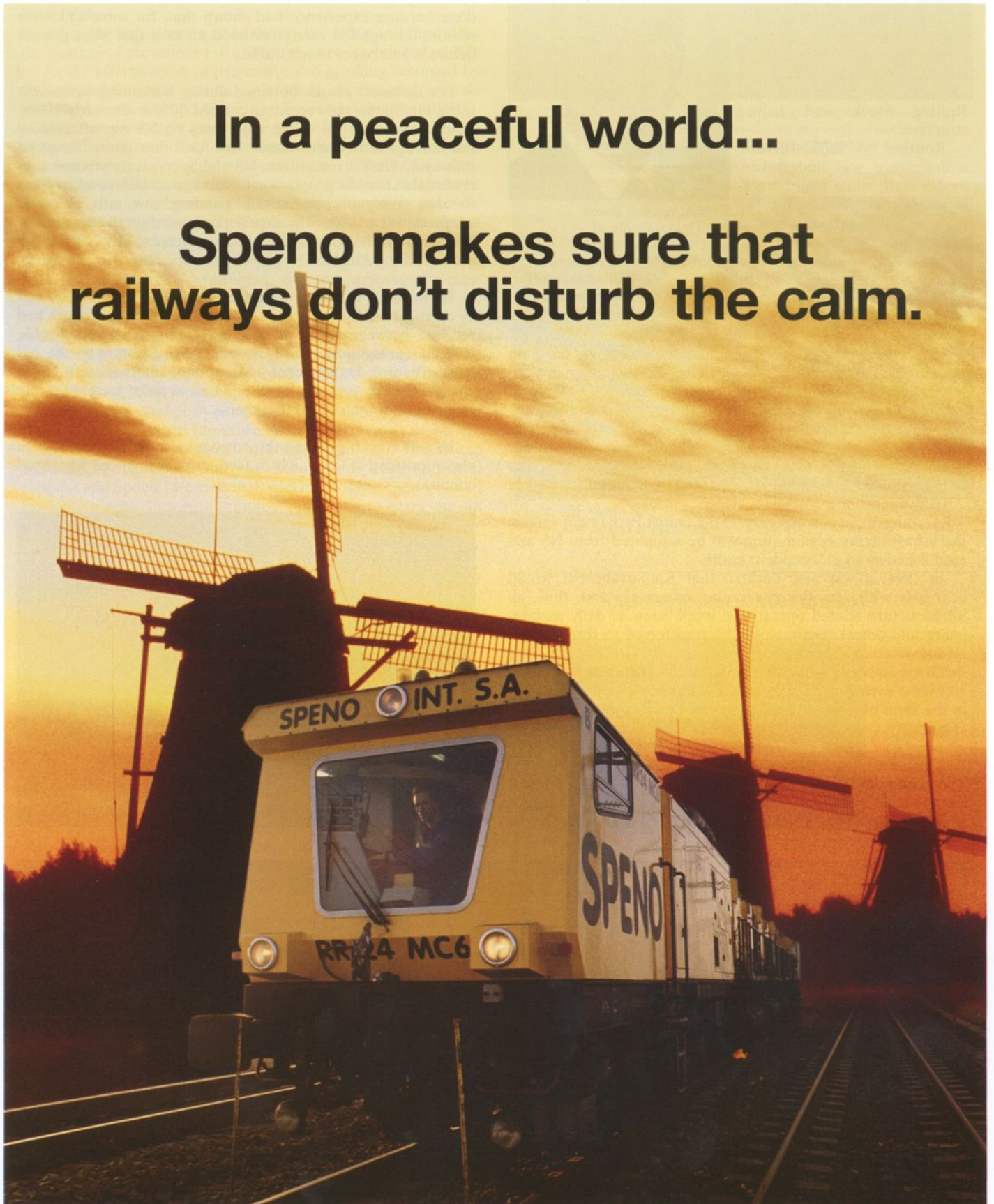


RAIL ENGINEERING INTERNATIONAL

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Rail grinding strategies on Netherlands Railways

Until recently, like most European countries, The Netherlands had one national railway company, Netherlands Railways (NS). Though all the shares were owned by the Dutch State, NS was a private company that had three main departments: Operations, Rolling Stock and Infrastructure.

Routine infrastructure maintenance was undertaken by NS staff, while major track renewals and specialised work, such as rail grinding, was put out to contractors.

In 1994, following new European regulations, NS was re-organised. A holding company, comprising two independent groups, was founded:

- the first group, market-orientated, concentrates on train operations. It embraces a new train operating company, NS Reizigers; a separate rolling stock company, NedTrain; and a new organisation for the railway stations, NS Stations;
- the second group, connected to the government, comprises the infrastructure departments: Railinfrabeheer, the owner of the national railway network; Railned, the independent capacity manager; and Train Control, which looks after the daily operations.

This arrangement is temporary. If the Dutch Parliament agrees, the infrastructure organisation will be separated from NS and established as an independent entity.

In 1994, it was also decided that Railinfrabeheer would deal only with activities concerning ownership and, thus, all infrastructure-related operational work, such as daily maintenance and defect repair, would be transferred to three Dutch infrastructure maintenance contractors (IMCs). Since 1997, the IMCs are responsible for all maintenance work except specialist activities, such as grinding, which continues to be carried out in the form of annual programmes by Speno International SA (Fig. 1).

Rail grinding strategies past and present

The railway network of NS has a track length of 4500 km (most lines feature double track). Formerly, important maintenance work was planned and implemented from a central office at the NS Headquarters in Utrecht.



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1970-1990

From the 1970s, it became the practice on NS to grind all new rails in the first half year after their installation, thereby removing 0.20 mm from the surface of the rail head. This was done because experience had shown that, for some unknown reason, corrugation rarely occurred on rails that were ground before it had borne much traffic.

For instance, results obtained during measuring campaigns using the Speno rail recording car SM 775, in the early 1980s, yielded that only 1% of the main lines on NS was affected by rail corrugation (versus about 10% on other main European railways). After investigation, NS and Speno International concluded that the low proportion of corrugated rails resulted from the NS policy of preventively grinding new rails that was adopted in the 1970s. The experience gained on the network of NS indicated that preventive grinding increased the service life of the rails by 25%.

In the areas that were nevertheless still found to be affected by corrugation, the rails were ground when the wave depth had reached between 0.02 mm and 0.07 mm (this target profile to limit corrugation growth was developed jointly by the NS Infrastructure Department and Speno International). This complementary grinding resulted in an average increase in the service life of the rails of five years.

In addition to grinding the corrugated rails, the latter were also reprofiled (Fig. 2), which favourably influenced wheel/rail contact.

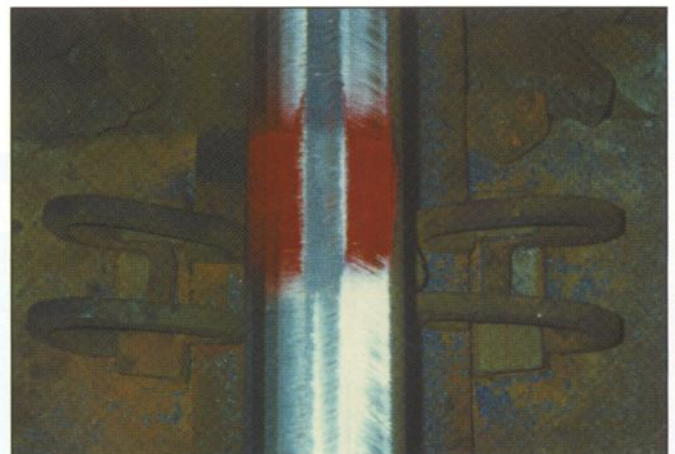


Fig. 2: Reprofiled railhead



Fig. 1: Speno RPS 32 heavy-duty grinding train at work on Netherlands Railways

1990-1998

Following the aforementioned re-organisations within NS between 1990 and 1997, regional management became responsible for local grinding programmes. For various reasons — different priorities, less knowledge of grinding, lack of data to justify a business case — little preventive grinding took place during this period, although traffic volume increased some 5% annually. After seven years, it became evident that rail corrugation was becoming more widespread, affecting some 15% of the network.

After 1998

Based on the experience gained during the 1980s and the 1990s, the strategy of preventive rail grinding was re-introduced on NS.

As the effectiveness of preventive rail grinding recorded by Railinfrabeheer, and results of a study on material aspects published by the European Railway Research Institute (ERRI), yielded that preventive grinding is only effective when 0.35 mm of metal is removed from the railhead, Railinfrabeheer issued new rail maintenance regulations: as from 1998 all rails are to be ground within six months after their installation, whereby at least 0.35 mm is to be removed from the railhead (in practice, 0.50 mm is being aimed at). Further, based on the results of annual rail condition recordings, a priority list was drawn up, which yielded that approx. 50 km of rail are to be ground annually by Speno International, thereby applying the new 0.35 mm metal removal regulation.

“Acoustic” grinding experiment

The period during which no preventive rail grinding had been carried out not only led to widespread rail corrugation (by 1998, as much as 450 km of rail required grinding), but also to an increase in the number of complaints concerning wayside noise levels. Corrugated rails can cause an increase in noise of 3-5 dB.

In 2002, Railinfrabeheer (in cooperation with the Dutch Ministry of Transport and the Ministry of Environmental Affairs) and Speno International, which has some eight years of experience with “acoustic grinding”, envisage to carry out an experiment during which a section of track will be ground under “acoustic conditions”. The aim of the experiment is to prove that rail grinding can result in a decrease in rail traffic noise levels of around 2 dB. A positive outcome of this experiment could result in a huge reduction in the current programme of building noise protection screens alongside railway lines.

Grinding of switches and level crossings

Because of geometrical constraints, high-capacity grinding trains cannot easily grind rails on bridges, and in switches and level crossings. However, the service life of these structures is also affected by corrugation.

In view of this consideration, several Speno grinding trains took part in a pilot project that was aimed at developing new ways of working in awkward conditions. In 2000, 14 km of track, including switches and bridges, and, in 2001, a further 45 km of such track, were ground using the multi-purpose grinding train RR 24 MC (Fig. 3). The remaining grinding tasks (648 km of plain track) were carried out using the heavy-duty grinding train RPS 32 (Fig. 4). The results were very promising (Fig. 5).

Headchecks

In recent years, the phenomenon of headchecks has become of great importance. Following the tragic accident near Hatfield in England, in 2000, an intensive inspection for headchecks was carried out in The Netherlands. Rails featuring headchecks must either be replaced or ground, depending on the depth of the cracks. For cracks featuring a depth of up to 2 mm, grinding is economically viable. Cracks featuring a depth of more than 2 mm necessitate rail replacement. At the moment, during headcheck grinding, the rails are reprofiled as usual. However, Railinfrabeheer and Speno International are working on an anti-headcheck rail profile that should see a reduction in crack growth rates. A trial held recently in this respect has yielded some very encouraging results.



Fig. 3: The Speno RR 24 MC multi-purpose grinding train was used in a pilot project, aimed at developing new ways of working in awkward conditions (e.g. on bridges, and in switches and level crossings)



Fig. 4: The Speno RPS 32 heavy-duty grinding train was used during the pilot project to grind the plain track

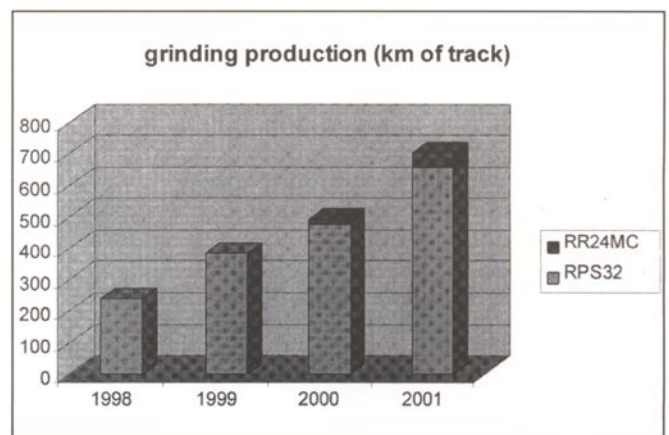


Fig. 5: Graph showing output achieved on Netherlands Railways by the RR 24 MC and the RPS 32 grinding trains

Conclusions

Based on more than 25 years of experience, the conviction of the necessity of preventive rail grinding is still strong in The Netherlands. Preventive grinding leads to a significant increase in the service life of rails, a delay in the occurrence of rail corrugation, and a decrease in traffic noise levels.

When grinding, it is of benefit to also reprofile the rail in order to ensure enhanced wheel/rail contact. Headchecks may still occur. However, as long as the cracks are not too deep, these can be removed smoothly and economically by grinding. As noted earlier, a new anti-headcheck rail profile is currently being developed. Initial results obtained during trials held in this respect are very promising.



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