High Precision Railway Ballast Construction

Task

Installation of a GradeStar-TPS machine control system on a Komatsu D41 P-6 dozer using a Pro Control system

Client

Hydrex, West Dreyton, UK

Date

Installation November 2003

Project Facts

Equipment:

* GradeStar machine control system (ProControl)
* Robotic TPS1100 Total Stations series
* Komatsu D41 P-6 dozer

Field:

* ProControl panel is mounted in the driver's cab

Benefits

* grading completed in a shorter period of time and with fewer passes
* more efficient and greater accuracy
* the system does all the work for the operator
* profile preparation is no longer necessary
* DTMs loaded directly on to the computer so grading is undertaken exactly according to project data

In early November 2003, the first fully automated GradeStar-TPS 3D Dozer control system in Europe was installed at the Hydrex site in West Drayton, UK. The GradeStar machine control system, based on the robotic TPS1100 Total Stations series, was installed on a Komatsu D41 P-6 dozer together with Leica Geosystems ProControl (the core 1D/2D/3D hydraulic control system). This 3D machine control system enables dozer operators to complete grading work in a shorter amount of time, more efficiently and with greater accuracy.

The GradeStar-TPS system offers enormous advantages compared to conventional machine control methods. The system does all the work for the operator. On site pre-preparation work such as the staking out of hubs and the installation of profile boards is no longer required. Digital Terrain Models (DTMs) can be loaded directly onto the GradeStar computer mounted in the driver's cab, allowing grading to be undertaken exactly according to the project data.

The 3D position of the blade is measured by a precise 360° prism attached to the machine (mounted via a rugged mast) along with data from the sensors (including tilt information). Based on the TPS 3-D position data, the computer always knows where the machine is and after determining the actual position of the blade, design information is used to calculate height and cross-slope deviations in real time in order to control the hydraulics automatically to the desired position. It then automatically calculates immediate corrections to the design data, which are used to control the blade. This is truly 3D operation controls the blades' elevation and slope as well as the position.

Leica Geosystems' machine automation experts Steve Cooper and Norbert Otte were on the job to complete the installation and testing in just two days. Tuning of the system took just one hour, first involving the fine-tuning the Pro Control speeds and settings to get a good result with just the control panel and then fine-tuning the computer together with the total station data.

Hydrex's GradeStar-TPS dozer is currently on hire to ACT on the Channel Tunnel Rail Link for a 10-week track possession — levelling ballast for the new line into St Pancras. Already feedback from operators has been very positive, stating that the system is easy to use and has reduced project delays.

The GradeStar 3D machine control system can work with either GPS or TPS sensors and has a standard control panel that can be used with sonic, laser and 3D systems. Special benefits of the GradeStar 3D GPS solution are the long control range (up to six miles); no need of direct line of sight and unlimited machines can be controlled simultaneously from one base station. The GradeStar TPS solution is the perfect choice when highest accuracy is required or when works in tunnels, under bridges or other areas are need to be carried out, where obstructions could impede GPS signals.

Other typical applications for the GradeStar 3D machine control system include fine grading on roads or highways, airport and runway projects, and the grading of parking lots.

"Due to the direct control from the drivers cab, fewer passes are needed which has resulted in increased accuracy and confidence in the final surface on this high profile job without the need for time consuming profiling and continuous QA checks."
Chris Ottley, Works Manager ACT

Leica Geosystems

Leica Geosystems Limited
Davy Avenue, Knowlhill
Milton Keynes MK5 8LB
United Kingdom
Ph +44 (0)1908 256500
http://www.leica-geosystems.com/construction

Application Report: Machine Automation