

Success Story DIWA NXT

Efficiency for the next generation of buses





DIWA NXT – closing the gap in drive concepts

Since 2022, Voith has been equipping city and intercity buses and touring coaches with the latest generation of its legendary DIWA automatic transmission system: DIWA NXT. With its mild hybrid system, the technology group is closing the gap between diesel-only and alternative drive solutions. Hanauer Straßenbahn GmbH (HSB) was one of the first companies to use vehicles fitted with DIWA NXT on its scheduled services. Since the end of 2022, a total of 16 new solo and articulated buses have been out and about on the streets of Hanau, the birthplace of the Brothers Grimm.



HSB – facts and figures

Bus fleet

- + 64 vehicles in scheduled services
- + Models:
 - Solaris Bus & Coach Urbino 12, Urbino 18, New Urbino 12, New Urbino 18
 - EvoBus Citaro O 530 G

Public transport network

- + 13 lines
- + Length: 111 km
- + Number of bus stops: 176
- + Distance covered: approx. 2.9 million km/year
- + Number of passengers: approx. 14 million/year

DIWA NXT – key details

- + Mild hybrid system
- + 7 gears (incl. 2 overdrive)
- + Central recuperation unit (CRU):
 - 25 kW continuous power
 - up to 35 kW peak power from energy recovery
 - 48 V motor with 300 Nm engine starting torque for all kinds of combustion engines
- + Integrated frequency inverter
- + Integrated secondary retarder

Boosting performance of the public transport system

Hanau is one of the booming large cities around the metropolis of Frankfurt. The birthplace of the Brothers Grimm, which has around a population of around 100,000 people, is continuing to grow. This growth is also reflected in its public transport system. Every year, HSB's vehicles are used by more than 14 million people. Here too, the numbers have been increasing for years, which is why the company developed a new fleet strategy in 2017. Its objective was a comprehensive development to achieve more sustainable mobility. At the same time, however, there had to be "greater performance on the road," stresses Corinna Maria Schulte, Managing Director of HSB.

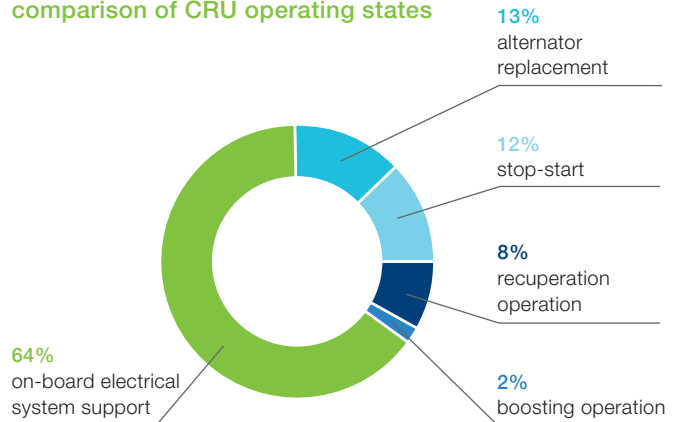
Among other things, HSB increased the number of articulated buses in its fleet. Twenty-nine of the company's 64 vehicles now travel through the streets of Hanau with the characteristic trailing section at the rear. Each bus can carry around 150 passengers. This restructuring of the fleet, along with the extra passenger traffic, has resulted in an 11 percent increase in performance. In other words, more passengers than ever can now be transported on Hanau's scheduled services.



“We’ve improved performance on the roads by 11 percent.”

Corinna Maria Schulte,
Managing Director of HSB

Analysis of operating data and comparison of CRU operating states



Even when used in heavy articulated buses and at the low average speeds prevailing in Hanau's city traffic, the DIWA NXT CRU can deliver the on-board power supply with around 64% recuperation energy. Also impressive is the more than 12% support for the automatic stop-start system. Both factors help save fuel and lower CO₂ emissions. (All figures rounded)

DIWA: a good experience in every respect

Polish manufacturer Solaris Bus & Coach is the supplier of the new buses. HSB has a longstanding relationship with the company, which is based in Bolechowo-Osiedle, south of Poznan. With one exception, the entire fleet for scheduled services consists of variants of the Urbino and New Urbino models, reliably powered by DIWA transmissions from Voith. This is yet another – and well-founded – tradition, as Manfred Senger, Technical Director of HSB, explains: “At HSB, I pretty much grew up with the DIWA transmission system. When I started in Hanau in 1984, our vehicles were already fitted with Voith technology. Over the years, staff and management alike have been completely satisfied with the various generations of the transmission system.”

Senger praises the various DIWA iterations because of their reliability, performance and drive comfort. HSB has been impressed over the years by the efficiency of the transmissions that has helped lower the fuel consumption of the vehicle fleet. At the same time, DIWA's reliability and ease of repair have ensured low maintenance costs and downtimes. “However, in the event of any problem, Voith's service team gets to us quickly and resolves it,” adds Christian Janka, Workshop Manager at HSB. Voith Service's online shop also earned considerable praise from the Hanau team: “Any spare parts we order are always delivered promptly, even overnight if it's urgent,” says Janka.

Decision in favor of mild hybrid

It was therefore logical that HSB would once again favor Voith technology when it came to the current renewal of the fleet. It opted for DIWA NXT, Voith's first mild hybrid transmission for buses. It is far more than just the latest generation of the legendary range of transmissions, as Markus Bischoff, Vice President DIWA & Dampers at Voith, underlines: "DIWA NXT combines all the technical strengths of earlier generations and eliminates their weaknesses." During the development process, the Voith team scrutinized and further optimized almost every component of the central transmission unit. The result is one of the most modern transmission concepts for buses with combustion engines.

In combination with the recuperation unit and a powerful 48 V electric motor, the innovative drive concept ensures substantial fuel savings with an associated reduction in CO₂ emissions. "We have rejuvenated our fleet with these new vehicles while simultaneously meeting the requirements of the EU Clean Vehicles Directive (CVD)," says Schulte. The CVD and its German transposition, the Clean Vehicles Procurement Act, obliges public transport operators to adhere to minimum targets for low-emission vehicles in their public procurement procedures.

All expectations met

Hanau meets all the conditions for fully exploiting the benefits of DIWA NXT. The 13 lines operated by HSB serve a closely integrated 111 km long network with a total of 176 bus stops. The topography is largely flat. "This also means that the vehicles have to repeatedly brake, stop and move off at short intervals. Accordingly, average speeds are low, especially as in some cases the buses are traveling in pedestrian zones in Hanau's city center," Janka explains.

The reliable stop-start function of DIWA NXT ensures lower air pollutant emissions in this environment with its narrow roads and tall buildings. These emissions also include CO₂, the reduction of which is a key objective of the CVD. "Thanks to the 16 new buses, we estimate that we are generating 1,000 tons fewer greenhouse gases every year than we did with their predecessors," says Janka. This aspect is also reflected positively in HSB's bottom line, as fuel consumption has been noticeably reduced. "Thanks to the improvements in the interplay between engine and transmission, we have achieved up to six liters less fuel consumption per 100 kilometers in our articulated buses compared with their predecessors. And fuel is not getting any cheaper," says Senger.



“Fuel consumption has been reduced by up to six liters.”

Manfred Senger,
Technical Director of HSB

Schulte projects that the investment in the transmission system will have been recouped in as little as 30 to 36 months.

When it comes to reliability, the DIWA NXT also meets all the public transport company's expectations. "Currently (as of May 2024), the vehicles have covered around 90,000 kilometers. So far, we have not had any downtimes or other major problems. We have been able to rectify any minor faults ourselves with our workshop team," says Janka. The new transmission system is just as maintenance-friendly as its predecessors. Only for the CRU components did training have to be provided for Janka and his colleagues. "Naturally, this reliability and ease of maintenance reduce our costs in the long term," says Janka. Schulte sums up the experience with DIWA NXT as follows: "Thanks to our many years of good experience with Voith, we were confident that we were opting for a sophisticated development, even though the transmission was still very new in 2022. The insights from practical operation during the last few months show that we made the right decision."



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