

Case Study

Customer:
Balfour Beatty Rail Services (BBRS)

Project:
Network Rail RT24 - Plain Line & S&C
Renewal

Solution:
Trimble GCS900 3D machine control
system & Trimble SPS930 UTS



Pushing Technology

Balfour Beatty Rail Services takes an innovative approach to using 3D Machine Control

Balfour Beatty Rail Services (BBRS) delivers the RT24 contract and additional S&C work for Network Rail. In particular, BBRS' Eastleigh depot renewed over 40km of plain line during 2008, culminating with two S&C and track renewal jobs in the St Denys and Wimbledon areas. In the three month period that included these final two jobs, the Eastleigh Depot achieved 100% on track quality internally whilst Network Rail's S&C Track Geometry Statistics placed BBRS as top in the country for the same.

St Denys and Wimbledon marked a significant turning point for the Eastleigh Depot seeing them adopt a completely new way of working, switching from a 2D laser based control system and traditional tape and theodolite survey practices, to a single new technology, 3D machine control, and a previously untried leap-frog method of operation.

A single Trimble GCS900 3D machine control system had been successfully used by BBRS' Broxbourne Depot for a previous

track renewal job in Manningtree. This experience lent itself to Eastleigh's ambitious plans to use two systems simultaneously.

The GCS900 system works by having a single electric mast with an active target prism centrally mounted on the blade of the dozer and a slope sensor to calculate blade tip position of the machine. This prism is tracked by a Trimble SPS930 Universal Total Station (UTS) 1" instrument, via a 2.4GHz radio, updating its position twenty times a second to the control box in the dozer's cab. This provides the operator with a real-time screen display and the 3D position of the blade in relation to the 3D design. Using a UTS based system provides the millimetre accuracy required for this type of work compared to a GPS based system which would deliver centimetre accuracy.

Preparation

Whilst the basics of a single dozer system had been successfully tried and tested by

▲ Careful positioning of the two Trimble Universal Total Stations enables BBRS to work continuously

the Broxbourne Depot, Eastleigh Track Delivery Manager Steve Hooper felt confident that the technology could be pushed a step further. "The St Denys site requirement was to deliver complex multi-crossover and single lead layouts staged over four 52 hour weekends. We'd seen what had been achieved at

"The Trimble system has reduced rework and the installation of the S&C's was millimetre perfect."

Manningtree but the time restraints and complexities of the St Denys site meant that we needed to work continuously during our weekend possessions. The solution was to use not one,

but two systems working simultaneously - two UTS 930's in conjunction with two Caterpillar D4 dozers provided by Quattro Plant Ltd, both equipped with the GCS900 system. Having access to these 1" UTS instruments would also allow us to speed up our setting out and checking by using them in place of traditional survey methods."

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Two systems had never been used on a project of this type before so additional help was enlisted from Trimble's UK distributor, **KOREC**. Together, Steve Hooper and **KOREC's** Technical Support specialist Scot Townsend, came up with an entirely new approach to ensure continuous work – leap-frogging.

By carefully locating both UTS instruments on the site, if one machine lost the line of site to its instrument, it could still see the second quickly and easily be switched to leap-frog over to receive positional information from this one instead. This was all managed by the control box in the cab so that the switch could be simply performed by the machine operator or technicians.

In preparation for the job, the drivers underwent two days of training with Quattro

first time, digging and reballasting could take place simultaneously.

Steve Hooper continues, "Our engineers reported that no corrections to the dozers were required and cross falls over 6-7m were perfect. Using a 2D system, BBRS would expect to get anything from 20-60mm lift on reballasting; however with the Trimble GCS900 system, there was a maximum lift of just 25mm post whacking which allowed minimum lift for the tamper. Dig accuracy was 15mm, well within Network Rail's +/-30mm tolerance. Compared to our old 2D laser system, we reduced our dig time from 4.5 to 3 hours and almost halved our 3 hour reballasting time. These efficiencies were borne from eliminating the need to change gradients or dozer blades for the difference in depths. Previously, by using tapes and theodolites



▲ The finished track - 100% pass on SD's on all parameters



▲ Millimetre accuracy - a single electric mast with an active target prism centrally mounted on the blade of the dozer and a slope sensor calculate blade tip position of the machine

and thoroughly tested the signal between their machines and the UTS whilst experiencing the benefits of machine control first hand.

Following these successful training days, Steve was further confident of a smooth job due to the high level of support provided by **KOREC** in positioning the UTS and machines for optimum use. This was backed up by **KOREC's** on site support and preparation of the data. The design was converted by **KOREC** into 3D data that could be used by both the GCS900 system and on a Trimble TSC2 data logger when running SCS900 software for use with a prism, pole and UTS instrument for setting out and checking by the technicians.

Continuous work equates to high productivity

By using the innovative leap-frog method of working, BBRS were able to work continuously and without disruption. For the

for setting-out we were constantly hitting pegs and resurveying. Using the GCS900 system we had instantaneous slews which allowed for pinpoint accurate installation. This meant minimum slews for the tamper

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installation of the S&C's was millimetre perfect, it really was that good!"

Steve also emphasises that his engineering team found using the UTS with a Trimble TSC2 data logger and SCS900 software

which allowed us more time to get it to 102 standard. Tamping was reduced to 2 or 3 times compared to the normal 3 or 4. The Trimble system had reduced rework and the

sped up all their survey operations from establishing control to carrying out a validation survey in just two days – a job that previously would have taken six or seven days.

Future Plans

The objective of this job was track quality - delivering fantastic results within a very tight schedule. The St Denys job achieved a 100% pass on standard deviations on all parameters -AL35, WT35, AL70 and MT70 - throughout the site, with the Taken over Certificate gained at T+8 (benchmark 12 weeks).

Steve Hooper concludes, "BBRS is constantly striving for greater productivity and Trimble machine control technology has to be a solution. We have 100% taken this on board and from our experiences, we know that this method of working brings greater efficiency. Consequently at BBRS Eastleigh Depot, we aim to be using the GCS900 system on all plain line renewal sites during the next 12 months."

All information kindly supplied by Steve Hooper, Eastleigh Track Delivery Manager for BBRS ■ ■

Project Update

BBRS Win Innovation Award

At the annual Rail Industry Innovation Awards Ceremony on the 26th June 2009, BBRS received the Innovation award for Small Scale Projects based on their work using Trimble Machine Control for excavation and ballast placement.

The award was presented by Lord Adonis, the Secretary of State for Transport, and the audience included Ian Coucher, the Chief Executive of Network Rail. BBRS beat off strong competition to win this prestigious award.

Contact us:

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