

Tailor-made service for track construction and maintenance machines

Quality and adherence to delivery schedules from troubleshooting through to retrofits

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As the number of running trains is increasing, construction windows for track maintenance are getting smaller and smaller. The maintenance of track construction machines plays a crucial role for planning safety. Track construction and maintenance companies therefore will evaluate which tasks they can carry out themselves and for which tasks the requirements of standards compliance, special measuring equipment and qualified technical staff are too high to be done in-house. Outsourcing will only work if one can rely on the service provider. This article gives an insight into the options for maintenance companies, either to use outsourced services on an ad hoc basis in addition to services supplied in-house or to outsource machine maintenance completely in order to ensure the availability of the machines.

In early June 2018 the German government came to an agreement with DB Netz about capacity-preserving construction [1]. In this agreement DB Netz and the railway companies commit to on-time operation with a significant increase of penalties as part of an extended incentive scheme. For the construction and maintenance machines in use this means even tighter schedules at the same reliable availability. As a manufacturer and service partner ROBEL has a responsibility for both of these subjects. A reliable service workshop lets the customer

not only decide about the when but also about the how and what. The requirement is clear: the service is to be delivered on time, at the agreed scope and with transparent costings. This is based on comprehensive technical expertise, knowledge of standards and maintenance intervals, quick analysis and reliable statements on what has to be done as a minimum and what additional work is considered advisable based on experience.

Centre of competence for axles

Shafts and wheel discs are always safety-related. Only if all process steps are performed to the highest quality will there be the level of safety that is indispensable in track construction and maintenance. Many track construction companies that carry out overhauls in-house outsource axle overhauls to specialist workshops. ROBEL is utilising the high degree of added value it can offer in-house for the reconditioning of running and power wheelsets and bogies - from manufacturing and testing through to repairs and overhauls (Fig. 1). Apart from the qualified technical staff required, the company's Freilassing factory also has the necessary measuring equipment and special machines.

For instance, a new double cylinder axle press (Fig. 2) is used for press-fitting and pressing off wheels and brake discs to/from the axle centre as well as measuring pre-mounted wheelsets. The press-fitted axles are measured with a laser, plotted and recorded efficiently and in line with prevailing standards. At a rate of approx. six minutes for two wheel discs the ROBEL

axle centre achieves significantly lower processing times and better quality at the same time. This also has an impact on the output: in 2017 about 600 power axles and 70 bogies passed through the service workshop at ROBEL.

Since the middle of 2018 a new cleaning system used for washing and removing the paint from complete wheelsets, axle shafts and individual components has been in operation. Apart from the huge time savings - manual cleaning of a complete wheelset would previously take a whole day - and the considerably reduced exposure of staff to pollution levels, the major benefit is the full compliance with the standards prescribed for European approvals. In France and the United Kingdom, for instance, cleaning axles and springs by sandblasting is no longer permitted.

Repairs of wheelsets and bogies

Vehicle failures during ongoing worksite operations can lead to skyrocketing costs. Therefore, emergency repairs will always be prioritised in our axle centre. Starting with an expert analysis of the work required, space and technical staff will be released to start repairing the damage straight away using the original drawings (Fig. 3). In such cases it is essential that spare parts are available. Our manufacturing experience pays dividends here: our warehousing staff knows where demand is greatest (axles, gearbox parts, bearings), which wear parts are standard parts and, most importantly, which components have long lead times. ROBEL's order and warehouse management is aimed at, amongst others,



Fig. 1: Bogie before and after reconditioning

the availability of wheel discs in all common EU sizes to ensure a quick response. In addition, our manufacturing facilities allow us to produce many parts in-house based on original drawings, if required. The aim is to strictly adhere to delivery schedules so that the machine can be redeployed on the track as quickly as possible.

Benefits of digital testing

Components subject to obligatory testing are relevant for the safe operation of maintenance vehicles on the track. Compliance with standards and documentation of the results provide the evidence required for approval that each machine component meets the requirements necessary for operation on the track.

Where automation and the use of machine-controlled testing makes sense, measurements are no longer taken manually but digitally. The measuring equipment and test rigs used at ROBEL, such as the geometry test bench, roughness measuring device or the micrometer have been adapted to the specifics of the track and are subject to strict requirements for maintenance and calibration. This ensures short cycle times and correct measurement results, which are automatically logged and documented.

A spring test bench is used for testing the primary and secondary suspension, i.e. normally 16 springs per bogie. The spring length, wire and coil diameters, force and any deviations are measured electronically, documented and recorded in a certifiable test protocol in line with DIN EN 13289/27204-4 (Fig. 4). At the end each spring that leaves the axle centre is marked in line with the applicable standards and of proven quality. A small but important part in a service system that focuses on consistently high standards.

Overhaul - planned value retention

The aim of preventive maintenance is the continuous trouble-free operation and, above all, the extension of the service life of a machine, which for Track Vehicles, for example, can easily be 25 years or more if serviced in line with best practice.

In Germany, for instance, it is a legal requirement for track construction machines to undergo an inspection every six years as per Article 32 of the Railway Construction and Operations Act (EBO). Condition of the vehicle permitting, the interval between two consecutive inspections may be extended several times by a year but to no more than 8 years. The scope of the inspection and maintenance measures as per EBO Article 32 is stipulated by law and worked to in check lists. The railway operating company now has the choice to take the required measures only or to also upgrade the machine with the latest technology as part of the overhaul work.



Fig. 2: Axle press for automatic press-fitting and pressing off wheels with digital monitoring and recording

Apart from replacing wear parts, the first inspection in an ideal scenario only requires visual checks and taking measurements. Special attention is paid to safety-relevant assemblies, such as travelling gear and brakes. Technical expertise becomes obvious in what measurements are taken and where and also in accurately determining and rectifying minor irregularities. In the course of the third inspection it is usually a good idea to have the vehicle overhauled completely. Here, the vehicle is dismantled

down to the last screw, the vehicle frame is completely exposed and measured. Assemblies such as the drive train are reconditioned and pneumatic, hydraulic, electric and electronic components renewed or completely overhauled. Calibrated measuring devices and original manufacturer documentation ensure the best service quality in each process step.

Once all components have been assembled, upgrades made and the machine is



Fig. 3: Overhaul of a wheelset with axle gearbox

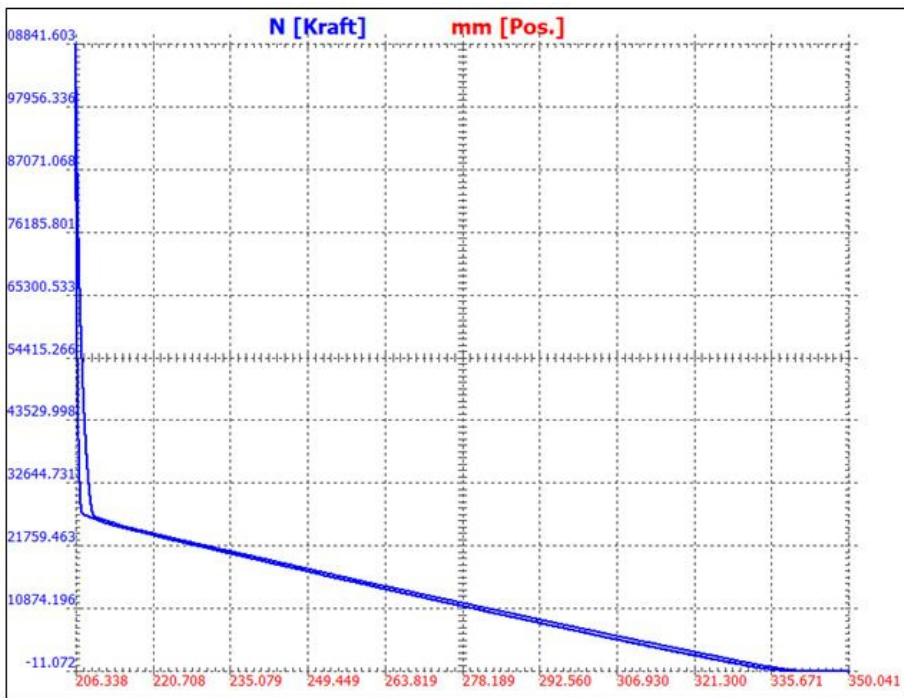


Fig. 4: The inspection record of the spring test rig confirms compliance with standards

operational again, it is extensively tested and commissioned. In-house track systems allow us to carry out the majority of the tests on site in Freilassing (Fig. 5). The final stage of recommissioning consists of test

runs on DB track, just next to our company premises; these can include brake tests, travelling gear adjustments or runs under load conditions. The machine is weighed on in-house calibrated weigh bridges. As

ROBEL has the required EBA certificates and approvals for acceptance, a completely overhauled machine that is ready to be deployed is returned to the client (Fig.6). A last load test or final commissioning is carried out at the client's site with the support of ROBEL service engineers.

Retrofit - new technology on a solid basis

Compared to a new purchase a retrofit brings considerable cost benefits for the customer. Depending on the scope of the retrofit, the machine will be out of action for three to six months but will be upgraded to the customer's specific requirements and can be deployed on the track for many more decades. No additional cost will be incurred if the modification work does not require any approvals. Training usually takes only half a day as the operators know the procedures. Accordingly, the cost usually arising from "initial issues" and operating errors will be reduced. The machine will be ready for deployment straight away. Since the vehicle is updated with the latest technology this will often open up new areas of use. For instance, if existing vehicles are retrofitted with particulate filter systems or new engines meeting the current exhaust emission standards, they will then also be suitable for use in tunnels.

ROBEL's well-rehearsed project teams implement the complete refurbishment. From the initial quotation through to final client acceptance the customer is involved in the project and has the opportunity to actively help shape the project.

Depending on clients' wishes, the following modifications can be carried out in addition to the mandatory work in the course of a major overhaul:

- Installation of a new vehicle cab
- Installation of a new heating or air conditioning system
- Generator retrofit
- Installation of new engines with current exhaust gas treatment (particulate filter or SCR)
- Installation of new hydraulic cranes and much more.

Following completion of the major overhaul the customer has a vehicle that is as good as new (Fig. 7).

Emergency assistance - accident repairs

After accidents, such as derailments and crashes of track construction machines, the reliability and experience of a service workshop is crucial. It is necessary to assess the damage straight away for insurance purposes and to release resources for unplanned repairs. Here manufacturer know-how is critical when liaising with the customer. The operating company knows the problem, the manufacturer knows the interrelations and has the original spare parts in stock. We restore the vehicle back to its



Fig. 3: Clearance gauge measurement on in-house test track

original quality as swiftly as possible and taking into consideration the legal provisions for accident repairs. Tests and acceptance are carried out directly at our factory so that the machine can be returned to the track straight away.

Support throughout the machine service life

A service workshop is only as good as its customer service. Our customer service team supports a new machine during its initial phase of deployment in the warranty period and ensures the trouble-free function throughout its service life, from re-certification inspections and maintenance through to the full service.

If the work site comes to a standstill, a fast response and timely repair of faults are important. As a manufacturer our company will make sure that easy access for maintenance work and fault analyses are taken into consideration in the design stage of a machine. The vehicle history will show all faults of a machine from the day it has been commissioned. In addition to that, the alarm list on the control panel will indicate to the vehicle driver where a problem occurs. Our service technicians will perform a diagnosis of the problem over the phone and establish the cause of the issue.

The best outcome for the worksite is if the fault can be repaired there and then. ROBEL service engineers go to sites worldwide about 700 times a year to repair hydraulic, pneumatic, electrical and mechanical faults. Decades of hands-on experience are invaluable here - our engineers know exactly what equipment the service vehicle will need to carry, they know the machine and the actions required. In addition, the service technician remains a permanent contact for the operating company: a short phone call from the machine operator or manager will then be sufficient to get a fault repaired.



Fig. 6: Dismantling the old bogie during an overhaul

Maintenance and re-certification inspections

The maintenance intervals detailed in the maintenance schedule (Fig. 8) for each machine help to maintain the functionality and operational safety of the machine. The customer decides on a case-by-case basis which individual services for the machine maintenance - engine, work units, wheel-sets, etc. - are to be carried out by external service providers. At ROBEL, re-certification inspections are carried out in-house by our trained staff. Our service facilities are equipped with heavy-duty cranes and lifting equipment for safely lifting heavy machines

for maintenance work in the lower machine area. The maintenance process, assembly and availability of spare parts are accurately synchronised to ensure safe planning for the customer.

Knowledge transfer for efficient working

Those who know their work equipment can use it correctly and safely. The better staff have been trained the lower the risk of accidents and the likelihood of operating errors. ROBEL works hand in hand with the customer to provide needs-based training in the course of commissioning a machine as well as product and service training in



Fig. 7: From old to new: Track Vehicle before and after a retrofit

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Voith Achsgetriebe SK525 (3x) + KE525 (1x)	Hauptüberholung	W 3-29 ff und Voith-Dokumentation			Grube	30.000 Bh bzw. 8 Jahre												(x)				(x)	
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Drehgestelle	Sichtprüfung (VT) sicherheitsrelevanter Schweißverbindungen	W 3-1 f									X												
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Laufräder	Prüfung auf Materialschäden gem. RIL 900 0100	W 3-13 f						X															
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Fig. 8: Maintenance schedule: the table shows the maintenance tasks and intervals for the individual vehicle components

electrics, pneumatics, hydraulics and mechanics. Theoretical and practical hands-on training on the vehicle are provided in preparation for the external examination and for operation, maintenance and use of the spare parts catalogue. After all, the track maintenance company should be able to handle the machine proficiently. Therefore, much of the training is provided on site; regular follow-up training is provided to reduce the number of operating errors and the cost of repairs. The training manager remains the personal contact that is available throughout the service life of a product and as such an ad hoc service provider for the track maintenance company.

Summary

ROBEL carries out servicing work on wheelsets, bogies and complete track construction and maintenance machines, making use of the latest market developments and technical know-how from design and

manufacturing. From the small service after 250 operating hours through to a complete machine overhaul we liaise with the customer about what is relevant now and in future for the safe operation of a machine and carry out the appropriate measures on time and to budget.

REFERENCES

[1] Rail Business, Pakt gegen Beeinträchtigung der Bahnen durch Bautätigkeit (Agreement to avoid disruption of railways by construction work), 11.06.2018

IMAGE CREDITS

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International service – from the spare part to the full service

ROBEL is a certified Repair Centre 512 of Deutsche Bahn (DB) and has approvals from European railway operators, such as

- the ECM certification for the maintenance of rail vehicles and secondary vehicles
- HPQ qualification from DB for production and reconditioning wheelsets and wheelset bearing housings
- Approvals from SNCF France and RISAS UK for the overhaul and new production of wheelsets



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