

HSM high-speed rail milling train - extending rail life for Network Rail

Maurice Verheijen, Director, Schweerbau International, describes the company's new machine for the UK.

Over the years, railways throughout the world have been confronted with growth in passenger numbers, increased train speeds, higher traction and braking forces as well as greater tonnage passing over the rails. Although, in many cases, rail maintenance regimes have been adapted to manage these increases via improvements in inspections, lubrication as well as rail grinding, Rolling Contact Fatigue (RCF) damage is still a serious problem encountered by many railways.

Whilst rail grinding has proven to be an excellent tool for controlling rail wear damage and preventing certain types of RCF development, some types such as squats, studs and other surface-initiated rail defects remain a serious problem affecting many railways throughout the world. Factors such as rail steel quality, poor wheel-rail interaction, not enough (or in some cases too much) lubrication, track geometry faults, vehicle characteristics - even climate conditions - contribute to the occurrence of these RCF defects. Rail defects up to 5mm deep are not uncommon these days.

Since RCF can reduce rail service life significantly and is a serious safety hazard, new methods of dealing with the worst rail defects have been required. Over the last decade, rail milling technology has been identified and applied by many railways throughout Europe as an essential treatment technique to increase rail service life, thereby significantly reducing rail replacement requirements and capital expenditure.

Schweerbau

For decades, Schweerbau, based in Stadthagen near Hanover in Germany, has been one of the main service providers for mobile rail treatment throughout Europe. Providing rail profile planing and oscillating grinding services since the late eighties, it was during the mid-nineties that Schweerbau introduced the world's first mobile rail milling train. In the following years, Schweerbau has developed and introduced further, highly innovative technologies including rail milling machines for London Underground operations



and rail rotational planing machines (DHOB technology) suitable for productive, high accuracy and clean machining of rails in turnouts. The company's most recent innovative development has been the HSM high-speed mobile rail treatment train, again setting new standards in terms of output, quality and last, but not least, safety.

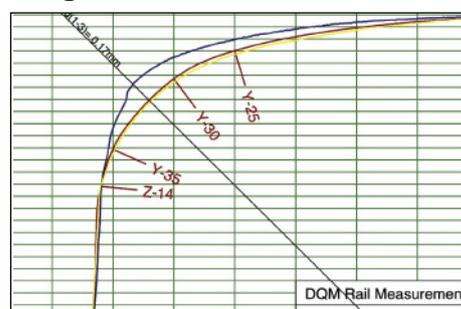
Today, Schweerbau operates the world's largest fleet of diverse mobile rail treatment trains for both main line and urban railway systems. Its portfolio of rail treatment trains includes planing, oscillating grinding, milling, rotational grinding, rotational planing and high-speed milling systems. When it comes to bringing rails back to shape or keeping them in shape, Schweerbau has all the tools in the box.

HSM

The HSM high-speed rail milling train, a three-car diesel-electric powered machine, was built by Schweerbau in 2015. It was based on experiences with earlier build rail milling trains, all with certain limitations and on the demands from the industry to meet the need for more productive machines to deal with higher metal removal requirements, plus reductions in track possession times combined with improved safety and availability.

It is fitted with four, high-output 1,440mm milling wheels with up to 720 cutters each, and rotating around horizontal shafts

Above: The HSM high-speed milling train during trials at Network Rail's RIDC Tuxford.

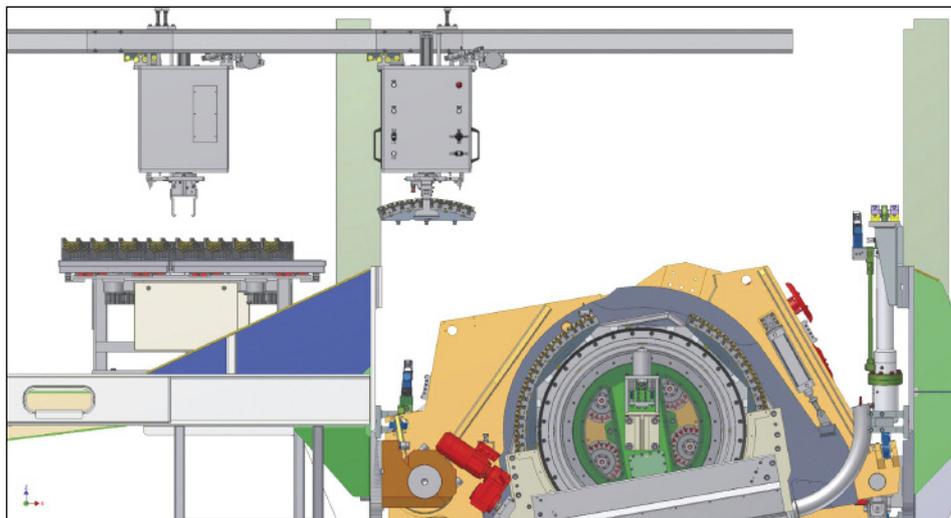


Above and below: High accuracy rail defect removal and reprofiling.



perpendicular to the rails. The so-called 'climb' milling process, where the milling wheels turn in the same direction as the machine working direction, in combination with the large diameter milling wheels (and number of cutters) allows for faster machining speeds with higher metal removal capabilities compared to previous milling trains fitted with 600mm milling wheels. In addition, the HSM milling technology allows for processing up to 5km of track without the need to replace the milling cutters. This eliminates the need to go trackside during regular engineering hours shifts, thereby improving both safety as well as total output per shift.

Where longer track possession times are available, the innovative 'segmented' design of the large diameter milling wheels (fitted on the HSM in combination with an on-board automated segment change system) allows for renewing all milling cutters on the milling



Left: The highly innovative automatic milling segment changing system on the HSM.

Right: The HSM under construction at Schwebbau's facility in Stadthagen, Germany.

wheels rapidly without the need to get off the train and work trackside.

From an environmental point of view, the HSM is capable of collecting 99% of the recyclable metal residue (swarf) produced and, due to its low noise emissions and the single-pass operation capability, noise nuisance during operation is significantly reduced compared to other mobile rail treatment machinery.

The HSM was fully approved and introduced on Deutsche Bahn in 2016 where it proved its capabilities in terms of output, quality and safety on its network. In 2017, Schwebbau was awarded a service contract to provide rail milling services on Network Rail infrastructure

Approvals

Schwebbau chose to work with AEGIS Engineering Systems for the management of the safety and approvals of the HSM for operation in the UK. AEGIS is an independent engineering consultancy based in Derby with an in-depth knowledge and experience in gaining approvals for a wide range of rolling stock and infrastructure projects. The HSM



provided an interesting twist on the approvals process, being a train developed by Schwebbau for future UK operations but that was approved by the German authorities for use on Deutsche Bahn infrastructure.

AEGIS developed an approvals procedure, that worked from the existing German design and compliance

documentation, to create a suite of work packs that demonstrated compliance with the mandated standards, chief amongst these being RIS-1702, GM/RT 2400 and EN 14033. In parallel, AEGIS ran a safety assurance process on behalf of Schwebbau, which was compliant with the Common Safety Method - although the project was deemed non-significant, the process applied ensured that best practice was followed. AEGIS also managed the process for achieving Network Rail Product Acceptance, by demonstrating achievement of the product acceptance requirements to show fitness for purpose and safety of operation.

AEGIS Certification Services provided the independent assessment (NoBo/DeBo and PAB) services to ensure that ORR authorisation was achieved in the most efficient manner, allowing Schwebbau to bring the benefits of its rail treatment services to the UK railway.

UK operations

Although Network Rail own and operate quite a large fleet of rail grinding trains that keep the rails in shape and switches throughout the network in shape, there are still certain areas on the network, which require a more corrective approach; areas which suffer from particular RCF problems, areas which cannot regularly be addressed by grinding trains or simply areas where it is more suitable and economical to use alternative methods of treatment due to issues such as access, environmental requirements or risks of fire. This is where the HSM will have its role on the Network Rail infrastructure over the next few years.

Schwebbau International

Although Schwebbau has been a track and rail maintenance 'service provider' from origin, the increasing worldwide demands for 'purchase' of specialist mobile rail treatment machines has recently led to the founding of an affiliate company Schwebbau International, also based in Stadthagen, Germany. By taking full advantage of the experience and know-how gathered in railhead treatment over the past 30 years, Schwebbau International focuses on the design, manufacture and supply of specialised high-tech maintenance machines such as rail milling trains, rail grinding trains and specialist maintenance trains. The next generation in mobile rail milling trains - the highly innovative CM42 series - is due for arrival in 2020.



Above: The outside of Schwebbau International's factory in Stadthagen.

Below: The CM series will be the next generation of rail milling trains from Schwebbau.

