



ON THE ROAD TO RECYCLING

MAKING NEW ROADS FROM OLD ASPHALT SAVES NATURAL RESOURCES. PINPOINTING THE LOCATIONS OF THESE REUSABLE MATERIALS MAXIMISES THE CONSERVATION OF DWINDLING AGGREGATE RESERVES, EXPLAINS MAX GLASKIN

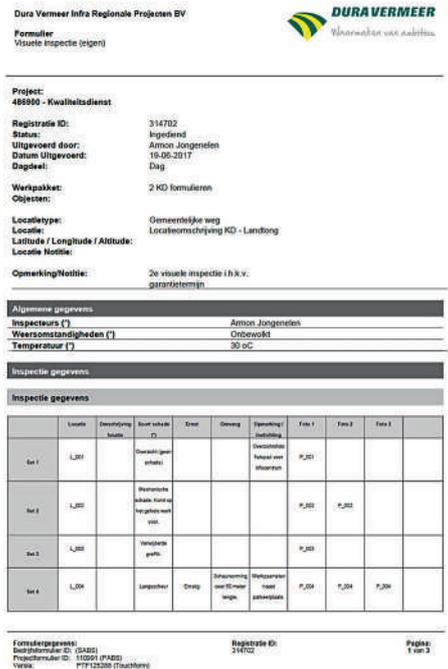
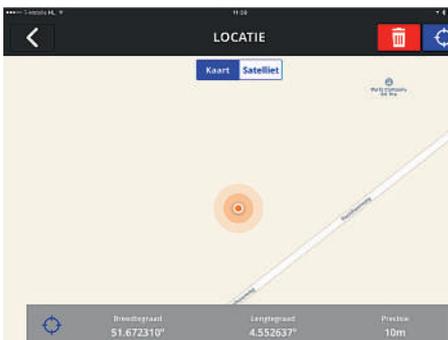
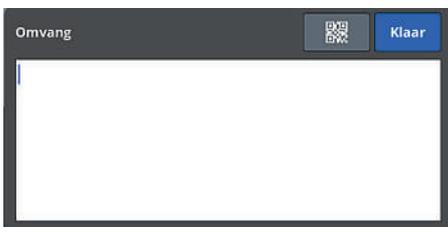
Nations need good connections to thrive. The Netherlands is among the best-connected in the world with a mesh of transport links that few can rival. It has 138,600km of roads, 3,200km of railways and 6,200km of waterways that serve not only the needs of the Dutch but also of every country on the continent that receives or exports goods through Rotterdam, Europe's busiest port.

Maintaining, improving and extending these vital surface transport networks demands careful use of natural resources. These are limited in the Netherlands because it is relatively small, at just 42,000 square kilometres. Its only source of aggregate for road building is river gravel and the Dutch government took steps to protect this dwindling reserve in the 1970s. Since then, the natural resource conservation initiative has developed into the wholesale practice of recycling the asphalt from old roads to provide materials for new ones.

"Today, between 50% and 70% of the base course for a new piece of road comes from recycled asphalt. That's a very big saving," says Armon Jongenelen of Dura Vermeer, a Dutch construction infrastructure and engineering company. "Even for the surface layers of a new road, up to 30% of the material originates from the surface layer of an old highway."

Some of the old material may actually have been laid down by Dura Vermeer in the 20th century. The company traces its origins back to 1855 and has grown into a business employing around 2,400, with revenues of more than €1bn annually. It has been constructing roads for more than half a century so it would have been likely it built some of the old highways that are now ready to be renewed with recycled asphalt.

One of Dura Vermeer's guiding principles is to be inventive, looking for creative and fitting solutions. As the head of quality in



PROJECT MANAGEMENT IN THE FAST LANE

Location information from the Trimble R2 is fed into Dura Vermeer's project management system via the Gappless app platform, which uses the Trimble API to manage the GNSS data. "We introduced Gappless to our team in 2015 and now it is used by about 450 of our people who manage our projects and collect data from the field," says Jongenelen. "It is very easy to set up and easier to use than spreadsheets or paper forms."

Gappless allows a manager to create a digital form for a task or activity, requesting specific data. The person charged with collecting that data can then access the form on their own iPad when out in the field and then use the touch screen to enter it. The app can also be used offline, even when there is no data connection available.

Depending on the internet connection the data is sent via the cloud to the company's Gappless online portal and is available within 20 minutes to the project manager, who can be anywhere in the world with an internet connection.

"It means that the manager can see the information that has been recorded in the field. It can also be downloaded as a PDF, Microsoft Word or Microsoft Excel file. Gappless is also able to upload the information in the data warehouse of Dura Vermeer," says Jongenelen. "It is a very friendly app and so much quicker than using pen and paper. The time it takes to train someone to use it is, oh, maybe five minutes."

the company's infrastructure and road construction division, Jongenelen has followed this principle to make sure that only recycled asphalt of an acceptable standard is used in new roads.

In earlier years, road construction was never as carefully controlled as it is today and materials were sometimes used that would not meet modern standards. So, before an old road is dug up and milled for recycling, small samples must be taken and analysed in the laboratory to assess the ingredients.

"Of course, we must keep a record of the locations from where each sample is taken so that the results of the laboratory analysis can be plotted back onto a map of the old road," says Jongenelen. "Then we will have confidence we're only using materials from the places where samples have been assessed as good and avoiding recycling materials that are contaminated."

Steer clear of tar

The key contaminant that must be avoided is tar. This black viscous liquid was used frequently in asphalt and is still applied in some countries to seal the surface of roads and car parks because it produces a smart finish in line with the popular image of 'black top'. Another attraction of using tar as a sealant is that it can help to preserve the asphalt underneath.

However, it is unacceptable to include tar in modern roads in the Netherlands and many other countries, as it contains chemicals known as polycyclic aromatic hydrocarbons (PAHs), which are toxic to plants, birds, fish

and mammals, including human beings. Tar would be safe if it didn't deteriorate, but a road surface is repeatedly exposed to vibration, abrasion and stress from the traffic and to fluctuating temperatures, precipitation and sometimes ice. These conditions promote the release of PAHs into the environment as dust, polluting the air and the water that flows over the road surface. Contaminated asphalt also poses a greater risk for the construction workers who are building the road because vapour released by hot tar contains a high level of PAHs. So the use of tar in new roads was banned in the Netherlands in 1991.

"That's why it's necessary for us to measure accurately the location of each sample of asphalt that might be recycled," says Jongenelen. "We have to take one sample for every 500 square metres of an old road asphalt and we had been using a simple consumer-style GPS device to get the location data. It was relatively inexpensive but it was only accurate to within five metres."

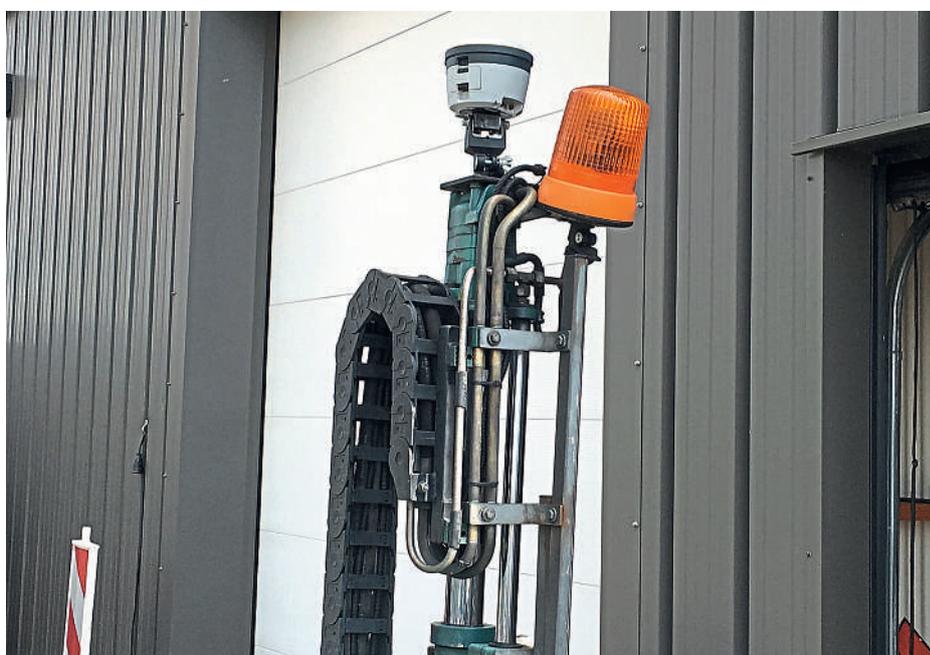
Minimum accuracy

After the Dutch government specified that the minimum accuracy of location measurements for tar samples had to be 20cm, Jongenelen had a decision to make. "We chose to look for better technology that our staff could use without a problem."

For a year, he tested a Trimble R2 GNSS receiver. "I looked at other systems as well and I chose the R2 because it was simple to use in combination with the Gappless app on an iPad, which we use for project administration," says Jongenelen. "It works easily so no training was needed. The location is captured with one click on the iPad. That's how easy it is."

The process is almost seamless and the Trimble R2 fits into the familiar workflow without slowing the job down. "When we are taking a sample of asphalt the R2 is positioned on top of the drill. The R2 connects with the iPad via Bluetooth. It takes no more than 10 seconds to get a measurement of the required precision," says Jongenelen. Getting the data from the R2 into a form that is usable for both the user and the database was facilitated by Gappless (see 'Project management in the fast lane'). Trimble has also supplied an application program interface (API) so that the coordinates in the system required by the Dutch authorities are available in the Gappless portal.

After the 12-month test period, Dura Vermeer invested in seven Trimble R2 GNSS receivers for its quality control engineers across the Netherlands. While the R2 works with various consumer mobile devices including those with Android or Windows platforms, Dura Vermeer prefers to link each of its R2s with an iPad because it can host the Gappless software. "The iPads come fitted with GSM SIM. This gives us the NRTK [Network Real Time Kinematic] positioning



that's needed for our measurements to be precise to within 20cm," says Jongenelen.

Jongenelen is happy with how the R2 receivers have been performing over the 12 months that they've been out in the field, recording the locations of each sample of old asphalt before decisions are made about whether it is acceptable for recycling.

The Trimble R2 and iPad combination has also been pressed into service by Dura Vermeer for two other applications further along in the road construction process. When a new road is being built, the layer of sand and gravel that is laid beneath it must meet a density standard. This is measured by technicians who use a Troxler nuclear density moisture gauge that assesses the degree of compaction. The R2 and iPad are used to record the location of the density measurement, which has to be done every 2,000 square metres of road construction.

After a road has been completed and opened to traffic, Jongenelen and his colleagues are tasked with checking the quality of the surface so that any damage can be repaired before the condition deteriorates further. Again, the R2 and iPad are used together to record its location, along with information about the state of the road surface. For assessing the condition of the asphalt, the Dura Vermeer employees use what is probably their most treasured equipment – their eyes.

THE LOCATION IS CAPTURED WITH ONE CLICK ON THE IPAD

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