

# Video inspection replaces track patrolling

**TRACK SAFETY** Video equipment has transformed track inspection in the Netherlands where on-track patrolling is no longer permitted. Eurailscout helped to pioneer the video inspection trains which make 900 trips a year to inspect switches and crossings.

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Nearly one year has elapsed since ProRail's last track inspector walked the permanent way. From December 2008 all track inspection on the main line network in the Netherlands has relied on video equipment, a move that has improved safety and the quality of inspection. Not only that, but the change has freed up paths in the timetable, allowing more trains to be run on what is already one of the world's busiest railways.

The development of video inspection in the Netherlands began in 1999 when the Dutch Ministry of Transport & Water Management demanded drastic measures to improve track safety because of the excessive number of accidents.

The infrastructure provider was given to understand that walking the tracks to assess the quality of the infrastructure was no longer acceptable. The practice had to be phased out with the presence of staff on operational lines cut to zero if at all possible.

In anticipation of new safety at work regulations, the railway companies and trade unions then defined the 'safe work on the line' project to address the problem. To prevent accidents, repair and maintenance work was to be carried out only when lines were closed to traffic.

Maintenance contractor Strukton Rail, which looks after half the 2776 route-km Dutch network, began looking at the technical options at an early stage, initiating development of prototype video inspection equipment in 2002. The objective was to bring the track into the office, with patrol staff becoming maintenance engineers able to do their work in a safe environment.



## Development

Right from the start, Eurailscout helped to pioneer video inspection technology. Shortly before the 'safe work on the line' standard was introduced in January 2005, initial comparisons were made between a prototype machine and visual on-track inspection. Dual inspection was carried out over six weeks, allowing direct comparison; this was followed by a risk analysis. The trial proved successful, with automated switch and crossing inspection offering comparable results to visual inspection.

As a result of this assessment, ProRail ordered the introduction of trainborne video inspection, but gave the industry time to bring the system to production maturity.

In spring 2005 Eurailscout and German company BvSys began development of the VST 05 track inspection car, and by early 2006 the first vehicle was ready to run. Reliability was improved in the first half of 2006, and

in the second half of the year output was increased significantly. With experience, further improvements were made to the hardware and software.

On the basis of the results achieved with the VST 05, Strukton Rail decided to introduce video inspection for every set of points in its maintenance district. This area covers 2500 km of track and 2150 sets of points, 500 of which must be inspected weekly, the rest every two weeks.

Over 900 runs a year are needed to inspect this number of points, and three more video inspection trains entered service in 2007. By the end of 2008 the processes were well established and the results welcomed by user and customer alike.

## Eight cameras

Eurailscout's video inspection trains comprise a locomotive converted to a recording vehicle and equipped with eight cameras:

- two panorama cameras, one

ProRail has access to four video inspection trains, each equipped with eight cameras.



Each recording train has four colour linescan cameras (above). The high-resolution video footage can be viewed either in colour or in black and white.

- pointing forwards, the other backwards; the cameras are installed at a height of 1.7 m to simulate the perspective of a walking inspection; the colour images have a resolution of 1 392 x 1 032 pixels;
- four colour linescan cameras with a resolution of 1 mm x 1 mm and a range of 800 mm; these record the inner and outer edges of the rails;
- two black and white linescan cameras with a resolution of 1 mm x 1 mm and a range of 1.5 m per camera; together they show the full permanent way.

Eight inspectors take two days on the track to check all the turnouts in a typical large station. The video inspection vehicle, with a single crew member, needs just 5 to 6 h to do the same job.

The driver operates the hardware and software, receiving audio and visual signals in his cab if the system malfunctions. Should this happen, the driver is informed about the problem; for safety reasons the diagnostics screen remains blank when the train is in motion.

The video inspection trains are incorporated into the daily timetable. A large number of trips must be made to measure all the turnouts, both on the straight and the diverging track, and each trip has its own timetable. The trains pass through the station in a carefully planned zigzag pattern until every point has been inspected. Even Amsterdam Centraal, which has over 200 sets of points, can be covered in one 7 h shift without restricting normal traffic.

The software in the recording system recognises the crossing frogs as the train passes over each turnout and identifies the location with the help of GPS co-ordinates and an integrated map of the station. The system constantly updates the operator as to which turnouts still need to be checked.

Roughly 250 gigabytes of data are recorded each day. This is sent to Eurailscout's headquarters in

Amersfoort by courier at the end of the shift and processed the following day. The company's data processing centre handles about 3 terabytes of information every week. All incoming data is first backed up, and then checked for quality and accuracy. If a set of points has been recorded several times, the best image is selected, reducing the volume of data. Then the data is sent by courier to the customer, who is able to analyse it no later than 48 h after the inspection.

### The inspection process

The maintenance engineer examines the images at a special desk which allows the condition of each turnout to be checked on at least three screens: a very high resolution 30 in monitor permits detailed examination of each of the components, and two 20 in monitors display the images from the other cameras and the database.

Navigation options in the software enable an assessment of whether the points can be negotiated safely. The turnouts can be sorted and selected according to number, track name, the contract area or the sequence in which the images were recorded. Once a set of points has been selected, all the views show the corresponding crossing frog. The zoom level can be set individually for each view, with a detailed image of the rails from a 45° angle, a black and white image of the permanent way from above and the panoramic images. The images from the linescan camera can be scrolled through in an unending sequence at any given speed, whereby the views all move synchronously.

If irregularities are identified, an older image can be brought up for comparison or the points viewed from a different angle.

The engineer examines the points one by one in a set order and draws up a report on the condition of each set. He focuses mainly on an assessment of the point locks, motors and frogs. Micro-fractures in the rails, damaged

frogs, burr formation, damaged welds and other flaws can be recognised in good time, thanks to the high resolution of the images.

If a defect is discovered, the relevant area is checked after each inspection until repairs have been carried out.

### Benefits

An immediate advantage for ProRail and NS was the release of paths previously taken up by track inspection time. Around 3 million services ran over the Dutch network in 2008, and thanks to the use of video inspection 100 000 more train movements could be added to the December 2008 timetable.

Even before the new timetable came into effect ProRail announced that video inspection had allowed it to end track patrols and visual inspection by staff.

Within two years Eurailscout has increased output to over 900 runs per year, achieving a fundamental change in the process to assess quality and the safe operation of turnouts. All stakeholders were involved at an early stage and, as a result, the change was embraced enthusiastically as a win-win situation:

- the maintenance engineer spends less time on the track exposed to danger;
- the infrastructure provider benefits from better quality and verifiability of the inspection;
- the operators benefit from higher availability of the line;
- the dispatcher no longer needs to co-ordinate and make allowances for the work of the track patrols;
- trains are more punctual.

Eurailscout is currently working on further improvements, including the transport of data from the office to the client. The amount of information in each package is still too great to allow transmission via the internet, but software currently being developed should make this possible in the near future. ☞