



Norwegian Contractor Veidekke Embarks on Tunnel Project



Photo by Anleggsmaskinen

Premier Norwegian Contractor Veidekke Embarks on World's First Tunnel Project Using Trimble® CCS900 Compaction Control System and Trimble Universal Total Station

Veidekke uses the first total station-controlled compactor for E134 tunnel and roadwork for precision compaction plus the collection of compaction documentation directly from the machine.

Solution

Trimble CCS900 Compaction Control System, Trimble SPS930 Universal Total Station, Trimble MT900 Machine Target and Trimble VisionLink software

Find out more at construction.trimble.com

Article originally published in **Anleggsmaskinen (AM.no)**

overview

Veidekke is Norway's largest construction and civil engineering company and the fourth largest contractor in Scandinavia. The company focuses on construction and engineering operations, rehabilitation work and major heavy construction contracts.



CHALLENGE

Veidekke was hired for a major widening and reconstruction effort for the country's E134 Damåsen–Saggrenda roadway project. Looking for even greater compaction accuracy, Veidekke turned to its technology partners and Trimble for help.

Benefits

- ▶ First total station-controlled compactor used in a tunnel - Using a Trimble Universal Total Station and CCS900 system, the team is able to reach an accuracy of within one centimeter
- ▶ Compaction accuracy optimizes material coverage - Real-time information aids in accurate compaction and reduces unnecessary passes that cost money, time and materials, and can result in over compaction or under-compacted areas
- ▶ Accurate Compaction Meter Values (CMV) save time - With a CMV measurements in real time, the team knows precisely when the area is properly compacted, without making additional unnecessary passes
- ▶ Streamlined compaction documentation - Trimble's intelligent compaction control system aids in the QA documentation process by referencing the total station directly; team can generate reports to document that the design grade has been maintained post-compaction

Renovating and widening main roadway E134

With nearly 7000 employees, Veidekke's business involves a network of Scandinavian construction and engineering operations, rehabilitation work and other major heavy construction contracts. Veidekke's other business segments include asphalt operations, production of crushed stone and gravel and maintenance of public roads.

As a leader in the industry, Veidekke was hired for the major reconstruction and widening of the nation's E134 Damåsen road. The E134 Damåsen stretch of road is one of the main connectors between Eastern and Western Norway. It runs through urban and densely populated areas and through to the Kongsberg city hub. Due to increasing congestion and a growing population in the area, the section through the town of Kongsberg is one of the most accident-prone

stretches on the E134 in Buskerud County. To address these challenges, Norway's highway authorities are embarking on a major infrastructure project that involves widening the existing roads, adding lanes, additional road construction and tunneling work. In total, the scope of the project spans approximately 13.2 kilometers, of which approximately 4.5 kilometers is in a tunnel.

First-ever compaction control and total station used for tunneling work

Per Gjerjordet, manager of Veidekke's E134 Damåsen project, explains that traditional GPS positioning equipment was not an option on this project because the tunneling work required blocks available satellites. Facing these constraints, Veidekke leaders knew they had to think outside the box. For help, the team turned to Pon Equipment AS and Per Ola Berntsen, SITECH the distributor for Trimble civil engineering and construction technology in Norway. Thorén is also one of Norway's foremost specialists on documenting compression and compaction.





Photo by Anleggsmaskinen

The Veidekke team selected the Trimble CCS900, the Trimble Universal Total Station, and Trimble MT900 Machine Target for advanced target recognition and tracking capabilities. The total station was selected for positioning, specifically, because it is ideal for work done inside tunnels and in conditions where there is no GPS coverage, under bridges and in long cuts, for example. In Norway the Trimble CCS900 system has been installed on 175 compactors. Today, only three of those installations are using a total station for positioning and all three are at Veidekke. The system works by “talking” to and getting its position from the Trimble Universal Total Station, and recording those measurements directly.

“This is the world’s first tunnel where the Trimble compaction system is used with a Universal Total Station,” said Thorén

Meet “Olaf” the compactor.

Trimble’s compaction control technology measures the soil stiffness as an indication of soil compaction and controls the machine compaction effort versus the measurement data. This information is then displayed as compaction measurements and it provides guidance to the operator. Finally, the system maps and records compaction data for QA/QC and documentation purposes. To find its position, the system uses a Universal Total Station using Trimble MultiTrack™ technology to lock on to and track active targets for dynamic measurement for use in grade control.

The team’s compaction operator, Ida Svean, has been using the Trimble system on the compactor for almost a year now with exceptional results. The Trimble CCS900 Compaction Control System helps Svean accurately control the compaction process, while also reducing unnecessary passes that result in over compaction. The system also detects material temperature and over- or under-compacted areas in real-time for optimum compaction levels. These capabilities improve compaction efficiency and coverage. Since using the grade control system, she’s even come up with a special name for the new compactor set up.

“Olaf”?? “Yes, the compactor. It’s actually a Cat CS68B. But I just call it ‘Olaf,’” she says. “It is great to see that the result is of such good quality and that the documentation is correct. Olaf and I have worked a lot to get familiar with the ground here.”



Photo by Anleggsmaskinen

Achieving accuracy of one centimeter site surveying.

Gjerjordet explains that the accuracy of using GPS on its compactors is typically 4 to 5 centimeters, and is ideal for meeting 20 centimeters requirement. Using Trimble’s compaction control system with a Universal Total Station, however, has improved accuracy to within one centimeter.

“Earlier, anyone could be sent to operate the compactor, and told to do a few passes,” said Gjerjordet. “But with this equipment, operating the compactor has become one of the most important jobs at the site.”

As Svean operates the compactor, she listens to her crew and watches the system’s Trimble CB460 Control Box. It guides her to compact the material until the CSC900 system’s Compaction Meter Values (CMV) indicate the correct compaction level is met, which is indicated with a ‘green’ light.

In addition, the Trimble CCS900 Compaction Control System has the ability to show where other compactors are and where they have been in order to avoid double compaction. By eliminating any extra passes, the team saves both time and money.



“It is time-saving compared to the old method, where we had to do a certain number of passes no matter what,” said Gjerjordet. “With a CMV measurement, we drive until it is properly compacted. We may get the correct values after two passes. In that case we do not have to do six, which saves us a lot of time.”

During this project, the operator, the foreman, the surveyor and the site manager were trained thoroughly to use the equipment as well as given guidance on best practices and some instruction on compression vs. compaction.

“The course and the training are important. I have seen many eureka moments in the participants’ eyes,” said Thorén. “Both with the young and the experienced, knowledge and competence are important factors, but it also gives greater ownership to what you are doing. After this training, everyone understands why the slogan is ‘run until green.’ It’s that simple.”

Automating documentation

Using the Trimble CCS900 system, the Veidekke team has also been able to record compaction results in a more coordinated way. This is particularly important as compaction control requirements continue to increase across roadwork projects.

The compaction data collected from “Olaf” is delivered in parallel to VisionLink® and SmartDok, a cloud-based project management solution. Trimble’s VisionLink software integrates site productivity, material quantities, and materials movement with asset and fleet management capabilities. While this is the first time Veidekke has collected compaction data this way, the team plans to follow this process going forward.

“Documentation is a challenge that many of the builders’ face,” said Gjerjordet. “Those who wrote the N200 know about it, but not the control engineers at the sites. On this project, we have a control engineer who knows and who pays a special interest. We have also given the builders’ people direct access in VisionLink. They have begun to understand the possibility of retrieving information in near real-time.”

With direct reporting capabilities from “Olaf” and VisionLink, the Veidekke team doesn’t have to spend as much time or money waiting on surveyors to document and ‘prove’ they’ve reached the correct measurements. The result has been a significant cost and time savings across the E134 project.

Compacting recycled glasopor material

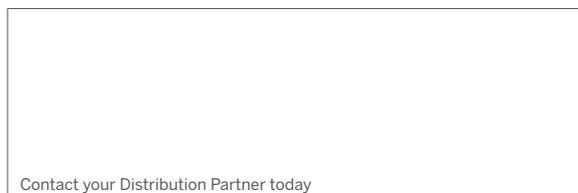
Thorén explains that maintaining correct compaction is even more important when that surface requires using glass pads as part of the surface’s frost protection layer, as is often used for this type of work. Glasopor, for example, is a brittle, cellular glass aggregate made from recycled glass containers collected from households in Norway.

Compacting glasopor using conventional methods generally includes the compactor making a number of passes and full vibration. When this happens, the road owner is often stuck with an expensive and useless layer of impervious glass dust where the frost protection layer should be. Veidekke is ensuring that clients avoid this by pressing individual rocks into a homogeneous layer with a higher carrying capacity. Leveraging Trimble’s compaction control system, Svean is able to compact the glasopor material with greater precision and confidence.

RESULTS

“Here, Veidekke has done everything they can to find a solution that ensures a good result,” said Thorén. “Measurements using leveling and plate load is one thing, measurements with the compactor’s compaction meter values is another. The CMV values have gone up and down all the time. We had to do something to find CMV values we can rely on. Very few can do something about this, but in this case we have managed to do it in collaboration between Pon, SITECH, Trimble, Veidekke and competent engineers with the contracting builder.”

PER GJERJORDET
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