

Network Rail orders a fifth high output ballast cleaning system for the UK

Plasser UK's Mark Simmons details the different elements and machines that form the latest system.

Network Rail has agreed to purchase High Output Ballast Cleaning System No. 5 (HOBSC5) from Plasser & Theurer. The system, based around the RM 900 ballast cleaner (so named because it processes 900m³ per hour) is the fourth of its kind. The system numbering seems confusing because system 1 is actually made up of two RM 95 NR medium output ballast cleaners.

The system

As mentioned previously, the ability to process 900m³ per hour is optimised not only on the RM 900, but throughout all the other vehicles making up the system. Immediately behind the ballast cleaner, as with HOBSC4, there is an integrated tamping and consolidating machine - the 09-2X/CM.

Behind the 09-2X/CM is the new ballast power vehicle. This provides the interface between the rake of MFS vehicles carrying new ballast and the 09-2X/CM and RM 900 combination. It also provides the motive power to move that new ballast rake of vehicles and, in addition, inserts new ballast into the track. New ballast is also inserted at the 09-2X/CM and RM 900, allowing the ballast bed to be built up in layers and each layer to be consolidated. This helps to ensure the longevity of the track quality.

The MFS vehicles, as in the previous three systems, consist of the two types. The MFS-D is a single line ballast handling vehicle, with a container holding approximately 48 tonnes of ballast. The bottom of the container is a conveyor belt which moves the ballast forward onto a transfer conveyor at the front of the vehicle which docks to the back of another MFS or new ballast power vehicle. The MFS-SB follows the same principle, however, the transfer conveyor belt at the front swivels to the side allowing transfer to the side. As the swivelling conveyor is heavier than its fixed counterpart, the MFS-SB carries slightly less ballast weight.

The MFS vehicles are interchangeable between the spoil handling system and the new ballast system. Spoil from the RM 900 ballast cleaner is passed over the front conveyor belt onto the spoil power vehicle. As for the new ballast, this machine provides the motive power to move the spoil handling system and provides an interface to the MFS vehicles forming the spoil system. In general, the spoil is usually wetter and contains the fines that are being cleaned out and thus has a higher specific gravity than new ballast. This means that the 48 tonnes the MFS can carry

Plasser & Theurer 09-3X-D-RT dynamic tamber, one of the seven examples already owned by Network Rail.



One of Network Rail's existing USP 5000 RT ballast regulators that form part of the current high output fleet.



translates to a lower volume.

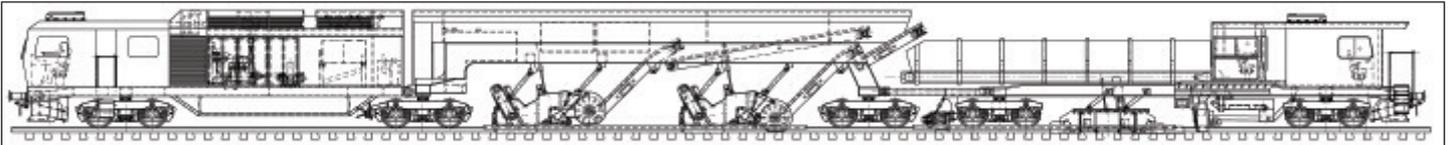
Supporting the core system are a set of plain line high capacity tamping machines and regulators. The tampers consist of two 09-3X Dynamic and one 09-2X Dynamic. These are three and two sleeper respectively, continuous action tamping machines with integrated dynamic track stabilisation and a small brush box. The regulators are a USP 5000 and USP 6000. The USP 5000 is very similar to the existing USP 5000 RTs in Network Rail's high output fleet while the USP 6000 is based on the AFM 2000-RT concept.

Design changes

The USP 6000 illustrates the design thought that has been required to achieve one of the

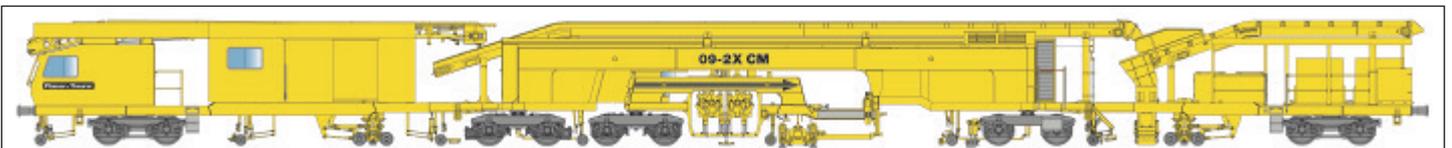
major new performance requirements for this system from Network Rail - the ability to work on third rail track with the third rail isolated but still in position. In that situation, the 09-2X dynamic and the USP 6000 will form the support plant. For standardisation and consistency, the 09-2X has the same frame and satellite as the 09-3X, but it is simply not possible to fit three sleeper tamping banks into the track with the third rail in place on some of the curves that are found in the third rail area.

The stabiliser unit fitted to the 09-2X is also specially adapted to fit. Regulating with the third rail in place is even more of a challenge and the USP6000 consists of a brush box especially suited for third rail along with a



Above: Drawing of the USP 6000 ballast regulator.

Below: Illustration of the 09-2X/CM machine.



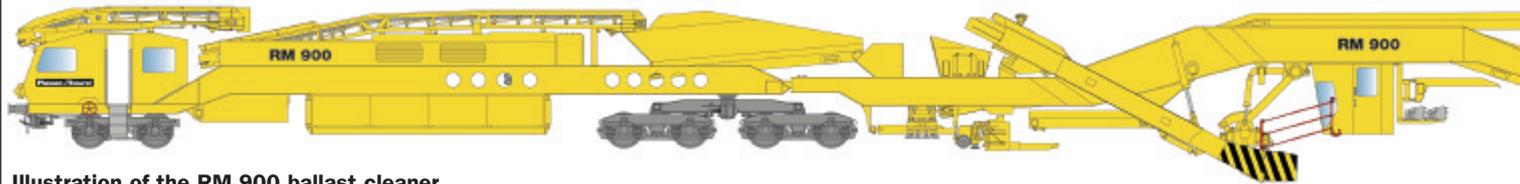


Illustration of the RM 900 ballast cleaner.

● sweeper arm that will clear ballast from between the third rail and running rail and even from underneath the third rail. The necessary extension required to achieve this has driven the move to the AFM derived design which allows for a second brush box to achieve the brushing performance and a bigger silo allowing more ballast to be moved from where there is an excess deposited, where required, to support the tamping process and create the desired profile.

Other changes

Less visible, but nevertheless very challenging, are the effects of changes in standards since the HOBCS4 contract was signed at the beginning of 2008. A simple calculation will tell you that Railway Group Standards which are updated four times a year have had 28 update cycles in this time.

What is not immediately evident is whether these have a significant impact or not. The significance of one of the changes is without doubt - GM/RT 2400, the core on-track machine design standard has changed from issue 4 to issue 5. This change has brought with it a

fundamental, philosophical shift towards use of EN standards. In large part now, GM/RT 2400 issue 5 directs you to EN 14033-1, which is the core OTM European standard. While the ever-closer integration of UK and European standards is welcome, this does bring a significant number of changes since the last system.

In addition, in this time period, the EN fire standard (EN 45545) has been completed and published. GM/RT 2400 directs its use for OTM design. This is a really fundamental shift compared to previous builds and is made more challenging because its implementation across Europe only takes effect in 2016 and so the railway components supply industry across Europe is not yet ready with compliant products.

One further, major change is the aim to significantly reduce operator exposure to ballast dust. This is achieved with a two-pronged approach. The MFS ballast handling systems will be fully automated and controlled directly from the power vehicles. The key benefit here is that it moves the people out of the vicinity of the dust. The ballast cleaner, 09-2X/CM and power vehicles will still require operators and the approach for this situation

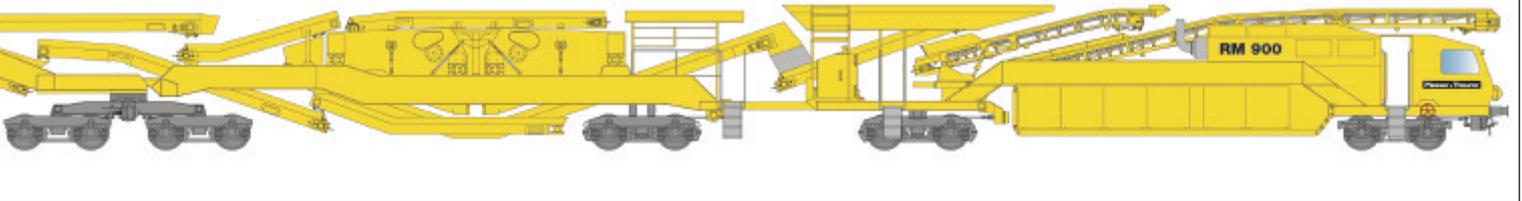
is to use fine mist dust-particle suppression systems in the key areas of dust generation to damp it down and to create a protection zone, even from dust blown off the MFS vehicles.

Intensive effort is also ongoing to make continuous improvements to reliability, availability, maintainability and safety. This takes account of Plasser & Theurer's worldwide experience with these and other systems incorporating the beneficial developments that have occurred since HOBCS4 was manufactured. This philosophy has been extended directly in the HOBCS5 project. At the project kick-off meeting held at the factory in Linz, Austria, the Network Rail project team presented (to the chief designers for all the various machine types in the system 5 consist) a list of improvement ideas that had been generated by wide-ranging consultation with the staff operating and maintaining the existing systems. Plasser & Theurer is working to implement these ideas wherever feasible.

The machines in detail

Having described the basic composition of the system, and the major areas of change, it is





worth looking at each individual machine type to gain a brief understanding of its features and highlight those that are new.

The RM 900 will feature a new design for the N7 (new ballast) conveyor as well as changes to the conveyor types and materials elsewhere, new wear plates and a new design of six-foot laser (track distance measurement system). There will be some adaptations to the trough arms and cylinders of the ballast excavation unit to account for the third rail remaining in situ and, to improve operations, the B3 (spoil conveyor) operator's position will be improved and shoulder compactors added. In addition, there will be dust-suppression nozzles strategically placed.

The biggest new feature for the 09-2X/CM is evident from its name - it now features two tamping banks for two sleeper tamping to increase its output performance as well as a sleeper auto-detection and warning system. The follow-up tampers' design lifts and shifts will be automatically generated via the 6-foot laser and DRP track geometry recorder computer on-board. As with the RM 900, for improved maintainability and safety, the 09-

2X/CM will have some of the conveyor types and materials altered and also include improved welfare facilities for the staff.

The spoil power vehicle will be fitted with dust suppression and a control station for automatic operation of the MFS vehicles and, additionally, will feature a new engine to meet the environmental improvement requirements in the latest engine emissions regulations. In addition to those developments, the new ballast power vehicle will feature redesigned ballast insertion chutes for third rail operation.

The MFS vehicle will all be fitted with the automatic operation control system, but will additionally feature engines with an eco-mode for stop/start and auto-idle functions. There will be no generators fitted, which will both improve the environmental footprint as well as the maintainability. This is made possible by switching to LED lighting and upgraded batteries and alternator.

The tampers and regulators will benefit from the latest Plasser P-IC control system and improved work and driver's desk layout for ergonomic operation. Additional safety improvements include improved soundproofing

to reduce the noise for the operators. The satellite bogie will now feature the same 1.8 metre axle centre bogies as the rest of the fleet with 920mm wheels. This improves not only standardisation of components, but also the ride behaviour of the machine. The USPs will also now be fitted with the same bogies and drive system as the tampers. They will all now be hydrostatically driven. The brush box on the 09-3X Dynamic will feature an improved design for better performance while the one on the 09-2X Dynamic will be configured for third rail operation. Of course, the USP 6000 is an entirely new design of vehicle to handle regulating with the third rail in situ.

Delivery

These features and improvements are certainly challenging, especially considering the short delivery timeframe - the system will be ready ex-works from Linz, Austria, in Summer 2016. However, Plasser & Theurer will rise to the challenge as it has for each of the last three systems to bring significant benefit to the high output ballast cleaning operation for Network Rail.

