Obvious benefits

Series, part 2

With retrofit programmes, track maintenance vehicles in good condition can be given a new lease of life at half the price and the same functionality.

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Gleaming in renewed splendour – the track vehicle of the municipal transport company Sporveien Oslo AS after the Robel retrofit programme.

Large-scale machine reconditioning. This is how one could describe a retrofit. Retrofits are nothing new to industry in general and the railway sector in particular. A machine or a vehicle undergoing a retrofit programme means an upgrade and major overhaul in one. A retrofit is the big brother of the periodically required overhauls, a so-called “major overhaul plus”. On a voluntary basis but making perfect sense. As long as the basic condition of a machine is good, a retrofit in place of a new purchase deserves consideration: half the price, full functionality, double the service life. Turning an old machine into one that is “as good as new” could be the rule of thumb for value retention through a retrofit. “Retro” here refers to the original status at the time of approval. On the outside and from a technical point of view, the machines after a retrofit are on a par with new ones but don’t include all the latest features that are possible and often relevant for approvals. Florian Steiner, Team Leader of Service Projects in the Service & Customer Support business unit at Robel Bahnbaumaschinen GmbH, compares retrofit and general overhaul as follows: “A retrofit allows much more than the law requires for general overhauls”, however, only within the legal limits set by approvals legislation.


ROBEL
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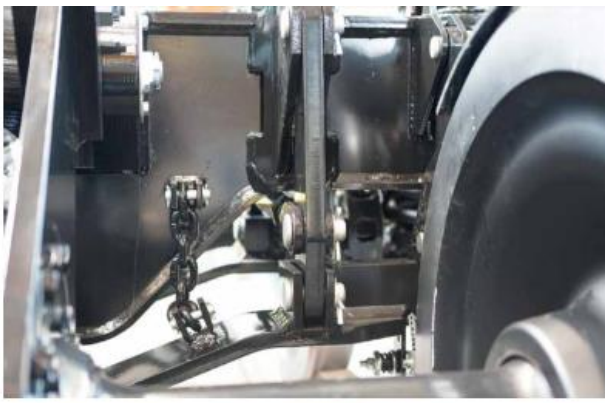

Each retrofit is different

Each retrofit considers the scope of upgrades very carefully. As a rule, the upgrades will not go as far as requiring new acceptance after completion. Due to the time and cost this would involve, many a retrofit advantage would disappear. A new engine can be fitted but not with much more output. Emission control systems are of course allowed. Possibly also a new control system (depending on the approval), but care needs to be taken when extending its functionality. New electrics, new hydraulics, more light, air conditioning, fire safety system, an additional generator, improved working safety as well as better ergonomics, comfortable seats - no problem. But if the overall weight or the dimensions were to increase, the old approval could become invalid. Therefore, the scope of work is carefully specified in close cooperation between customer and service partner and depending on the current and target condition.

Manufacturers such as Robel in Freilassing that offer both new machines and retrofit programmes, have the advantages of existing original documentation and direct access to many spare parts. Thanks to the model history, they know of all developments and possible weaknesses of their previous products. The staff are highly trained and provided with all the required workshop equipment for turning "old into new" successfully. At the Robel works in Upper Bavaria, retrofit programmes have been running for about ten years as an economical alternative to new machine purchases. Especially the track vehicles, which are manufactured in large numbers, have been undergoing retrofits on a sizeable scale up to now. With their large angular cabins, they still look very modern but may have been in use for a few decades and possibly also changed owners. Several infrastructure maintenance companies in Germany and other countries have recognised the benefits of retrofits, so that several track vehicles at the same time will often undergo retrofits in Freilassing.

Numerous benefits

Sometimes a retrofit cannot be avoided, for example if a machine will have to meet stricter emission standards in its area of deployment. Therefore, the best time for a retrofit may vary from machine to machine. After the third general overhaul, which, according to the German Railway Construction and Operating Regulation (EBO) is due every six to eight years, the decision will have to be made between a new machine purchase or a major overhaul and upgrade. During its time in the workshop, the existing vehicle will be out of service for a few months, depending on the scope of the retrofit. But approval procedures for new machines may take a long time and be expensive. And staff will have to be trained afterwards. On the other hand, the retrofitted vehicle can be deployed straight away after the agreed downtime, staff and customer workshops are familiar with it. In addition, there is a 24-month warranty period. It's not only the operators of track vehicles that have recognised these benefits: Robel also carries out retrofits on other machines, e.g. rail trains and ballast ploughs (see page 48).

Following initial discussions, the customer will organise "cover" during the downtime of the machine, maybe hire a replacement machine or specify precise time windows during quieter periods. This is followed by a calculation of time requirements and cost, updates of design, drawings and data, compilation of parts lists and work instructions, ordering spare parts and components. Overall, "the time from deciding for a retrofit to the machine being operational again will be at least seven but no more than twelve months", according to Project Manager Florian Steiner.

Work involving many steps

Once the decision has been made, everything has been discussed and planned, the machine "returns" to the factory, is received like a patient. Disassembly, dismantling the machine into its components - sometimes down to its last screw - is the first step for the old vehicle to get fit again. Of course, this also includes safety-relevant components and load-bearing structures. Finally, after a few days' work, the bare machine frame will stand on the shop floor, surrounded by many other well-arranged but no longer complete components. Components which will be reconditioned externally by the respective manufacturers are sent off or exchanged for components that have already been reconditioned. This revolving exchange of structurally identical components, such as hydraulic and pneumatic components or engines, has become an effective method to limit the waiting times for the return of the parts and will certainly be within the approval specification.

Opposite page, top: The track vehicle on the left after a retrofit, the one on the right at delivery before a retrofit.
Opposite page, centre and bottom: The specialists at Robel Bahnbaumaschinen GmbH pay close attention to the bogies – the photos show brake rigging and bogie springs before and after a retrofit.

Within four years, 22 apprentices reconditioned this Robel crew car from the 1950s.

After disassembly, the machine and its components will be cleaned, checked and measured. For instance, the frame will be sandblasted so that all welds are clean from paint and other layers for checking. Damage from accidents or derailments will often still be visible after repair, but special methods are required for welds. Here, Robel relies on magnetic particle testing, among other things. A ferrous powder displays different patterns in the magnetic field if the tested material is faulty. Here, too, each task is documented in great detail.

A slightly different approach is taken for wheelsets, where there is no sandblasting in the interest of inspection and value retention. For machines from some countries this is no longer permitted anyway. French regulations forbid the grinding of wheelset shafts, British regulations do not allow wheelset sandblasting. Therefore, Robel has a paint stripping plant for complete wheelsets. Immersing the wheelset fully in an alkaline bath removes any grease, dirt and paint. In addition, this takes 20 minutes and is therefore much quicker than manual cleaning, which used to take a whole day for each wheelset and was neither a clean nor a pleasant job. When taking the wheelset out of the bath, “you can see the condition of the material perfectly”, says Florian Steiner. If the grooves on the axle bearing or wheel disc are too deep, the wheelset needs to be replaced. For reconditioning or reproducing all types of wheelsets, Robel relies on its large and expertly equipped axle centre. Here, many different wheel discs are stored, and shafts are turned - everything just around the corner of the workstations for the retrofit.

From a crew car to an object of affection: the “Klv 51” trainee project

It is the forefather of today’s track vehicles, has a front-end engine at the small driver’s cab that is typical for old-type lorries and a wooden loading platform: the formerly popular Klv 51 small railway vehicle with combustion engine. From 1955, Robel built 238 of them in Munich. Robel in Freilassing now owns one of them again, a type of museum vehicle from the first series, reconditioned and partly rebuilt. This was not a retrofit programme, but a project of the company’s workshop apprentices. 22 apprentices of six age groups were involved in the project for the little yellow vehicle.

It started on 16th October 2014, when the “crew car” was still painted in blue and white, very worn and had an untypical structure. Trainee industrial and construction mechanics, electronic and mechatronic engineers spent around 2,300 hours over four years on getting the gem into shape. Most of the work was carried out between May and July, and new apprentices would join the project every year. After all, the scheduling needed to take into consideration basic training and exam periods for the apprentices. It was not easy to find suitable documents from the archives after 60 years; some drawings and parts lists were missing. On top of that, crew cars used to be available in different versions, and many parts of the machine were no longer original parts. The various departments at Robel supported the project. And although the popular device looks really small, Robel also had to find space in the busy workshop for the work to be carried out.

Robel’s Klv 51 with type and works number 21.11 W14 was bought back by the company at the end of 2011. The small two-axle vehicle had first belonged to the German Federal Railway and then had stood idle at Maarheeze in the Netherlands. Its future place will be at the Robel premises. The engine and gearbox have been reconditioned and are fully operational: “It runs superbly”, Training and Project Manager Manfred Höglauer and his trainees are really pleased with the result of the long but very instructive job. There are no plans for taking the vehicle for a ride or donating it to a museum, but the company is considering adding a reproduction Robel crane typical of that era.
(Achim Uhlenhut)

A “double cylinder axle press”, which is usually not part of normal workshop equipment, takes on the removal and fitting of the wheel and brake discs at maximum precision. And, of course, all required data is documented automatically following the laser measurement and recording. All measurements, not only of the wheelset and frame, are taken digitally, if possible.

A clean run with new power

The existing drive engine can be replaced with a structurally equal replacement engine with particulate filter, that has been reconditioned by the manufacturer, or a new engine with SCR catalytic converter or urea injection with the same output. For the retrofit of its track vehicle fleet, which was carried out by Robel, the Norwegian transport company Sporveien Oslo AS decided in favour of new engines with the latest emission control systems. They now comply with the strict environmental requirements for use in Oslo, Europe’s Green Capital 2019. One particulate filter alone can result in expanding the area of deployment to tunnels, the very clean version will open up use in inner city areas which would otherwise be “closed”. Real added value.

No vehicle, no machine without a control system. This technology, too, will be checked and updated by the manufacturer. A little more work will be required for aligning a new engine with the existing system and a control system that may well be 20 to 25 years older. If certain electronic control assemblies are no longer available, this will add to the complexity of the task. But up to now a suitable solution has always been found. Once everything has come together, the reassembly of the big vehicle puzzle will commence. Fitting all the components in and on the frame is the same as for vehicle new builds. In both cases, everything will be installed and dismantled again following successful functional tests prior to painting. Only then the final assembly will be carried out, which also includes the cabin.

A new house

Another decision that needs to be made is whether the cabin of a track vehicle should be reconditioned or newly built. In both cases fireproof material in accordance with current fire safety requirements will replace the existing flooring, the insulating materials (also on cables and conduits), parts of the interior panelling and the built-in seats. A new driver’s seat has better ergonomics than its worn predecessor. Nowadays, the window panes are not necessarily glued in, they may be clamped or screwed in. This makes it easier to replace them following damage during operation. On top of that, it requires less effort: For bonding, special clean rooms are required, applying silicon adhesive cannot be done in the same room as paintwork. Fitting additional windows will improve the view of the line and working area. The cab will have the same measurements as before but will have better ergonomics, be newly equipped and even more practical than before. And the cabin front looks slightly different.

The track vehicles for Norway were fitted with new engines and fully rewired.

Once the cabin is fitted, the work on the track vehicle is approaching its end. Hydraulic, pneumatic, electric and electronic components have been put in their places, everything is connected up and working. The lighting, now in LED technology, is updated, just like the heating, air conditioning, sockets and much more. Final comprehensive tests mark the start of the machine’s second era of deployment. Factory commissioning includes functional tests, trials and test run, some of which can be done on Robel’s own track installations. The final commissioning will then be performed at the customer’s site. In the end, the customer will receive a fully overhauled machine with up-to-date documentation, a new spare parts catalogue and many revised drawings. Half a day’s training due to different operation is still a lot less than would be required for new machines. Another 20 years of use at full output, better working safety, better ergonomics and better environmental protection can commence. “Due to their obvious benefits, retrofits have become very popular”, says our specialist Steiner, who is sure that the demand will increase even further.

In the course of 2019, a quick-action ballast distributing and profiling machine (SSP) from the track construction company H. F. Wiebe was retrofitted at Robel Bahnbaumaschinen GmbH for many more years of service life. The machine was not only fully reconditioned (above left) but was also fitted with a new cab with a new driver's and operator's desk (bottom left) as well as numerous new windows for an even better all-round view of the work site (right).

All-round treatment for a second lease of life

New paint, new cab and much more - the retrofit programme for ballast ploughs offered by Robel Bahnbaumaschinen GmbH started with a machine from the track construction company H. F. Wiebe. Robel, the manufacturing company from Freilassing in Germany is attracting attention with its retrofit programmes for track vehicles (see page ••). The SSP110 SW quick-action ballast distributing and profiling machine, which was first deployed in 1987 by a previous owner, underwent a major overhaul, an all-round treatment at the age of over 30. This was done very thoroughly: no part remained untouched. The design, which is very popular with track maintenance companies, is well proven, and after a retrofit and taking into consideration its specified limits, the machine is ready to start a new lease of life. Compared to a new purchase, this saves considerable time and investment.

The list of the work carried out is long. It starts with the disassembly, followed by numerous measurements and tests. As with new machines, the work is concluded with work trials and inspections and approvals before the machine is handed back. What happens in between, fills many pages of bullet points. The invisible work included the renewal or replacement of many parts, from the deflector plate through to complete wheelsets and each individual gear wheel. Everything that was deemed to need replacing after thorough examination was replaced, everything that could be improved was improved. What is obvious at first sight, apart from the new paint in track construction yellow, is the new driver's and operator's cab. Unlike the old cab, this one also permits the view down to the ground, which, together with new headlights, improves the view of the working area. Heating, insulation and fire safety equipment are new, as well as the driver's desk and the seats.

At a second glance, one also notices changes to the plough blades. Not only are they of new, highly wear-proof material but they also have folding additional shields. Additional emergency stop buttons and many other devices have been added for better safety, and the external work control system has been updated with further functions.

Robel had to do a great deal of preparatory work for the retrofit. The machines were originally designed and built by Plasser. The original documents are still archived, but many essential parts had to be digitised or recreated on the computer. A lot of work, which will now benefit other retrofits of this type of ballast profiling machines: Over 100 of those have been built in Freilassing for German customers alone.