

**VOITH**

# Efficiency all Along the Line. DIWA Excellence



Utilizing Service.  
Moving on Excellently  
with DIWA Excellence.



Worldwide, over 160 000 DIWA automatic transmissions are in service. This makes the DIWA one of the most successful bus transmissions ever. Behind this success is more than just a product. With DIWA Excellence, Voith offers manufacturers and operators a service and consulting program that starts with the driveline design and extends across the entire life-cycle.

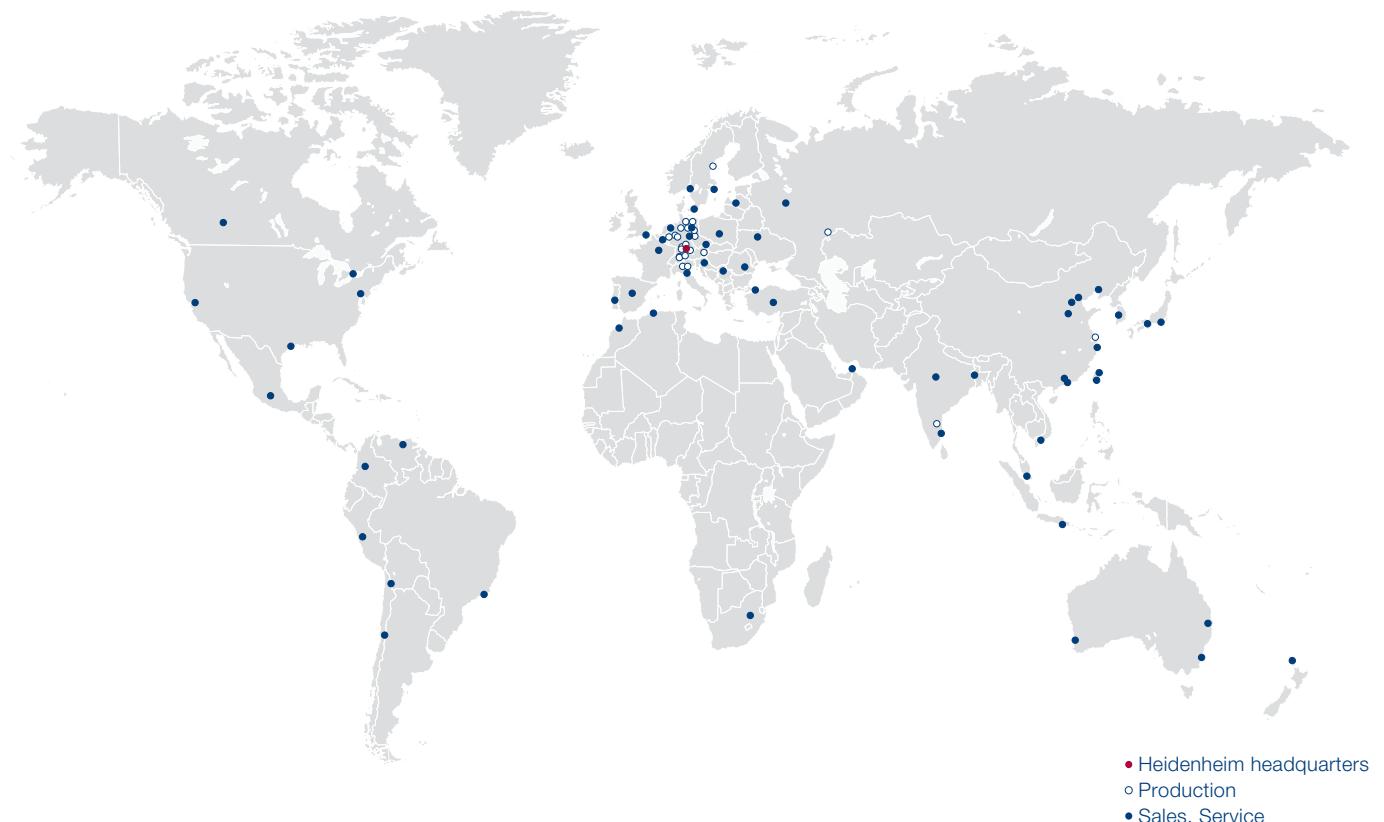
DIWA Excellence offers customer-oriented solutions that are tailor-made for your specific requirements. Alongside targeted measures for fuel optimization, the modular program also covers individual solutions for maintenance and repairs up to service- and maintenance agreements. And all this with the latest technologies, for example the DIWA SmartNet telemetric system. DIWA Excellence increases the efficiency of your fleet all along the line. Because it reduces costs and increases

vehicle availability and makes a vital contribution to the achievement of your sustainability goals.

And with over 40 marketing companies worldwide, this service is at your disposal wherever you use DIWA transmissions. At uniformly high quality standards. We have the know-how. Utilize our experience.

#### Voith Turbo worldwide

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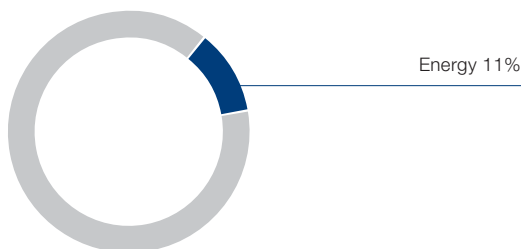
- 1 SensoTop masters the demanding topography in the city traffic of San Francisco, USA.
- 2 High savings potentials with BRT Systems like here in Bogotá, Colombia.

# Reducing Costs. Utilizing Fuel Optimally, Increasing Efficiency.

Fuel is not getting cheaper. This makes it a major item among operating costs. With DIWA Excellence you can reduce consumption sustainably and increase efficiency – and simultaneously offer higher safety and comfort for all.

## Distribution of operating cost

Source: VDV



## Our solutions for optimum fuel consumption

- Consultation on driveline configuration – ideal conditions right from the start
- Operating data evaluation – identifying potential
- SensoTop – always in the optimum gear
- DIWA driver training – great potential

### Always in the optimum gear – with SensoTop

Level route or hilly terrain? Heavy or low load? Where other manufacturers exclusively rely on driving dynamic calculations, the inclination sensor provides additional and precise information about the topography of the route – so that SensoTop can steplessly adapt the gear-shifting points in any situation – for maximum fuel efficiency.

### Up to 7% less consumption

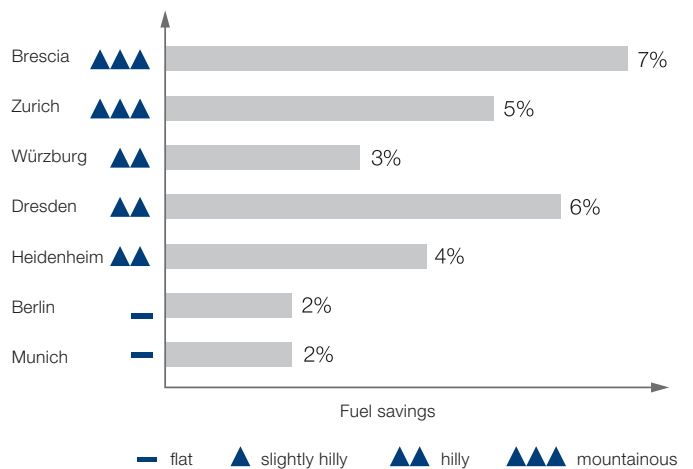
Depending on the topography and the vehicle operation, SensoTop reduces fuel consumption by 2% to 7% compared with conventional gear-shifting programs. Savings potentials that significantly reduce your operating costs. At the same time, SensoTop makes an active contribution to a cleaner environment because CO<sub>2</sub>-emissions are effectively reduced.

### Higher safety

SensoTop also increases the safety of passengers and drivers. The gear-shifting strategy avoids gear hunting at upward gradients and allows comfortable start-ups.

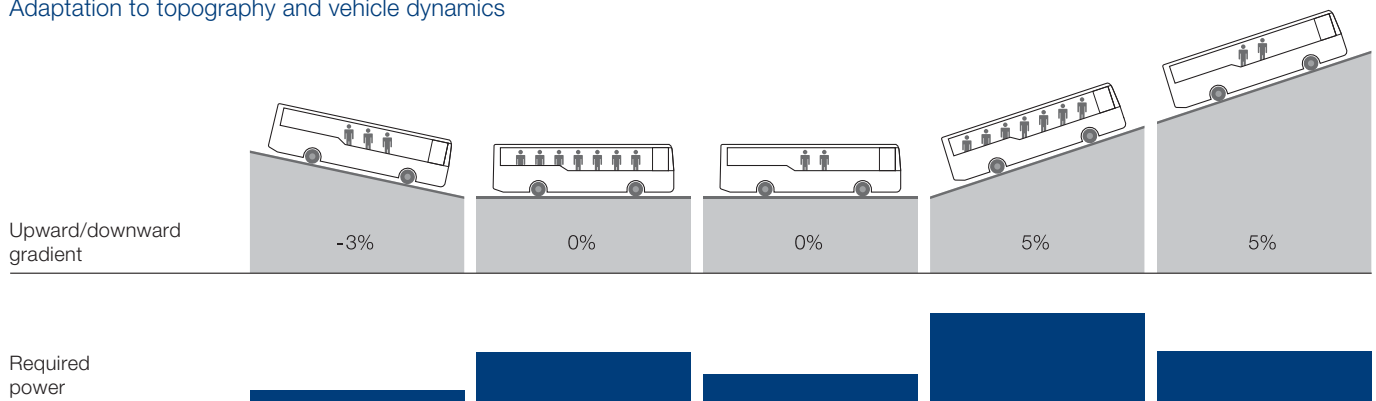
### Fuel savings with SensoTop

Depending on topography and vehicle operation between 2% and 7%.



### Optimum fuel consumption with SensoTop

Adaptation to topography and vehicle dynamics





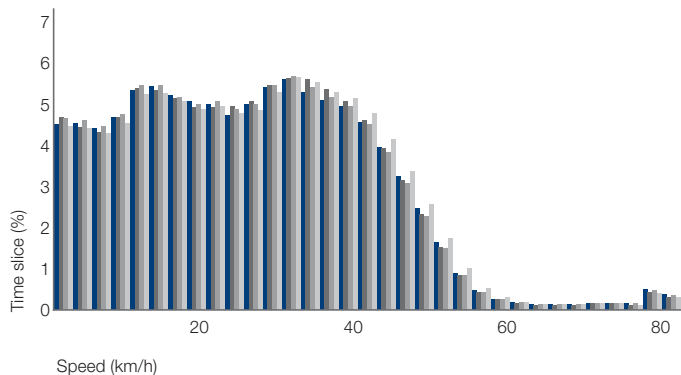
### Ideally configured from the start – the driveline

No matter whether a bus has to cope with heavy urban start-stop traffic, take commuters from the suburbs to the city or enjoys unhindered travel in a BRT System – a customized driveline is the best precondition for optimized consumption, comfort and performance.

Voith has decades of experience and is always happy to give advice on individual driveline configurations. The optimum driveline for future service is defined in close coordination with operators and manufacturers while it is still in the concept phase. This saves fuel and costs – and all this even before the first drive of the bus.

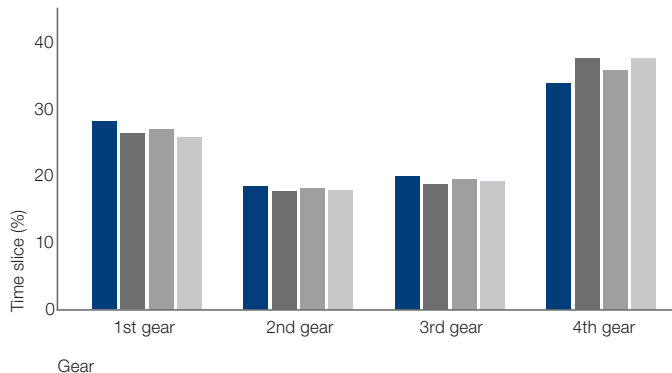
### The operating data analysis identifies optimization potentials

Speed profile per bus in %



### Time spent in individual gears (V > 0)

Per bus in %





### Always up to date – the operating data recording system

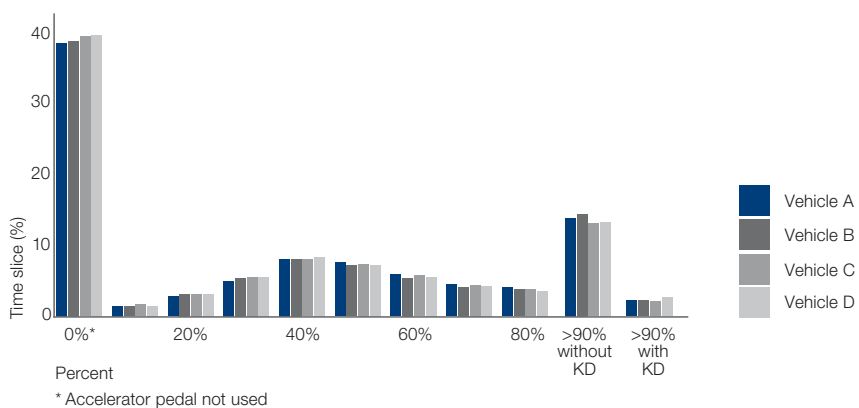
How often does the bus stop along the route and for how long does it stop with the engine running? How high is its average speed? What is the gear distribution? These are just some of the questions that are reliably answered by the operating data-recording system. It provides insight into the vehicle operation, the driver behavior and the condition of the transmission and also identifies optimization potentials.

### With intuition and feeling – DIWA driver training

Everything depends on the driver. Based on his experience and routine, significant fuel savings can be achieved through individual driving behavior. Higher safety and less wear are other advantages to be gained. The Voith DIWA driver training shows how to do it. To the benefit of your drivers – and you as an operator.

### Time spent in accelerator position with kick-down

Per bus in %





- 1 Permanent transmission monitoring increase bus availability in Dubai.
- 2 Düsseldorf buses make more and more use of exchange transmissions.

# Increasing Availability. Reducing Downtimes with Preventive Maintenance.

A bus is not earning money unless it is on the road. And what's worse: Every minute that your bus is off the road costs money: Maintenance costs, repair costs, if not even fines for non-adherence to schedules due to vehicle downtimes. With the preventive maintenance of DIWA Excellence, downtimes can be reduced and workshop stops can be planned. And all this before any failures occur.

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## 99% availability in Dubai and Abu Dhabi

Over 1 000 buses from different manufacturers in Dubai and Abu Dhabi are fitted with DIWA transmissions and have been utilizing the permanent transmission monitoring platform of the DIWA SmartNet telemetric system for several years. Using GPRS, the

system transmits relevant parameters from the Middle East to the Voith server in Heidenheim, where the data is automatically evaluated. The local Voith service engineers have permanent access to all transmissions and can immediately introduce any required measures. Hightech in the desert. The result speaks for itself.

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### Düsseldorf runs well with exchange transmissions

The business with exchange transmissions in Germany is growing by double digits. The operator Rheinbahn Düsseldorf swears by it and, in return for defect old units, gets fully over-

hauled transmissions that are technically up to date. As a result, the operator saves on repair costs and enjoys the reassurance of ex-works warranty.

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### Pure routine – The Health Check

This selective assessment of the condition of the transmission is available in three different versions. Depending on the scope of the examination, your Voith service technician analyses selected transmission data and tests the function of the unit on a test drive. He carries out a visual examination of the entire system and usually performs small repairs on the spot. Your advantage: you have a better grasp of the condition of your transmission and are able to plan workshop stops.

### Permanent reassurance – via DIWA SmartNet

An even higher degree of availability than provided by the Health Check is ensured by continuous transmission monitoring with DIWA SmartNet. DIWA SmartNet regularly transmits transmission data via satellite to a Voith server. The evaluation is standardized. In the event of any irregularities, operators immediately receive an automatically generated failure report – and thus an opportunity for preventive repair.

In this way, unscheduled vehicle downtimes can be prevented and standstill periods are reduced to a minimum. As an operator you thus benefit from maximum vehicle availability. DIWA SmartNet can be used as a stand-alone system, but is also suitable for integration into existing on-board computer systems. Whatever suits you best.

### Tested and found to be good – spare parts and exchange transmissions

And what if a transmission really fails? In this case Voith delivers a fully overhauled exchange transmission. These units meet the latest technical standards and are tested in accordance with the same requirements that apply to new transmissions. But above all, exchange transmissions are delivered within the shortest of times – including ex-works warranty. As a result your bus is back on the road in no time.

The same applies to original Voith spare parts. All of these parts originate from consistent Voith series production and are therefore significantly more reliable than parts that just look the same. In short: With Voith spare parts and exchange transmissions you are on the safe side when the availability of your fleet is at stake.

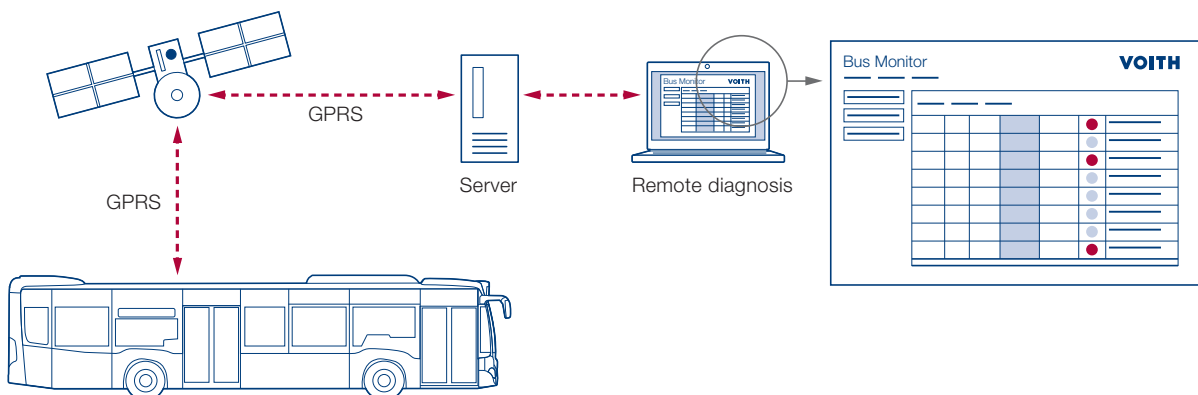
### Availability can be planned – with service- and maintenance contracts

Good to know that the specialist from Voith looks after your transmissions as if they were his own. In this way you can concentrate on your core business while your buses are in the best of hands. Depending on requirements we set up an individual service- and maintenance concept for you. This means that you can enjoy planning security at full cost transparency. And once again: Higher vehicle availability.

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### Monitoring all transmissions – DIWA SmartNet

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Promoting Sustainability.  
Reducing Noise,  
Cutting Down on Emissions.



With DIWA Excellence your commercial and ecological goals take center stage. This pays off – by significantly lower cost, verifiably higher availability and measurably lower pollution of the environment.

#### **More comfort, more value for the environment**

The service and consulting program DIWA Excellence makes a vital contribution to reducing CO<sub>2</sub>- and particulate matter emissions and minimizing general noise levels – through individual driveline advice, SensoTop, DIWA driver training and operating data analysis.

This benefits all concerned. Drivers and passengers who enjoy higher traveling comfort, the inhabitants of large metropolises, and of course the environment in general, which is delighted about every saved ton of CO<sub>2</sub> and particulate matter.

#### **Using resources responsibly**

DIWA Excellence makes sure that resources are used responsibly. Defect transmissions are not scrapped, but fully overhauled, in order to go back on the road as exchange transmissions.

Further evidence of resource efficiency are cost reductions due to lower fuel consumption as well as preventive maintenance. Therefore, DIWA Excellence is also a vital contribution to long-term protection of the environment.

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#### **Better quality of life for Bogotá**

The TransMilenio of the Colombian capital is the first traffic project recognized within the framework of the Kyoto protocol to sustainably reduce emissions. Since its establishment in

2000, the BRT System has saved nearly 3.8 million tons of CO<sub>2</sub>. About 84% of the buses are fitted with DIWA transmissions and part of a preventive maintenance scheme – Voith thus makes a significant contribution to this success.

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Engineered Reliability