BUILDING SMOOTHER SURFACES: TRIMBLE PAVING SOLUTIONS

Trimble

MORE PRODUCTIVE AND PRECISE PAVING FROM THE CONSTRUCTION TECHNOLOGY AUTHORITY

Trimble applies advanced positioning technologies to make all phases of heavy and highway construction more productive and precise. Whether you are building new roads or resurfacing existing roads, Trimble paving and milling solutions offer the most comprehensive set of concept-to-completion roading solutions in the industry.

Leveraging design surfaces, grades and alignments on the machine, operators can mill and pave more accurately, reduce material overages and significantly improve productivity. Using 3D technology, smoothness is improved because the machine is automatically implementing the design. You no longer risk using stringline that is incorrectly set, knocked over or damaged. Trucks can be more productive as they no longer need to drive around stringline or stakes.

Simply stated, the more you use these systems the more productive and profitable your road building will be. By using one data model from beginning to end, you'll use less material, experience less re-work, take less time, use less fuel and end up with a better road or surface.

DEPENDABLE TECHNOLOGY. DEPENDABLE SUPPORT.

Reliability is especially important in paving systems, because the paving can't stop. Trimble components are built to withstand the heat, steam, tamping and vibration that are regular on pavers. And while system durability prevents downtime, Trimble's extensive dealer network ensures that training and support are always close.

Trimble®

CONSTRUCTION OF NEW ROADS: Trimble's

Survey, Design and Site Positioning

Bulk Earthworks to Fine
Trimble GCS900 Grade Con

RE-PROFILING EXISTING ROADS: Precision

Survey , Design and Site Positioning

Precision
Gra

end-to-end solutions fill the gap in construction workflow

Grading:
trol System

Base Compaction: Trimble CCS900
Compaction Control System

Asphalt Paving: Trimble PCS400 **OR** PCS900 Paving Control System

technology for smoother roads using less material

Milling: Trimble GCS900
de Control System

Asphalt Paving: Trimble PCS400 **OR** PCS900 Paving Control System

TRIMBLE PCS400 2D PAVING CONTROL SYSTEM

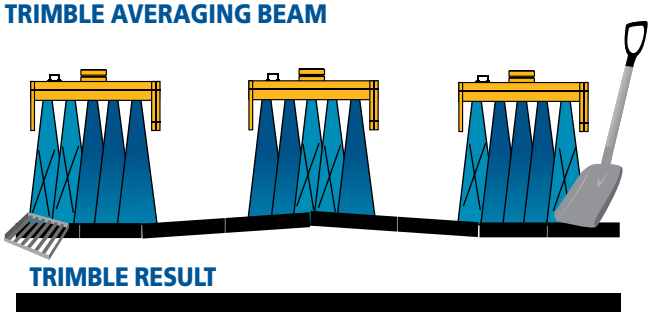
GRADE AND SLOPE CONTROL FOR ASPHALT PAVERS

Using the latest and most accurate technologies, Trimble® PCS400 Paving Control System helps you achieve road specifications with less cost while increasing your bonuses. The PCS400 system employs superior Trimble sensor technology to reference off a stringline or a surface with greater accuracy and smoothness. The graphical display on the Trimble CB440 Control Box allows paver operators to quickly view, understand and control the settings and measurements of the grade and slope sensors for increased productivity.

Using the Trimble PCS400 system can help you:

- Lay the finish surface at an accuracy of three millimeters (1/100 foot) and within smoothness spec, using Trimble's sonic averaging beam technology
- Minimize use of expensive material... the sonic tracer allows you to pave within a tighter tolerance and get closer to the minimal asphalt thickness specification
- Reduce training time and operator mistakes... the advanced controller has a large, easy-to-understand display and allows simpler operation
- Pave slopes of 0.5% accurately and consistently
- Achieve excellent rideability results and finish on-time
- Gain the competitive advantage... get the job done faster and with superior results

TRIMBLE AVERAGING BEAM



The averaging beam has three ST200 Sonic Tracers mounted to average out longer irregularities like road waves.

THE MOST OPERATOR-FRIENDLY DISPLAY

The PCS400 has a large display and an easy-to-understand layout for measuring cross slope and material thickness. The optional split screen allows one operator to control and monitor the left and right side of the screed on one control box.

REFERENCING OFF A SURFACE

The ST200 Sonic Tracer uses five sonic sensors and an averaging technology that allows the system to ignore irregularities that decrease accuracy, such as stones, grate inlets, shovels and workers' feet. The averaging capability is enhanced when the system is configured with a beam using three ST200 Sonic Tracers. By spacing out the sensors, the system smoothes out any unevenness or longitudinal waves in the reference surface by calculating an average value over the entire length of the beam.

REFERENCING OFF A STRINGLINE

When the tracer's center is moving away from the stringline, the control box warns the operator and provides correction guidance. The ST200 provides 25 centimeters (10 inches) of accurate sensing range over a stringline or narrow curb, unlike the single sonic sensors in the market.

The Trimble ST200 Sonic Tracer ignores irregularities that decrease accuracy.

TRIMBLE PCS900 3D PAVING CONTROL SYSTEM

3D MILLIMETER PRECISION CONTROL

The Trimble PCS900 Paving Control System adds the precision and flexibility of 3D technology to the many benefits of the PCS400 system. Adding the Trimble SPS930 Universal Total Station, MT900 active target and a Trimble CB430 Control Box gives you the flexibility of a 2D+3D control system. One side of the screed can be 3D height controlled, while the other can be controlled by the variable slope of the 3D design, by a fixed slope or by a surface reference sensor. You can now switch between 2D and 3D depending on the job requirements. Plus, if you already have a Trimble GCS900 Grade Control System, your return on investment is increased by simply re-purposing its hardware.

The PCS900 system allows you to lay precision asphalt or base material where there isn't an accurate reference surface and where a stringline is normally required. Since PCS900 is a stakeless system, you save time and labor by eliminating the staking process, plus truck productivity increases by less travelling and maneuvering around the stringline.

The millimeter precise 3D control of the PCS900 paver screed allows you to:

- Take out longitudinal roadwaves and high and low spots early in the process with the less expensive first layer materials, which minimizes the use of the more expensive top layer materials
- Increase road smoothness using less asphalt than with traditional paving methods
- Lay complex designs such as transitions, super-elevated curves and frequently changing cross slopes
- Achieve accuracy and smoothness specs, which in many cases can mean bonus income
- Increase productivity through repeatability... eliminate the need to recalibrate height settings after each paving run

The Trimble CB430 Control Box provides a graphical display of screed position and design.

TRIMBLE UNIVERSAL TOTAL STATIONS

The Trimble SPS930 Universal Total Station is accurate to one arc second in the vertical and horizontal angles, making it ideal for paving operations where the accuracy tolerance is very tight. It provides greater range than other laser-based solutions, is easier to set up and is more stable in windy weather conditions. Further, a contractor can use the same total station to gradecheck the laid mat or for other survey requirements on the job site.

The total station uses active target technology to reliably lock onto and track the target. This unique feature eliminates false lock-ons, ensuring that the correct machine is being tracked. Additionally it has built-in "search intelligence" to quickly search for and find the target when lock is lost. The 45 degree (100%) tracking capability means that, unlike laserfan 3D paving solutions, you can pass close by the total station without losing lock. The high update rate, low latency and synchronized angles and distance measurements capabilities make it perfect for dynamic applications.

3D MILLING USING THE TRIMBLE GCS900 GRADE CONTROL SYSTEM

WHY 3D MILLING IS A BETTER WAY

For resurfacing existing roads, Trimble's 3D milling system brings the accuracy of the GCS900 Grade Control System to milling machines. Combined with either the PCS400 or PCS900 Paving Control Systems, the end result is a smoother road surface using less material and finished in less time.

Around the world, government agencies typically specify milling as a fixed depth cut... and any improvements to road smoothness are left to the paver to fix. Now, with the precision of Trimble 3D milling, contractors can perform surface profiling that provides several benefits:

- **Smoother roads** – 3D milling allows contractors to mill out the existing undulations in the road surface, creating a smoother surface for paving and a higher smoothness index in the finished product.
- **Higher productivity** – production increases of 100% are possible by only milling the higher spots and leaving correct grade in place.
- **Less asphalt usage** – construction cost are reduced since less material needs to be taken off. In addition, less asphalt needs to be used for the final surface... further reducing costs.
- **Shorter lane shutdowns** – an important side benefit to the higher productivity of 3D milling and paving solutions is the decreased time to completion... and that makes everyone happy.
- **Mill complex designs** – variable depth and slope milling enables milling of transitions, super-elevated curves, variable drainage slopes and longitudinal waves... without re-work!

HIGH ACCURACY MILLING WITHOUT STRINGLINES

With GCS900 on a milling machine, you can now mill surfaces at variable depth and slope without stringlines. Controlling the precise cutting depth of the mill minimizes over-cutting, creates a smoother surface and reduces the need for additional costly asphalt or concrete material in the ensuing re-paving process.

Controlling the cutting depth can also reduce the number of passes required of the mill, reducing the need for subsequent grading or milling work and reducing wear on the milling machine or grader blade. More efficient use of the mill in the first pass also means the machine can be moved to the next site quicker and used to its maximum profitability.

Result after fixed depth milling of a road with longitudinal waves

Result after paving:

lower smoothness bonus + higher asphalt usage
= less profit, worse road

Result after 3D milling of a road with longitudinal waves

Result after paving:

maximized smoothness bonus + minimized asphalt usage
= more profit, better road

IMPROVE MATERIAL USAGE AND PROFITABILITY

3D milling can help you realize significant material savings, increase smoothness and improve profitability.

TRIMBLE GCS900 WITH UNIVERSAL TOTAL STATION

The Trimble 3D Milling System uses the same main components as the GCS900 Grade Control System; the SPS930 Universal Total Station, MT900 active tracking target and CB430 Control Box. The Universal Total Station is ideal for milling solutions for several reasons:

- Best accuracy – every millimeter saved reduces the milling and paving cost substantially
- Flexibility – you can work on sites where the GPS is obstructed (overpasses, trees, tunnels, buildings)
- High return on investment – precise surveying and machine control work can be done with one instrument

TRIMBLE SITE POSITIONING SYSTEMS

The productivity of Trimble grade, compaction, milling and paving control systems can be optimized by using Trimble Site Positioning Systems and powerful Trimble construction software. Together they achieve the next level in construction productivity—Trimble Connected Site™ solutions. Using streamlined workflows and wireless data transfer, design updates and progress reports can flow between field and office in real time, maximizing machine and personnel productivity. Trimble Site Positioning Systems give contractors the flexibility to complete any task and the ability to reduce downtime by quickly resolving problems on site.

Additionally, Trimble Site Positioning Systems work with your entire construction workflow: tracking, reporting, validating and controlling workflows from receipt of initial designs to project completion.

SMART GPS SYSTEMS

Trimble offers Smart GPS Antennas that are the simple solution to all your site measurement and stakeout applications. These high-accuracy smart antennas use GPS+GLONASS satellite signals to compute exact locations and give contractors an easy-to-use, wide area measurement system for a variety of site preparation and grade checking applications. The Trimble Smart GPS Antennas can be used as either a rover for site measurement and stakeout, or as a base station for site measurement and machine control operations. And because the GPS receiver, GPS antenna, radio, and battery are integrated into one housing, you don't have to deal with cables and multiple components.

Connecting Site Positioning Systems

TOTAL STATIONS. TOTAL PRODUCTIVITY.

Trimble grading, paving and milling solutions use high accuracy universal total stations that handle machine control and site positioning duties from one equipment investment. Trimble universal total stations provide superior tracking during measurement and machine control applications. Single person robotic operation increases cost savings and productivity.

Connecting Machine Systems

Connecting Your Jobsite

CONSTRUCTION SOFTWARE

Trimble SCS900 Site Controller Software is designed for highway construction and paving applications, and runs on Trimble handheld controllers, including the Trimble Tablet. The software simplifies operations, increases your efficiency in the field, and minimizes downtime.

DATA MANAGEMENT

Trimble Business Center - Heavy Construction Edition allows you to automatically transfer and manage data between the office SPS, PCS and GCS systems. You can organize, manage, and track all site measurement and stakeout and machine control operations for multiple crews and machines on multiple sites, and generate high-quality reports.

BETTER DATA. BETTER FLOW.

Managing data for highway construction and paving projects is easy with Trimble solutions. You can get updated design data to the field when you need it... improving turnaround time for design changes and allowing contractors to realize productivity gains throughout all phases of the job.

Plan
software that optimizes transportation routes to minimize project time and costs.

Design
data preparation and management for the construction jobsite life cycle.

Grade
control that is faster, more accurate and minimizes rework.

Check
measurement, stakeout, quality control and progress monitoring on the job site.

Construct
with precise positioning for faster completion with less re-work.

Pave
new roads or re-profile existing roads for greater smoothness using less material.

Only one company can optimize your productivity with the broadest, deepest and most advanced set of tools for integrating measurement, data management, machine operations and asset management throughout the construction life cycle. Productivity is... Trimble.

Trimble: The Construction Technology Authority

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