Freight noise
FOCUS
UIC NOISE NETWORK/UIC ACTION PROGRAMME NOISE REDUCTION FREIGHT TRAFFIC
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STATUS HOMOLOGATION OF COMPOSITE BLOCKS

UIC is working on the homologation of K and LL brake blocks to help reduce noise emissions of railway freight transport

K-blocks

Since July 1st, the composite brake block quality K is also fully approved by ERA. UIC handed over the K-brake block types that are currently approved according to the UIC regulations in UIC leaflet 541-4. With this approval by ERA all new freight wagons can be equipped with composite K-brake blocks, thus realizing the targeted noise reduction for new wagons. The fully approved K-brake blocks are CoFren C810 and Jurid 816M. At this moment the industry is developing new brake block types, so that in the coming years the small number of approved K-brake blocks will increase.

LL-blocks

The development of LL-brake blocks is going forward but still a few hurdles have to be taken. The main issue that needs to be solved is the influence of LL-blocks on the equivalent conicity. The use of composite blocks results in higher wheel wear and increase of the so called equivalent conicity (see 'conicity for dummies' on page 4). To control the running safety of the wagons the wheels need to be checked (at this moment every 25.000 km, following an initial check after 50.000 km) and possibly reprofiled regularly. A study to increase this period between the checks is ongoing. In this study the limit value for the equivalent conicity will be defined and the reduction of the growth of the equivalent conicity by an optimized brake block contour is investigated.

Another issue that needs to be solved is the spread in friction coefficient. Results realized at test benches and the results from slip brake test are not always consistent. This behavior needs further investigation in order to realize the 1 to 1 replacement of cast iron blocks in existing wagons. Until this issue is solved, every wagon category to be tested to guarantee the required brake performance. The last main issue is the check and perhaps improvement of the requirements of the locked brake test. The current demands are very strict and could possibly be lowered.

BRAKE BLOCK INSPECTION
(SOURCE: LLOYD'S REGISTER RAIL)

UIC's synthesis report on LL-blocks is finished. This report summarizes and analyses all research done on LL-blocks. The UIC Regional Assembly Europe has decided to prolong and expand the temporarily approval of currently available LL-brake blocks Jurid 777, CoFren C952-1 and Icer-Becorit IB116* until 2012. The number of wagons that can be equipped with LL-blocks will increase. Wagons with LL-blocks need to be reported at UIC and need extra inspections. This enables the collection of more data and experiences with wagons with LL-blocks to solve the mentioned outstanding issues.

A new version of UIC's application guide of LL-blocks will describe the new conditions on the use of LL-blocks. This application guide will be published soon, making a new step in the development and application of LL-blocks. ■

New report on noise related track acces charging is available on UIC site: http://www.uic.org/plugins/UIC_SPIP_kit/doc_download.php?id=4268

INTERVIEW BECORIT - UIC FREIGHT NOISE FOCUS

Manufacturers of brake blocks are playing an important role in the reduction of noise emission of freight wagons. A well known manufacturer is Becorit, located in Recklinghausen, Germany. Freight Noise Focus asked Herbert Freudenberg (director application engineering and testing), Dirk Herkrath (director sales and purchase) and Dr. Jürgen Schröder (managing director) to explain their vision on brake block developments with respect to noise reduction.

Can you tell something about the history of Becorit?

Becorit was founded in 1926. During that time the company was concentrating on friction products for the local coal mining industry. In 1946 the development and production of composite materials for the railway industry commenced. Over the years we have established ourselves as one of the leading suppliers of railway friction material. One of our key successes was the introduction of the first asbestos free brake pad material in the late 70`s and its UIC homologation in 1980. More recently, one of Becorits composite brake shoes was the first to obtain UIC homologation for a K type material. Since the year 2006 we have been part of the Wabtec Group.

How would you describe the role of Becorit and other manufacturers within the noise reduction programme?

Becorit, as well as other manufacturers, has made large investments in the development

RAILWAY NOISE ABATEMENT IN SWITZERLAND:

A PROGRESS REPORT

Detailed cost-effectiveness analyses based on extensive mapping led to an ambitious railway noise abatement programme in Switzerland. This programme includes 1) rolling stock improvement by retrofitting all Swiss rolling stock with composite brake blocks 2) noise barriers with a cost-benefit constraint, and 3) installing insulated windows where legislated thresholds cannot be achieved with the first two measures. Additional incentives are differential track access charges.

The noise abatement programme is part of a package to promote public transportation which is largely financed through taxes on road freight transportation, on gasoline and with the value added tax. This package was accepted by public vote in 1998. The 15 year implementation programme started in 2000 is now in its 9th year: During this time more than 4500 freight wagons (out of a total of 7000) have been retrofitted with composite (k) brake blocks and about 100 km of noise barriers (out of a total of 300 km necessary) have been constructed.

The noise barriers built and the wagons retrofitted to date have made it possible to attain legal thresholds for some 72'000 people out of the total of 250'000 persons with noise levels exceeding thresholds. Once the project is complete, 170'000 people will attain thresholds levels while the rest will receive noise insulated windows.

No major technical of operational problems have been noticed with the retrofitting of freight wagons with k-blocks. ■

and production of organic brake pads and brake shoe materials for railway applications. Within this framework, Becorit has introduced organic pads, K-Shoes and LL-Shoes, homologated by UIC. Within the Wabtec Group, a substantial contribution is made to projects like Eurosabot or the Whispering Train Project, in which the Cofren 810 brake block was applied.

Another important contribution consists of testing and simulation. Becorit proposed a number of simulation programs (such as shuntage or winter testing) which are recognised by the industry and UIC. Very supportive is the advanced test centre that Becorit has at her disposal, comprising for example 3 full and 3 small sized dynamometers, winter simulation, shuntage and thermal imaging. Unique for Becorit is that, within the framework of Euro Rolling Silently, we have also put a lot of effort in referential tests with cast iron blocks and in recycling possibilities for new brake block materials.

IMPRESSION OF TEST BENCH FACILITIES OF BECORIT (SOURCE: BECORIT)

What developments can be expected from Becorit within the framework of noise reduction?

As part of our continuous improvement philosophy we are already working on the next generation of block material with optimised LCC values.

What are typical difficulties Becorit encounters during the development of composite blocks?

The approval process appeared to be very time-consuming. The new block materials also gave cause for additional requirements and legislation during the development process. Combined with the differences in legislation between different countries, this led to a significant increase of development time and investments. This is unfortunate, since this results in a longer time-to-market and less availability of the products for the operators.

What is the better technology: K- brake blocks or LL- brake blocks?

As per current status the K-shoe is used for new build while the LL shoe can be considered as the substitution for the cast iron shoes without changing the brake system. This applies to 600,000 old freight cars currently running on cast iron. From a manufactures point of view both systems can be produced with the same quality standards. In general, it is true to say for all materials/products, improvements are always possible as time and new technologies come along. What we need now is an introduction of composite blocks within the whole industry and an ongoing process of collection of information from various applications in the field in order to get a base for the next generations.

Will composite brake blocks become competitive to cast iron brake blocks in the (near) future?

It already has been proven under LCC consideration that there is a competitive situation regarding organic blocks. Nevertheless, this is always influenced by the efficiency of the brake system and the application in question. In addition, the system would surely benefit from increased investment for industrialised production within the friction industry. For this reason, Becorit encourages all efforts from the EU and local governments to stimulate the application of composite blocks. This would result in an increased demand, giving cause to brake block manufacturers for investing in automated manufacturing processes, ultimately leading to a decrease in production cost and therefore more attractive LCC.

What is Becorit's vision on the future of brake block technology for freight wagons?

Becorit continuously improves her products in order to keep delivering state-of-the-art technology. Based on experience from operators in the field, which is very valuable to manufacturers, we will develop new generations of existing products. We therefore look forward to the European implementation of cast iron replacement materials.

What might be a chance in the future, is to consider the brake block and wheel as a system instead of separate parts. Our vision is that by merging the expertise of brake experts and wheel experts, the complete system will benefit, ultimately leading to improved brake performance, less noise emission and better LCC values. ■

THE PILOT AND INNOVATIVE ACTION PROGRAMME FOR FREIGHT TRAFFIC NOISE ABATEMENT IN GERMANY

By Thomas Quernheim, Managing Director and Matthias Arnold, Senior Consultant at Die Ingenieurwerkstatt GmbH

LEISER RHEIN
(SOURCE:WWW.LEISER-GUETERVERKEHR.DE)

Rail noise has been on the increase in Germany for many years. In the Rhine Valley – one of the worst affected areas – noise emissions at night sometimes exceed 75 dB(A). In response to this situation, the Federal Ministry of Transport, Building and Urban Affairs (BMVBS) launched a pilot and innovative action programme in 2008 with the aim of reducing the noise emitted by freight traffic. In cooperation with the relevant ministries and railway industry representatives, this programme aims to lay the foundations for the retrofitting of existing freight trains, replacing their current cast iron brake blocks with low-noise composite blocks. The Program consists of two main parts: First, the pilot project "Silent Rhine". It will comprise the retrofitting and testing of the first retrofitted freight wagons on the Rhine Valley route and elaborating the practicability of a noise-differentiated track access charging system. The second part is the innovative action programme to support the development of K- and LL- blocks. Our company 'Die Ingenieurwerkstatt GmbH' has been assigned by the BMVBS as project manager and as intermediary to handle the day-to-day work in relation to the programme.

The pilot project "Silent Rhine": Investment subsidies for retrofitting

The pilot project aims to use investment subsidies from the German federal government to retrofit up to 5,000 freight train wagons, replacing their cast iron blocks with composite brake blocks (LL and K blocks). The implementation of this measure will yield to rapid preliminary results in the reduction of noise at key points in the Rhine Valley. This funding measure must be notified by the EU. The necessary funding guidelines have been submitted to the relevant EU bodies. After notification that the application has been approved, the funding guidelines may be published and retrofitting orders from wagon owners accepted. Subsidies may, however, only be granted if the recipient can provide a service in return. Thus it is necessary to produce evidence showing the number of journeys made by retrofitted freight trains in the Rhine Valley. A Radio Frequency Identification System (RFID) will be used for verification, in addition to operational data provided by the railway companies.

Noise-differentiated track access charging system

At present there are no incentives to encourage wagon owners to retrofit noisy freight wagons in Germany. The 'Freight traffic noise abatement' pilot and innovative action programme therefore also includes a feasibility study of a noise-differentiated track access charging system. The strategy aims to adapt a simplified noise-differentiated track access system by 2012 at the latest and a harmonised EU-wide system from 2016 onwards. This regulatory administrative measure aims to ensure that all freight wagons are retrofitted with low-noise composite brake blocks in a timely manner.

Innovative action programme: LL blocks yet to be homologated for standard operations

Retrofitting LL brake blocks is considerably less expensive than retrofitting K-blocks since the procedure entails far fewer alterations to the freight wagon. An innovative action programme has thus been launched to support the development of K and LL blocks. For this reason we support the efforts of the International Union of Railways (UIC) to develop these blocks and promote their homologation for standard operations. As LL blocks are the most cost-effective option, their homologation within the shortest time span possible therefore represents the most efficient method of ensuring abatement of the noise resulting from freight traffic and is thus a significant measure for residents. ■

PORTUGUESE EXPERIENCES WITH COMPOSITE BRAKE BLOCKS

The one-to-one replacement of cast iron blocks by composite blocks on existing freight wagons on a bigger scale still hasn't started in most European countries. The application of LL-blocks is still in its infancy. This is not the case for Portugal, were since 1996 all formerly cast-iron braked wagons have successfully been equipped with composite blocks.

Mr. Redondo of the Portuguese Railways (CP) tells that the reason for replacing the cast iron blocks on freight wagons was not the noise issue. "We found out that our freight wagons did not have the brake performance we needed for our new signaling system, so we were looking for another brake block. We had good experiences with the application of organic blocks on passenger trains and asked the supplier of these blocks to develop a dedicated block for our freight wagons". Since 1996 CP only uses the organic ICER905 on all its 2850 freight wagons.

The ICER905 is used as a one-to-one replacement for the cast iron blocks, however it is not a real LL-block; the friction coefficient is somewhat higher than that of cast iron blocks and it does not fulfill all of UIC's specifications for this brake block category. For example long descents and winter circumstances do not occur in Portugal and Spain, where the wagons also run.

CP is content with the use of LL-blocks. Wheel- and blockwear of the blocks have been measured and analysed thoroughly and CP has concluded that the organic blocks have no negative influence on the LCC of the wagons. Results that might have benefits for the UIC's investigations on LL-blocks. At the moment the effective level of noise reduction for these Portugese blocks is still unknown. On the short term measurements are planned to find out if the Portuguese wagons with ICER905 fulfill the new TSI Noise requirements. ■

COMPOSITE BRAKE BLOCKS: THEIR EFFECT ON WHEELSET MAINTENANCE

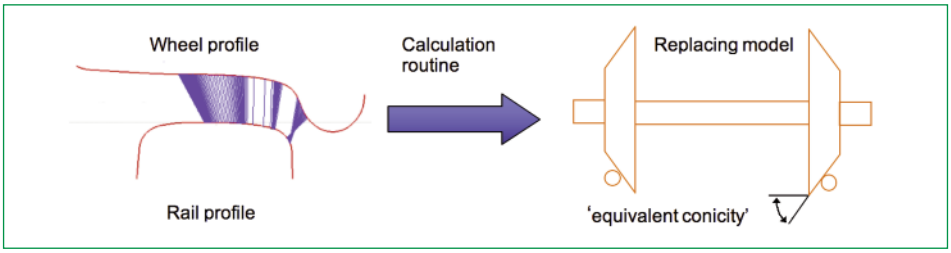
The use of composite brake blocks instead of Cast Iron (CI) brake blocks affects the lifetime of both the brake block as well as the wheel. The wear of composite brake blocks is significantly lower compared to CI-brake blocks, which implies a longer lifetime. On the other hand wheel-wear is higher resulting in a shorter reprofiling term. By simply copying the maintenance procedures, used for CI-braked wheels, to composite-braked wheels, the life cycle costs (LCC) will increase. To minimise that increase, an investigation was launched within the Dutch "Whispering Train" project (www.whisperingtrain.eu) by Lloyds Register Rail with the aim of optimising the maintenance strategy for wheelsets braked by composite-blocks.
Several workshops in Europe have been visited to obtain information on 'common practice' for CI-braked wheel maintenance and composite-braked wheel maintenance. Most important question was wether the reprofiling cutting depth can be changed, because this has the largest effect on LCC. In some cases the cutting depth can significantly be reduced compared to the conventional situation (from 6 to 2 mm). In other cases an increase in cutting depth is necessary due to a hard layer on the wheel surface or due to cracks found in the wheel surface. Wheel maintenance procedures are differing per workshop, in part due to differing geographical and operational circumstances.
The coming years, Lloyds Register Rail will gather and analyse more reprofiling data making it possible to find a "general" reprofiling cutting depth for composite braked wheels and to give advice on maintenance strategy. ■

REPROFILING OF WHEEL
(SOURCE: LLOYD'S REGISTER RAIL)

AN INTRODUCTION TO EQUIVALENT CONICITY

During the in-service tests with LL - brake blocks and with K-blocks a relative high wear of the wheel tread has been observed. This phenomenon leads to high values of the equivalent conicity. What is the equivalent conicity, why is it a blocking factor in the homologation of LL-blocks and last but not least, what is UIC doing to solve this problem?

The equivalent conicity is a parameter that is used as an indicator for stable running behaviour. The general opinion is that wheel wear shall be minimized, because high wear can result in instability problems when running at maximum speed. In order to study the very complex relation between wheel wear and running stability (in which many parameters play a decisive role), the equivalent conicity is frequently used. This parameter reduces the characteristics of the wheel-rail contact to a single value which is believed to be a good approximation. The equivalent conicity is defined as the inclination of the wheel running surface of a conical shaped wheel which characteristics are similar to that of the real wheel and rail profile (see figure).



The application of composite brake blocks has shown that, apart from the positive effect of noise reduction, the wear of the wheel tread is high in comparison with traditional cast iron blocks. For freight wagons the application of cast iron brake blocks does not require to monitor the wheel tread profile during operation. For these wheels the main parameters to be checked relate to the shape of the wheel flange. The increased tread wear, due to the use of composite brake blocks, affects the characteristics of the wheel rail contact and consequently the running behaviour. Since this type of wear did nearly not exist before, no limit values for the maximum wear during operation of the wagon has been defined.

Wheel wear will generally lead to increasing equivalent conicity values. Ultimately this could lead to an instable running of the wagon in which the safety related limit values, as used within the certification process, are no longer met.

Within the UIC several initiatives have been undertaken to come up with limit values for the equivalent conicity that are feasible in practice. In order to maximize the wheel life (and thus the economic feasibility of composite brake blocks), the objective will be to set this limit value as high as possible without affecting the stable running of the vehicle.

Recently a preliminary limit value for the equivalent conicity has been defined within UIC. This limit value is to be used for the time being. Further research will be undertaken to come up with a final value which will set limits to both the allowable wear on the wheel as well as for the rail.

At the UIC Freight Noise Workshop at November 10th more information on this topic will be presented. ■