The Unimat 09-8x4/4S BR Dynamic E³ takes technology to the next level

Multiple innovations installed on one machine: the Unimat 09-8x4/4S BR Dynamic E³ by Plasser & Theurer is a cutting-edge combined machine for complete maintenance of tracks and turnouts in the field of tamping and profiling technology. In short: existing ballast resources are used during the tamping process, which achieves a perfect result with just one machine. The Unimat 09-8x4/4S BR Dynamic E³ track and turnout tamping machine is designed for optimised worksite logistics. It combines the functions of several machines: ballasting, tamping, profiling, stabilising, surveying, and post-measuring. It was conceptualised as a versatile tamping machine that uses innovative technology while driving technological innovation. This Plasser & Theurer machine boasts cutting-edge technologies while using features that promote research: an inertial measuring system, ballast condition measurement, tamping reports, virtual workstations, and preparation for a GPR system.

Georg Skalla
Managing Director at Franz Plasser Vermietung von Bahnbaumaschinen GmbH
Purkersdorf
Georg.skalla@plassertheurer.com

Optimised periodic track maintenance, flexibility, and high capacity with an 8x4 tamping unit

Track possessions available for sections of lines and machine operating times are becoming shorter and shorter. This is due to more condensed cyclic schedules and is particularly true in the area of periodic track maintenance. In other words, the sections to be maintained are also becoming shorter and shorter. However, they often contain a variety of track components: plain line track, turnouts, cross-over points, connecting pieces, and closure rails. All of these sections pose different maintenance challenges. In short: modern machines have to be as universal and variable as possible to handle them as flexibly as possible. This is precisely where the machine concept of the new Unimat 09-8x4/4S BR Dynamic E³ comes into play.

Experience has shown that a combined machine such as the Unimat 09-8x4/4S BR Dynamic E³ unlocks its full potential when it comes to periodic track maintenance. A single machine takes care of all necessary work sequences: everything from measuring the track geometry to maintaining the track and the ballast bed as well as post-work treatment with a dynamic track stabiliser. The synergy effect that results from using one machine instead of several machines is obvious when it comes to direct costs. The Unimat 09-8x4/4S BR Dynamic E³ has also been optimised to simplify servicing, which entails lower maintenance costs. A decrease in service staff also provides additional economic benefits. Fast and easy servicing not only saves time and money, it also increases availability in productive use.

The core component of the Unimat 09-8x4/4S BR Dynamic E³ is its high-performance universal tamping unit, which provides the perfect prerequisites for both turnouts and plain line track. The machine can tamp a turnout with the same quality, capacity, and speed of a proven 4x4 tamping unit. At the same time, the 8x4 tamping unit can tamp longer sections of connecting track quickly and at high capacity using 2-sleeper tamping mode.

Further, the new 8x4 tamping unit is equipped with eight tamping unit segments that work independently of each other as well as 24 tilting tamping tines. The continuous-action 2-sleeper tamping machine has a newly developed tamping tine arm design for more freedom of movement. The opening width, penetration depth, and squeezing distance can be varied as needed. The machine can also switch to 1-sleeper tamping at any time: this is particularly beneficial with twin sleepers or hollow sleepers, where the point machine is located. Tamping double-slip turnouts and turnouts with a movable-point frog is turnout tamping at its finest. The 8x4 tamping unit easily masters this task using its power reserves and versatility. Thanks to these features, the machine combines the high performance of 2-sleeper tamping with maximum flexibility in 1-sleeper mode.

So much more than tamping

In all areas such as its machine concept, technology, and ergonomic design, the Unimat 09-8x4/4S BR Dynamic E^3 combines time-tested, state-of-the-art, and future-proof components. This combined tamping machine for turnout and track with ballast profiling is the successor to the time-tested Unimat 09-475/4S N-Dynamic. Like its predecessor, it completes all the necessary work sequences for track and turnout maintenance in the technologically correct order during a single pass. Major differences are not usually recognisable right away. However, they are anything but marginal. The major difference which is immediately recognisable is Plasser & Theurer's pioneering E^3 technology.

„Economic - Ecologic - Ergonomic": the power of E^3 hybrid drive technology

The Unimat 09-8x4/4S BR Dynamic E^3 is driven by the revolutionary new E^3 hybrid technology. In addition to the conventional drive system, the machine can be fully electrically powered in running and working mode. All rotary motions are fully electrically powered (drive in running and working mode, tamping units, etc.). Linear movements remain hydraulically powered. This means that in addition to the purely electric drive unit, the E^3 machine concept also allows for a decentralised electrohydraulic drive system for the machine's main work units and auxiliary work units. This is coupled with a significant decrease in the amount of hydraulic oil required.

In particular, the consumption of fossil fuels (diesel) can be decreased to a large extent during running mode thanks to traction current, which is mostly carbon neutral and less expensive. There are fewer exhaust emissions and fewer noise emissions (no diesel engine operating). This has an especially positive impact in urban areas, increasing acceptance among line-side residents.

Innovative cab concept: one work cab gets the job done

Owing to the E^3 drive system, the machine is comparatively long. Particularly with tamping in the area of the turnout, this may have potential disadvantages. For this reason, attempts were made to make the machine as short as possible. A newly developed single-cab design was the result: it is the first of its kind and also impacts operation.

This new concept provides enough space for the co-tamping operator (who operates the lifting and lining unit) and the tamping operator in a single cab. Despite a multitude of functions, work in the cab is simple and clear. A new feature that is part of the single-cab design is a fully virtual workstation for the co-tamping operator. They now work on the continuously moving part of the machine, sitting with their back to the tamping operator. Thanks to six high-resolution screens, there is a digital overview of the control system, which offers further advantages. 24 high-resolution cameras provide a better view of the work area when compared to an "analogue" workstation.

Beyond that, the Unimat 09-8x4/4S BR Dynamic E^3 has an ultra-modern crew room that provides space for six people and features all the necessary amenities: WC, kitchenette, seating area, heated lockers, and a "digital workplace". Machine personnel in the seating area can also see what is happening during operation. This area can be used for quality monitoring or for training. The new crew room complies with occupational health and safety regulations. Then there is also a workbench for performing minor repairs.

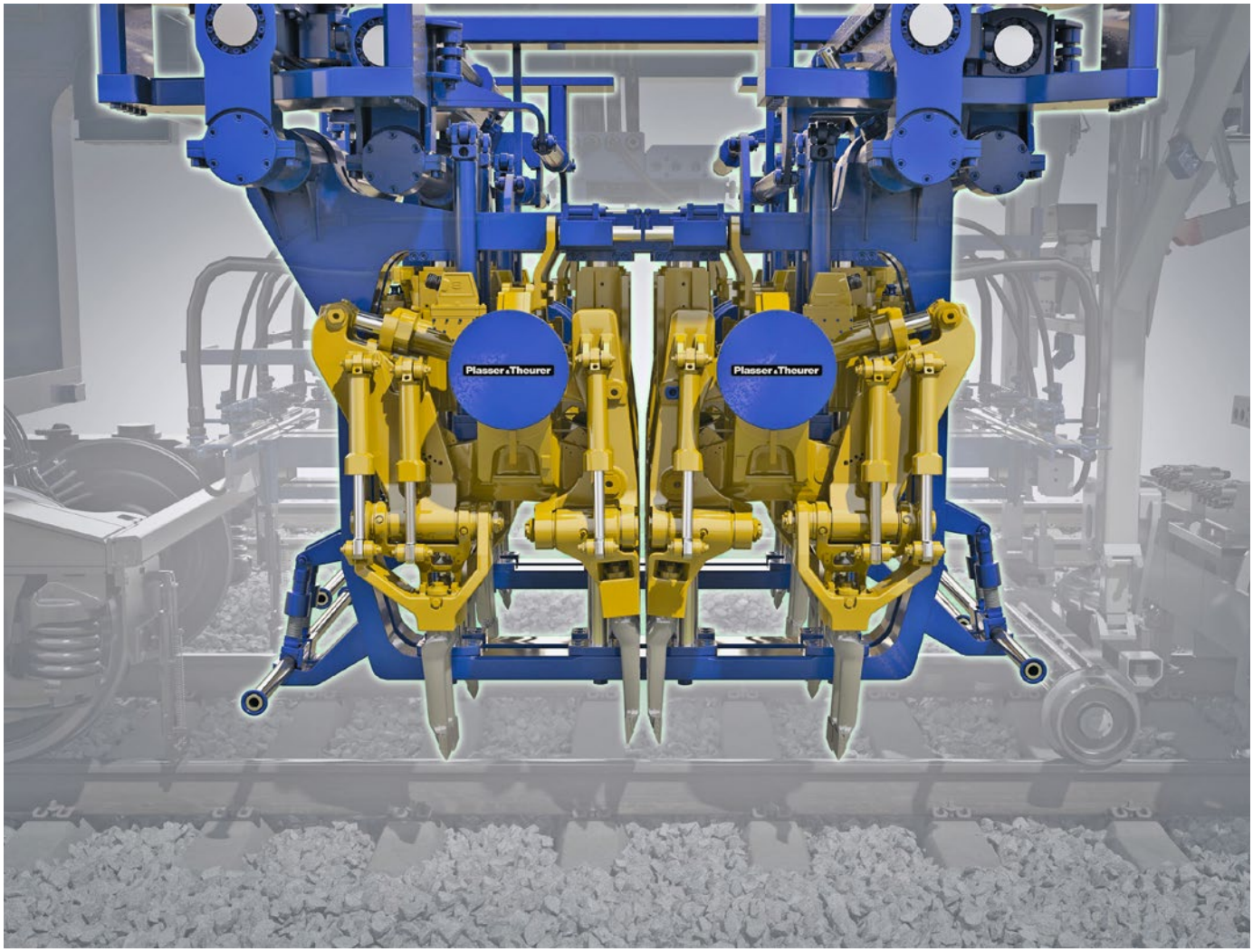
The Unimat 09-8x4/4S BR Dynamic E^3 at a glance: goals, economic aspects, benefits

- Machine profile: combined machine; turnout tamping machine with increased plain-line tamping capacity thanks to the 8x4 tamping unit with a profiling, ploughing, and sweeping unit as well as a ballast hopper (up to 12 m^3); possible to insert ballast directly in front of the tamping unit
- Main area of application: periodic track maintenance; several shorter sections of track under repair, consisting of a turnout and closure rails, during shorter track possessions; thanks to the front plough, the machine is so flexible that maintaining new layers remains possible; compared with individual machines, this combined machine has clear advantages in view of cost effectiveness and efficiency
- As the entire drive unit of a second machine is no longer required, this entails cost savings when purchasing, operating, and, in particular, when servicing the machine.
- Saves time and simplifies planning: work sequences are carried out in a uniform, coordinated manner
- Pooling expertise on one machine mitigates shortage of skilled staff: only five machine operators needed for regular operation

Photo: Plasser & Theurer

1: The new Unimat 09-8x4/4S BR Dynamic E^3 is a single machine that combines ballasting, tamping, profiling, stabilising, surveying, and post-measuring

Photo: Plasser & Theurer



2: The 8x4 tamping unit combines performance, precision, and flexibility. That is what makes it particularly suited to tamping both in turnouts and on terminating lines. The tamping unit segments can be lowered independently of one another, and tilting tamping tines provide optimum tamping in the critical turnout area

Efficient and systematic ballast management

The Unimat 09-8x4/4S BR Dynamic E^3 ensures the highest tamping quality and long-lasting work results with proven technologies from Plasser & Theurer's BR (short for "Ballast Regulator") portfolio. This comprises ploughing, sweeping, profiling, and ballast management. Surplus ballast is collected, stored (12 m^3 hopper capacity), distributed, and discharged via plough, sweeper, and profiling units. Thanks to a machine concept combining tamping and BR, ballast resources are used sustainably and systematically placed in front of the 8x4 tamping unit. This enables tamping in large areas, particularly in turnouts, without placing ballast additionally by means of external ballast trains.

This machine concept includes a shoulder plough with a slewing limiter to prevent infringements of the clearance gauge and a centre plough for re-arranging track ballast on the ballast crown. The sweeper brush no longer needs to be replaced manually for wooden and concrete sleepers. It adjusts at the push of a button. Because of the pantograph, the Unimat 09-8x4/4S BR Dynamic E^3 does not place new ballast. This is not required for the intended application scenarios.

Dynamic track stabilisers optimise track geometry durability

Dynamic track stabilisation has become indispensable to sustainable track maintenance. This is all the more important as traffic loads increase. High-speed lines are particularly affected. The stabilising units rearrange the ballast stones into a more homogeneous structure. This means that the dynamic forces produced by rail traffic are more evenly distributed within the formation. Therefore, there is no longer any need for speed restrictions after tamping. In addition, controlled settling considerably increases the track panel's lateral track resistance. For even more homogenous track quality and for more precise stabilising ramps and transitions, the Unimat 09-8x4/4S BR Dynamic E^3 is equipped with another option: the continuously adjustable variable impact force from 0 to 100 %.

InertialMeasurementTrolley: on the fast track to track geometry

In addition to the conventional chord measuring system, the machine is fitted with the future-proof technology for precise and comprehensive measuring results: the inertial measuring unit (IMU) mounted on a compact two-axle trolley. The IMU records

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a space curve that is assigned a relation to the rails via mechanical track gauge measuring. The compact system set-up enables complete post-measuring with little space required. Further, it is possible to survey the track geometry at speeds of up to 60 km/h prior to track correction – this saves a significant amount of time in daily operations. The system also enables a precise depiction of long-wave faults (alignment and longitudinal level faults for the wavelength ranges D1 and D2).

Quality at a glance thanks to the Plasser TampingReport – detailed reports for a high level of transparency

Plasser & Theurer currently offers two SmartTamping options: the intelligent tamping assistance system Plasser SmartTamping – The Assistant and the Plasser TampingReport. The Unimat 09-8x4/4S BR Dynamic E³ is equipped with both of them. In addition to the result report of the DRP electronic data recording processor, the TampingReport provides you with more detailed information on work sequences. Tamping reports provide proof of technologically correct maintenance and can serve as basis for strategic decision-making. The reports provide detailed information that helps you to optimise and expand the planning of future maintenance activities. Highly customisable display options are available both for the back office and on the machine itself. You can hide and display individual tamping positions, lifting and lining positions, corresponding values, and the obstacles detected while viewing them using the continuous zoom function.