Greater availability of track maintenance machines due to the use of new wear-resistant materials

Modern track maintenance machinery is known for its long-term availability. However, the working parts are subject to wear and tear depending on use, with the rate of wear varying according to frequency of use, ballast bed characteristics and ballast quality. In recent years Deutsche Plasser has therefore been developing and testing new materials that significantly extend the service life of work units, for example, in tamping, cleaning and ballast profiling machines.

The optimisation of the laying and maintenance of railway track is a challenge both in technical and economic terms and at the same time an economic necessity for the railway system (Fig. 1). Therefore the costs of all maintenance work, including the associated material and machine costs, must be recorded and monitored [1]. This monitoring also concerns the life cycle and durability of the individual machines and their work units. As these units are subject to wear dependent upon the operating conditions, attention must be given to prolonging the availability of these components [2].

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For some time Deutsche Plasser has collected, evaluated and analysed data from the customers on the varying operating behaviour of the materials used on Plasser & Theurer machines. New materials were put into service over the past months with the aim of prolonging service life. The following new developments are described here:

- ▷ Hardened metal tamping tines,
- ▷ Brush elements for ballast ploughs,
- ▷ Hardened metal wearing edges for ballast ploughs,
- ▷ Wearing plate PT 1650,
- ▷ Excavating chain links for ballast cleaning machines.

Fig. 1: Tamping unit of 09-3X Tamping Express

Hardened metal tamping tines

Five decades concentrated on the development of the tamping machine have also brought new findings over and again with regard to the individual components: a further result of this development is the Plasser hardened metal tamping tine (Fig. 2). The engineers have worked on the design of the tamping tine and developed a functional shape which is forged in one piece in production as a solid component and two features exert the primary essential influence on the service life: form and manufacture.

Another step forward in development is the all-round armour with hardened metal plates over the entire area of the tamping tine which receives the most wear in the ballast bed. The underside of the tine separates the ballast bed as it penetrates, the tine plate transmits the squeeze forces to compact the sleeper bed and the rear side of the tine is subjected to heavy wear from the ballast as the tines penetrate and

Fig. 2: New hardened metal tamping tine

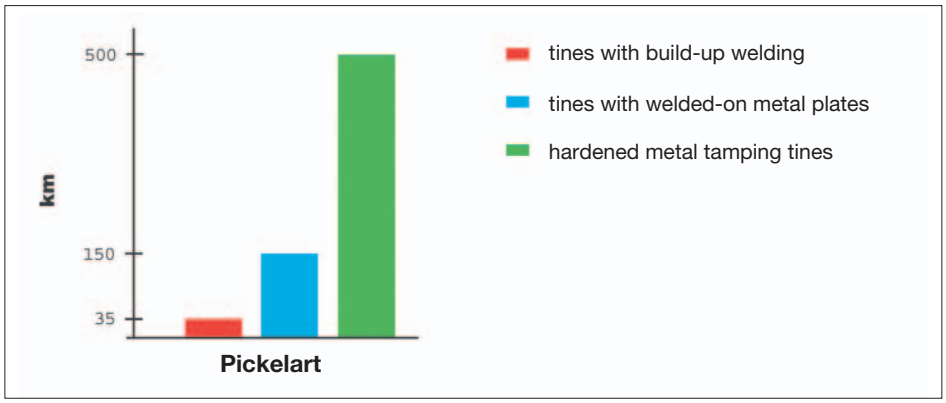


Fig. 3: Comparison of the service life of various types of tamping tines

during opening after the squeeze action. Therefore all these areas are armoured by brazed, hardened metal plates:

- ▷ the penetration edge
- ▷ the tine plate
- ▷ the conically shaped rear side of tine and
- ▷ the side surfaces with brazed, hardened metal sections.

This has greatly increased the service life of a tamping tine. Furthermore, the shape of the tine plate surface remains the same throughout the whole service life. This reduces the danger of tamping with insufficient tine plate surface which is essential to achieve a constant uniform tamping quality. The service life has a fundamental influence on the price/performance ratio. Economic efficiency calculations are influenced decisively by the high output per metre. All these factors have a favourable influence on the productive time of the machine and the operating costs (Fig. 3).

The first operations in the past months have proven impressively that this tamping tine fulfils all expectations. Line performances of around 500 km have already been achieved. This guarantees the excellent price/performance ratio.

New brush elements for ballast ploughs

The hoses of the sweeper brushes on ballast ploughs are subjected to high wear, depending upon the type of permanent way and the characteristics of the ballast, so a new solution was sought in this area. Due to the application of new brush hoses in solid rubber design (Fig. 4), it was possible to raise the wear-resistance in practical operation. A new kind of fastening of the solid rubber element on the brush shaft enables fast replacement and flexible exchange of the brush shaft for other types of track. This brought an extension of the operational availability of the ballast ploughs in two respects:

- ▷ the interval between replacement of the brush hoses can be extended due to the higher service life of the material, and
- ▷ the new type of fastening of the rubber elements enables fast exchange.

Hardened metal wearing edges for ballast ploughs

On the profiling and shoulder ploughs of the ballast distributing and profiling machines there is a high level of wear on the material due to the continued contact with the ballast. Due to the special design of the ploughs, the ballast is drawn up from the shoulders to the crown of the ballast bed. A flow of ballast crosswise to the track axis is possible in any desired direction.

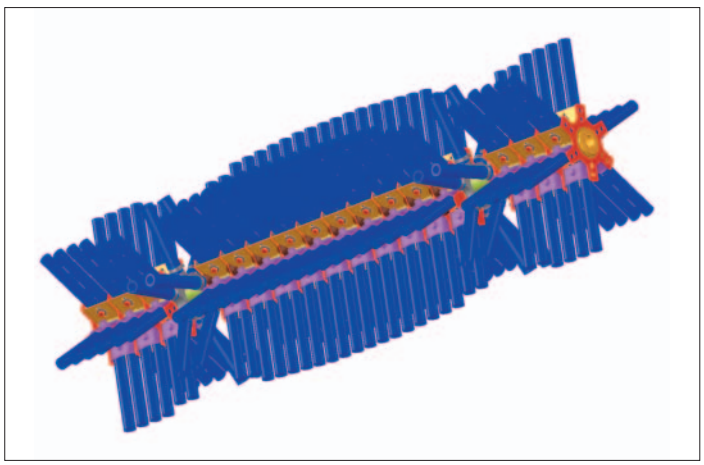


Fig. 4: New brush elements for ballast distributing and profiling machine

Highly wear-resistant hardened metal edges are mounted on the profiling plough and at the front movable plate edges of the shoulder ploughs to raise the durability of these machine parts that are subjected to heavy wear and tear (Fig. 5). The special carbide quality, which is selected according to the operating position, produces a service life up to 15 times longer in comparison to conventional, weldable material. In many cases it is not necessary to dismantle the components for repair, thanks to the easily exchangeable hardened metal edges. These new hardened metal wearing edges reduce the downtime of the machines and bring considerable cost savings.

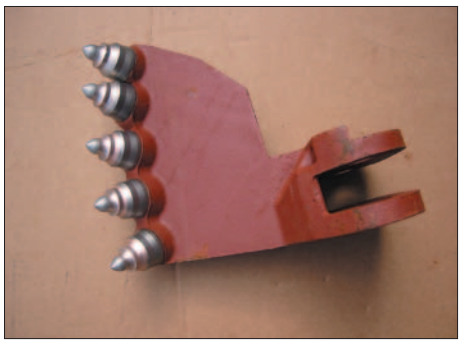
Wearing plate PT 1650

A variety of wearing plates are in use on many machines for track laying and track maintenance. All work units that come into contact with the track ballast are subjected to various degrees of wear depending upon the type of stone (e.g. basalt, granite, etc.) and the hardness of the ballast bed. A large number of wearing plates (Fig. 5) are required, particularly for

Fig. 5: Hardened metal wearing edge for ballast ploughs

Fig. 6: Excavating chain of a formation rehabilitation machine

Fig. 7: Excavating link for ballast cleaning machine



the shoulder ploughs of the profiling machines, cutter bars and conveyor chutes of cleaning machines and formation rehabilitation machines. The machine designers have reacted to this with innovative developments to keep the forces that occur as low as possible.

In the past, high strength plates, such as Hardox 500, have enabled a longer service life and consequently extended the intervals between maintenance. A further increase in the service life has been achieved with the new wearing plate material type PT 1650 that Deutsche Plasser is now offering. Up to 70 % longer operating times of these components are obtained due to a new type of metallurgic composition of the material.

This brings enormous savings for the machine operator because he can use the machine for longer in the future without having to exchange individual wearing parts. This enables enormous savings as regards transport of the machine to the workshop, occupancy of the repair workshops and working time for the respective servicing work. All this offers a high availability and thus higher cost-efficiency of the machines.

Excavating chain links for ballast cleaning machines

Like the wearing plates of the ballast cleaning machines, the individual links of the excavating chain (Fig, 6) are also subjected to a great deal of wear. The chains consist essentially of scraper shovels with two to five fingers, intermediate links and bolts. The fingers loosen the encrusted ballast, the scraper shovels serve to convey the material into the chain guides. Due to the application of new materials for the scraper shovels and scraper fingers of the excavating chains (Fig. 7), service life has been doubled. This defers replacement of the chain and brings a higher productivity of the machine.

Besides the new developments mentioned here, Deutsche Plasser has always endeavoured through close cooperation with the railways and contractors to achieve further advances as regards material quality, wear behaviour and availability of the complete track maintenance machines. The wear behaviour of the individual components and their properties can be recorded and evaluated, thanks to electronic documentation of all the wearing parts required, exact reports by the fitters on location and the intensive cooperation with the design engineers of the machine. Fast documentation of the operating conditions on location using digital cameras and fast transmission of these photos to the Technical Customer Service by email enables prompt reaction to the demands of practical operation.

Summary

For cost-efficient track maintenance, even the individual machine parts must be monitored and evaluated for economic efficiency. On the basis of intensive cooperation between the customer and the machine manufacturer, high quality materials can be used in design and production. Research and testing of new materials can lead to longer service life of the work units and therefore a more efficient application of the machines because there are fewer downtimes and wage costs incurred by repeated exchange of poor quality wearing parts. Furthermore, the operating costs of long-life materials are lower. Greater availability of the track maintenance machines is guaranteed by the use of new materials and is absolutely necessary for cost-efficient operation and completion of the orders in good time.

References

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