Still no through trains on the Bothnia line

On 28 August 2010 the Swedish King Carl Gustaf inaugurated the Bothnia line between Örnsköldsvik and Umeå – prematurely, as it would later turn out. Due to delays with the modernisation and partial new construction of the approach from the south, the Ådals line from Sundsvall to Nyland, the start of through traffic along the Bothnia line initially had to be postponed to December 2011 (see previous reports in RU 4/2008 and 3-4/2011).

ETCS problems

Of the 180 km-long Ådals route, 100 km have been upgraded while 60 km of track have been re-aligned. Since August 2010 the regional operator Botniatåg has been operating a reduced and initially problem-prone passenger service between Örnsköldsvik and Umeå only, using just two Regina units. In contrast, the southernmost section of the Bothnia line from Örnsköldsvik to its connection with the Ådals line, including the six-km-long Namntall tunnel, Sweden's longest railway tunnel, remains for the time being little more than a useless stump pointing southwards.

Three months prior to the planned start of through services the Swedish infrastructure operator Trafikverket had to announce yet another eight-month postponement on the Ådals line, moving the date to August 2012, the reason given being delays with the implementation of ETCS Level 2 by Siemens. Already starting in April 2012 though, a limited through service with a few trains has been announced, for which night trains might be suitable; however, SJ has only two ETCS-equipped Rc locomotives for this purpose.

Further delays are a serious setback for the transport authority Norrtåg and the operator Botniatåg, a joint venture between SJ and DB Regio Sverige. Norrtåg had been established by the northern Swedish districts to run "regional" trains with the new Alstom X 62 (Coradia Nordic) units over a network of several hundred kilometres, from Sundsvall in the south to Kiruna in the north.

SJ will eventually serve the Bothnia line with direct through trains between Stockholm and Umeå, using the new, four-coach Bombardier Class X 55 EMUs. These units, derived from the Regina regional trains, are capable of speeds up to 200 km/h, even though 250 km/h would be possible on the Bothnia line. Their lack of tilt technology will make travel time between Stockholm and Sundsvall in fact longer than with the currently used X 2000 trains. Unlike these, however, the 20 Class X 55 units, now officially designated as SJ 3000, are equipped with ETCS. They also feature an onboard bistro and generally offer a high degree of comfort.

The controversial issue of freight traffic

The concept of routing freight trains northbound over the existing inland line and southbound over the Bothnia line is in jeopardy. The Swedish rail freight operators are of the opinion that Trafikverket should pay for equipping traction vehicles with ETCS in order to avoid market interference (distortion of competition) in favour of road transport. In case no agreement is found, Green Cargo will continue to use only the inland line, which is equipped with conventional protective systems, for both north- and southbound freight trains. Hector Rail plans to equip merely three Class 142 (former ÖBB Class 1142) locomotives with ETCS. For small freight operators, major investments for their old but reliable Nohab diesel locomotives would not be worthwhile anyway. (jst)

Left: The Bothnia line runs close to the coast and links up with the upgraded Ådals line. Together with the existing inland route, a dual track link between northern and southern Sweden becomes available (illustration: Botniabanan).

Right: The spacious SJ 3000 EMU makes full use of the generous Scandinavian loading gauge. Unlike the X 2000s, these new units are equipped with ETCS and are therefore slated for deployment on the Bothnia line. SJ 3749 is seen here at Kristinehamn (photo: B. Talbrant, 8 September 2011).

Rail lubrication for noise reduction on the Zürich tram network

It has become quieter along the Zürich tramlines: in the last few years the curve squeal of trams has disappeared "clandestinely" – i.e. without anybody really noticing.

The noise caused by the wheels of rail vehicles in curves has always been a troublesome accompanying phenomenon. How it arises is a story of its own, which has already been the topic of many publications and will not be the focus of this report. As a rule the squeal is particularly loud after it has rained, when the rails are drying out. Cold is an amplifying factor. For years experts worldwide have been searching for effective and affordable solutions. It has always been clear that lubrication can prevent the noise, but that it also reduces adhesion.

Zürich Public Transport (Verkehrsbetriebe Zürich – VBZ) also tested several solutions. The simplest was the application of graphite grease onto the edges of the rail head. Every few metres along the track a spot of grease was applied by hand with a brush. This solution was effective, but personnel-intensive, and consequently only possible in a few places, largely in and around the depots. Until a few years ago VBZ even equipped a hotel reception with the necessary utensils free of charge, so that the hotel staff could keep the noise from the two 90° curves directly in front of the hotel under control. The correct dosage was important, as excessive grease leads to reduced adhesion and a smeary mess on the road around the rails.

Already in the 1960s VBZ purchased a lubricating vehicle, a converted tram car

with a tank in the rear and retractable runners in the grooved rails. Later converted delivery vans were used. The drivers followed the tramlines, lowered the lubricating runners into the grooved rails before the curves, and lubricated the curved rail edges. Due to their somewhat unusual behaviour in road traffic, these vehicles were fitted with rotating yellow warning lights. There were various generations of such vehicles, always en route two at a time. After rainfall the vehicles could hardly keep up with the lubrication; it took hours to treat the entire network. Finally, the two vehicles cost an annual sum of CHF 650 000. Today one such vehicle is still kept in reserve.

All lubricants were environmentally friendly but were washed away even by light rainfall, so that constant application was necessary, up to five times a day.

Around the Elisabethenstrasse depot a track-watering system was tested. A toilet cistern (flushing tank) was mounted inside the depot at a height of about 4 metres. As soon as a tram approached, flushing was triggered via the transmitter of the traffic signalling control system ("Sesam") and the grooved rails were flooded with water. This worked reasonably well, at least when the outside temperature was warm.

In the late 1970s and the early 1980s the first fixed rail lubrication systems were installed on the approach tracks to the Paradeplatz ("Parade Square"). These didn't work satisfactorily either and caused slippery streets. Therefore, the lubricating vehicles remained in use and nobody believed in a better solution any more.

In 1996 the machine and system construction company Moklansa was approached by a mining company and asked whether it could deliver a rail lubrication system to reduce the heavy wear on the rails. Their newly-developed system worked well, greatly reducing wear. Rather as a side-effect, the shunting was also quieter. Consequently, possibilities for further use were sought, resulting in the awareness that noise reduction would be most desirable, especially for trams.

During a visit to Karlsruhe Municipal Transport, VBZ employees had their attention drawn to such a rail lubrication system. In June 2001 it was decided to install and test two such systems in the Zürich suburb Schwamendingen. The positive effect was followed with scepticism and amazement. There were markedly fewer complaints from afflicted residents. VBZ therefore decided, back in 2002, to extend the concept throughout their network: 170 such systems are scheduled to deal with all problematic curves by about 2014.

With the progressing installations came a few modifications and improvements of the entire system. By late 2010, 150 rail lubrication systems had already been installed in Zürich by VBZ, Glattalbahn and Forchbahn, 141 of which were in operation. The remaining nine systems will be working shortly. By the end of 2011 there will be 203 lubrication sections (some systems handle several sections). There is no other tram network worldwide equipped with so many stationary lubrication systems.

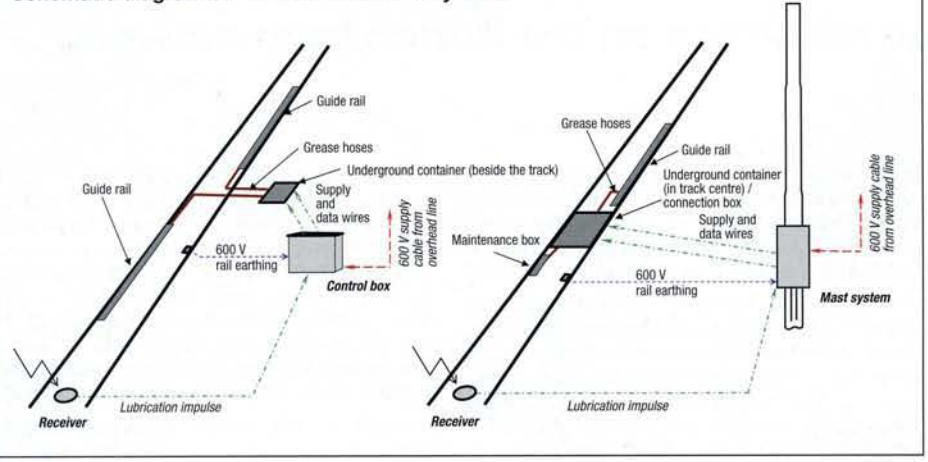
Function

The current version of the Zürich systems works as follows:

There is a lubrication section fitted in the track approximately 15 metres ahead of the corresponding curve, staggered for the right and the left rail. Adjustable guide rails position the wheel sets for optimal application of the lubricant. It is not possible to position both pairs of wheel sets simultaneously. Every lubrication section – approximately two metres long – has five to eight lubrication points, so that the wheels on the flange, running surface and on the back of the flange are greased as evenly as possible over their entire circumference. The trams should not exceed 18 km/h as they run over the lubrication section, in order to avoid excessive centrifugal forces. A distance of a few metres from the curve is necessary in order to ensure that the lubricant is correctly distributed on the rails to form a film. This film reaches a length of 200 to 300 metres. The lubrication sections are positioned to avoid road vehicles running over them as far as possible.

The lubricant reaches the lubrication points via channels of 4 mm diameter, which are drilled directly into the rails. The lubricant outlets are positioned according to the local circumstances, so that precisely the correct places are greased. When a tram approaches, the lubricant is pressed onto the rails. The necessary quantity is predetermined by the temperature. According to the manufacturer it would also be possible, via sensors in the ground, to take as well humidity into account for regulating the quantity of lubricant, but in Zürich this will not be done. The dispersion of the lubricant is achieved by means of a gear pump and a progressive distributor ensures that the same quantity

Schematic diagram of VBZ rail lubrication systems



Above left: A lubrication system under construction at the future Zürich tram stop Schiffbau. Front left a short lubrication section without guide rail, behind it the underground container, in the background the lubrication section of the other rail with guide rail (photo: J. Lüthard).

Above right: The preferred, but due to lack of space not-always-possible, installation in a cabinet, here at the Schmiede Wiedikon (Zürich-direction) tram stop. Inside the cabinet, top left, the power supply, top right, the not-yet-fitted transmitter module; centre: grease reservoir; bottom left: 600 V circuit breaker; bottom centre: gear pump with hose to track system; bottom right: memory programmable control, and cable to track below. In Zürich only two of the three possible grease reservoirs will be used in the cabinets (photo: J. Lüthard).

Below: Two commonly installed system configurations. In both cases the grease reservoirs are positioned underground in the track system. The GSM system for sending text messages is not shown (diagram: VBZ, M. Besse).

is dispersed through every hole. The approaching tram is detected via the signalling control system "Sesam".

The memory programmable control system and the lubricating hydraulics are fitted in a container located within 120 metres of the lubrication section, either in a cabinet or below the ground in the vicinity of the track. The systems are often housed in a cabinet together with the control system for rail points. The 24 V power supply of the system comes from the 600 V overhead line, but power could also be derived from the 230 V grid.

Following heavy rainfall the grease film forms anew after the next ten or so trams have passed. The lubricant used is virtually insoluble, biologically degradable and officially approved by the cantonal Office for Waste, Water, Energy and Air. It lubricates adequately, but is also sufficiently viscous, to prevent the vehicles from slipping.

The bores in the rails are checked for blockages once a month and when necessary drilled again. They do not affect the stability of the rails; this has already been demonstrated with heavy mining transport.

Each system is monitored automatically via the control. If a fault arises, or if a grease reservoir is empty, this is notified automatically by text message (SMS) via the GSM mobile phone network and registered in a VBZ database. As the supplier is responsible for the maintenance of the system in Zürich, the notifications are continuously transmitted to the supplier, thereby enabling precise intervention and uninterrupted operation of the systems. The grease reservoirs must be changed every six to eight weeks.

On average the installation of a system costs CHF 40 000. As the wear of the rails at the relevant sites is shown to be reduced by 10 to 20 %, this fact alone shows that the systems pay for themselves. However, at least in Zürich, a decrease in rail running surface corrugation has not been detected.

The advantage of a stationary lubrication system compared to a vehicle-based wheel-flange or rail lubrication system is that the dosage is more precise and can be applied directly to the contact point between wheel and rail. If, for example, the deflection of the bogie is monitored to trigger the lubrication, the latter always occurs too late.

Further applications

The systems which are so successful in Zürich have already been recognised elsewhere. Such systems have been and will be fitted mostly for tram, narrow-gauge and industrial railways, all having narrow curve radii. By the end of 2010 more than 80 further systems were in operation in Switzerland. (lüt)

Stadler's problems in Austria almost solved?

Package of measures for the Graz Variobahn

Over the past few months, technical measures for the Graz Variobahn trams have been developed in numerous tests and expert discussions in Graz and Berlin. The holding company Holding Graz Linien which operates the trams and the manufacturer Stadler Pankow GmbH have defined several optimization measures that need to be carried out on the vehicles and are also based on a multi-stage test series. Since the noise emissions are basically an issue concerning the entire wheel/rail system, the main priorities at vehicle level were to further improve the damping and test modifications to the suspension without impairing the safe running characteristics. As a result, both parties decided on the following package of measures for all 45 Graz Variobahn units:

- Softer secondary suspension in the trailing bogie to reduce the noise level in motion,
- Softer primary suspension in the trailing bogie to reduce vibrations,
- Use of new wheels with softer characteristics for damping and to counteract vibrations,
- Replacement of metal linking elements with polyurethane components to reduce noise,
- New absorbing system on the wheels in the form of dynamic damper elements for reducing vibrations.

These measures are scheduled to be implemented as a complete package on one vehicle starting in November 2011, now that the individual measures have been tested and analyzed. After the measuring and test program, commissioning of the "new" Variobahn is planned for the first quarter of 2012. Stadler Pankow will be paying for all material costs incurred by the package of measures for Graz. Holding Graz Linien for its part will assume the costs for any infrastructure measures and for making workshops and equipment available. (wa)

Network certification for Steiermark (Styria) GTW

Progress appears to have been made in the certification procedure for the Stadler GTW DMUs for Steiermärkische Landesbahnen (StLB) and Graz – Köflacher Eisenbahn (GKB). Following certification of the Trainguard Basic train protection system by the German Federal Railway Authority (Eisenbahn-Bundesamt), the Austrian Ministry of Transport issued a type certification for all three GTW versions in October 2011. On 27 October StLB deployed a Class 5062 GTW 2/6 for the first time for regional train 8660 from Weiz with scheduled departure at 1.36 p.m. However, the very next day regional trains on the Gleisdorf – Weiz line were already being operated again with ÖBB Class 5047 multiple units.

A network certification from ÖBB Infrastruktur is required additionally for deploying the Stadler DMUs on the ÖBB network. This was granted in October for all vehicles for a limited period up to the end of the year 2011. At the beginning of November StLB started trial operation of Classes 4062 and 5062 to Graz. At the time of going to press, GKB had still not deployed Class 5063 on the ÖBB network. Unrestricted certification can be granted once trial operation has been successfully concluded. Up until now, only limited deployment by StLB and GKB has been possible in domestic traffic on lines without PZB/Indusi train protection. (bei/rr)

On 27 October 2011, more than ten months later than planned, Steiermärkische Landesbahnen DMU 5062.002 waits in Weiz ready for its maiden journey as regional train 8660 to Gleisdorf (photo: S. Greiner).