stop-start that it was before with dump truck drivers waiting around for checks"

Checking

Whilst D&M supplied the plant for the site, Fitzpatrick set up the control for the job including the purchase of a base station and a Trimble GPS Rover and ACU logger



Dual Trimble MS990 integrated GPS receivers were mounted onto the back of the excavator



Mark Humphrey checks work done with a Trimble Rover and ACU logger

with software for QA checking purposes. Daily checks are carried out by Mark Humphrey using the Rover with the same design data as in the cab loaded on the logger. Fitzpatrick has also taken out a license to Trimble's VRS Now service – the same solution as used by the Ordnance Survey to achieve RTK accuracies without the need to set up a base station – enabling Mark to quickly check work on several sites in one day without the encumbrance of base station set ups.

System Evaluation

Mark Humphrey is enthusiastic about the benefits of introducing the Trimble system to the site. "Aside from the health and safety benefits, we are without a doubt reducing setting-out time by around 85% not to mention saving an Amazonian rain forest by not using stakes! Although we still have a few boards around as a rough guide, this is now essentially a stake less site. The accuracy is well within the tolerances we would expect whatever method we use, but is now achieved considerably

faster. This brings us the added benefit of better utilisation of the good material that we are digging out. We know exactly the volume coming out and can therefore reduce the cost of importing additional fill."

"Once the legwork is done – the setting up, design and calibration – the job pretty well looks after itself leaving me free to visit other Fitzpatrick sites to carry out checks rather than sitting around here trouble shooting. Best of all is the peace of mind. We regularly check the machine and control and they are always +/- 20mm, well within tolerance. We've had no need for any rework to date, everything is exactly as on the drawing and the client loves that"

The success of the GCS900 system has led Fitzpatrick to back it up with a second system on the Kent site, this time on a Komatsu dozer where Mark estimates a 100% saving on setting-out time when trimming the enormous 95,000 sqm piling platform.



A full display on the in cab screen

Future Plans

When the prepping of the Kent site is finished in July/August, the system will move onto a contract at Peterborough for the construction of two landfill cells. Mark concludes, "It's fair to say that using 3D Machine Control is now an integral part of our working practice and I've had a lot of visits from other divisions of Fitzpatrick interested in adopting the technology. This is the first project we've used it on and with hindsight I can see that there are many ways that we can better manage its usage in the future for even greater productivity. The systems are entirely interchangeable which means that we can easily move them from machine to machine depending on the factors we can't always plan for such as weather. Reliable technology has been backed up by KOREC's fantastic technical support. Any minor issues we've had have been sorted out promptly and they've pulled a rabbit out of a hat when we've needed extra kit."

*All information kindly supplied by Mark Humphrey, Design Engineer, Fitzpatrick Environmental Division.
www.fitzpatrick.co.uk*

About Fitzpatrick

Fitzpatrick have grown organically, through evolving with our customers, to meet the demands of today's construction industry into a respected multidisciplinary contractor with a turnover approaching £400 million.

The Environmental and Remediation Division was set up two years ago to provide clients with a service that enables them to achieve stringent targets issued to them by the Government for the forthcoming decade. It also specialise in the regeneration and remediation of brown field sites so valued engineered design solutions can be achieved within commercial restraints.