RAILWAY FRICTION MANAGEMENT

WONROS™ technology

Globally leading technology

protected with over 30 patents

- ✓ RAIL & WHEEL **WEAR**
- ✓ RAILWAY FRICTION **NOISE**
- ✓ RAIL &WHEEL **VIBRATIONS**

Pioneering technology in *rail friction noise* management since 1991.

Award-winning technology

- ✓ ***European Business Award for the Environment*** in 2004 by the European Commission.
- ✓ ***Research and innovations award*** in 2012 and 2014 by the **International Union of Railways.**
- ✓ **Seal of Excellence** by the European Commission in 2019.

European Business Awards for the Environment

IRRB International Railway Research Board

UIC

Major benefits

- Up to 300% **extention of rail lifetime** in curves and adequate wheel lifetime extention - important savings are generated!
- World‘s only technology to **consistently reduce friction noise (squealing) by up to 99,9%.**
- **Reduced vibrations** positively affect rolling stock (e.g. bearings) & infrastructure (e.g. ballast subsidience).

WONROS™ technology

Composite Hardly-Fluid Compounds (CHFC)

➢ Expect very low consumption!

- **Typically 5-7 times lower consumption** compared to standard mineral-oil-based or water-based lubricants and TOR friction modifiers.
- More than **40% solid particles**, typical competitors only 3-5%. High % is crucial for the effectiveness.
- Balanced selection of anti-noise, anti-wear & anti-vibration additives.
- Developed to withstand very high load pressures.

WONROS™ technology

Composite Hardly-Fluid Compounds (CHFC)

IMPORTANT: It is the composite materials that provide the anti-wear, anti-noise & anti-vibration results. Devices „only“ enable precise and reliable application!

- **Reducing squealing** and other friction phenomena: gauge wear, gauge corner cracking (GCC), rolling contact fatigue (RCF), corrugation (sinus line) and corresponding negative phenomena on wheels.
- **Dedicated types of CHFCs for different applications:** trackside, on-board, marshalling yards.
- **Environemntally friendly**, do not bioaccumulate, non-corrosive, do not interfere with conductivity.

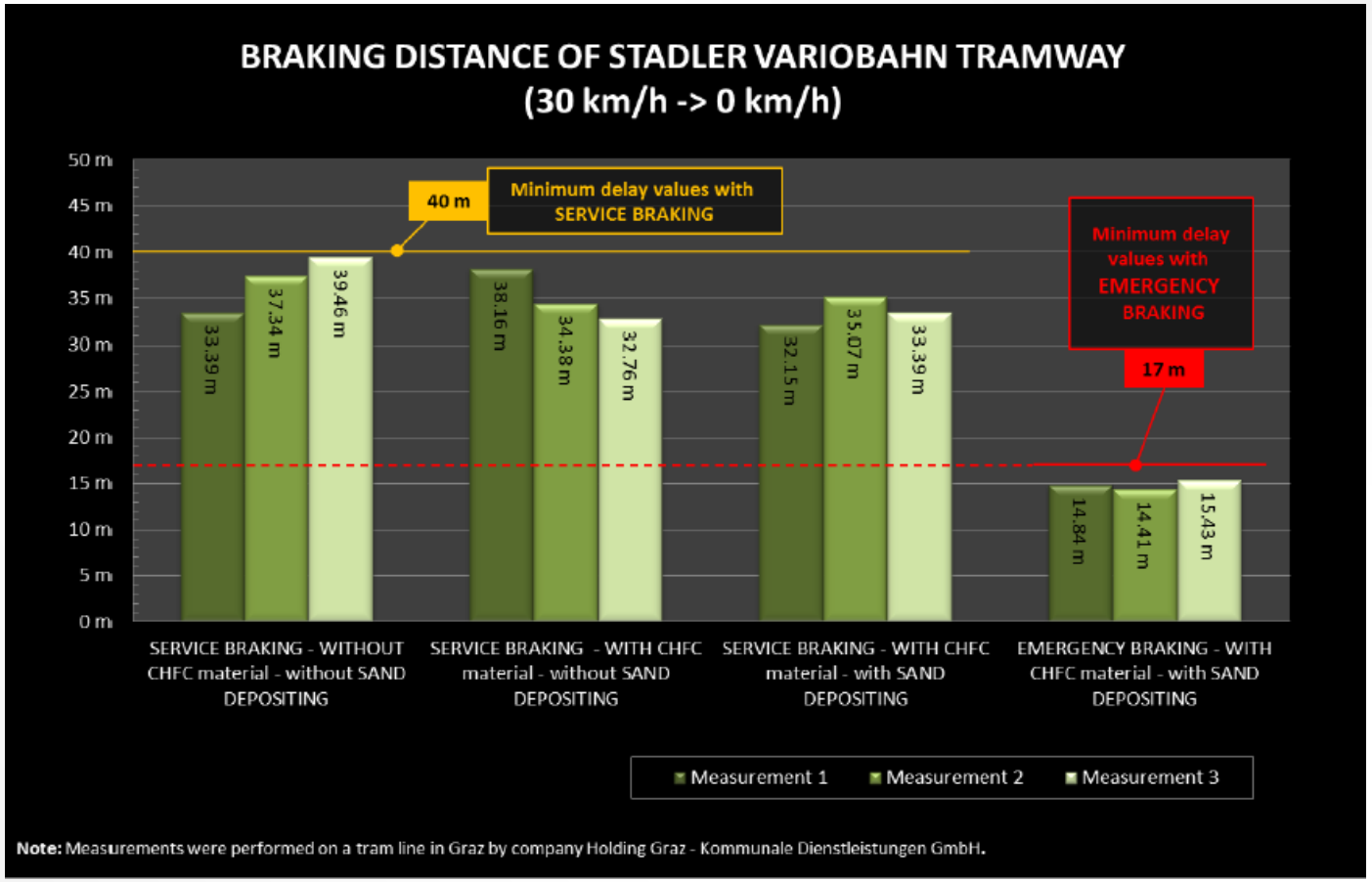
WONROS™ technology

Safety first: braking distances are not compromised!

CHFCs are the only materials that can **simultaneously be applied on top of rail (TOR) and rail gauge** – complete protection of rails and wheels.

Competitive technologies run risk of flange lubricants getting transfered on top of rail and thus compromising required traction on TOR.

CHFC is often the **only solution for sloped railways**.



In this particular case standardized braking distance and time was 4,3% ***shorter*** after CHFC application.

Highest safety levels

- ✓ **Results delivered also in rainy conditions:** CHFC materials do not react with rain and consumption during rain is not increased.
- ✓ Physical properties were attested by Deutsche Bahn on a large dynamometer (with very good results): CHFC **fulfil tribological demands** on all parts of the wheel-rail interface
- ✓ **Required friction coefficients maintained** within frames accepted by the tribological science ($\mu \approx 0{,}15 \div 0{,}25$, provided steel/steel $\mu = 0{,}1 \div 0{,}3$.)
- ✓ Technology and management systems have been **attested and verified** by various independent bodies:

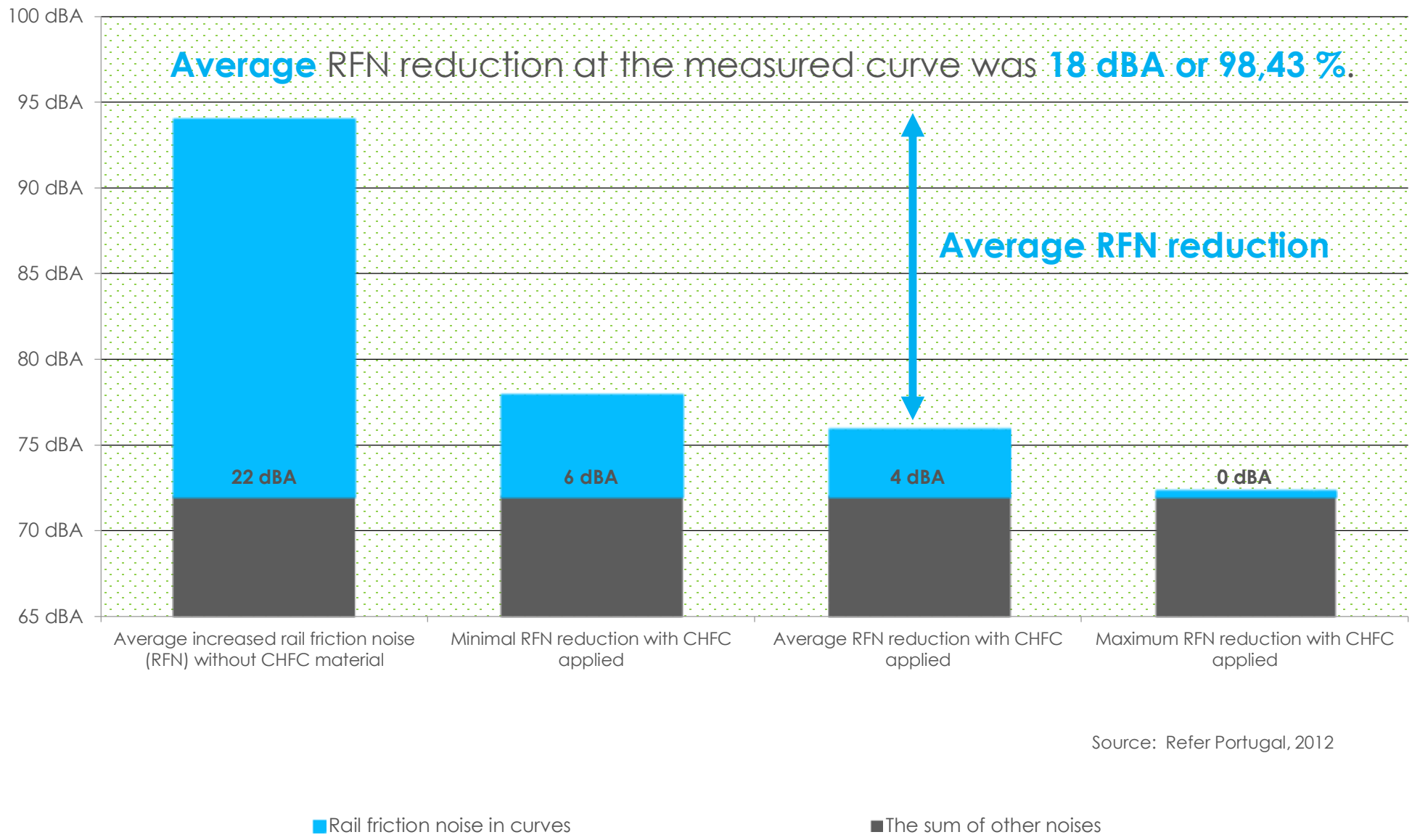
WONROS™ technology

ISO 9001
ISO 14001
BUREAU VERITAS
Certification

SIQ

TÜV SÜD
Rail

Rail Friction Noise reduction/elimination



WONROS™ technology

Rail Friction Noise reduction/elimination

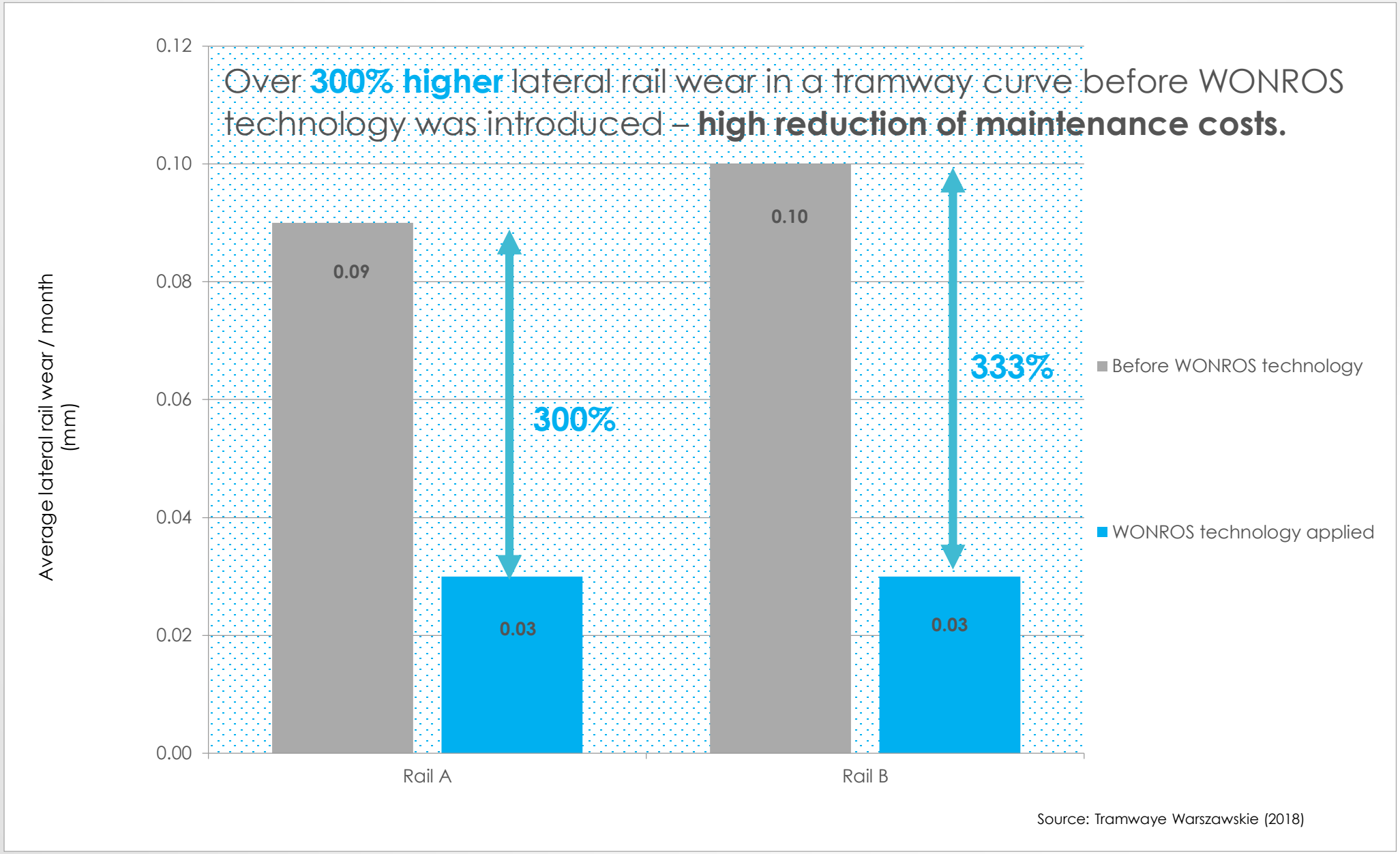
- ✓ train,
- ✓ tramway,
- ✓ marshalling yard

Click to watch & listen.

Youtube **recording of the results before/after** implementing WONROS technology. The technology reduces RFN most convincingly where many other available technologies have failed.

WONROS™ technology

Self financing technology



Source: Tramwaye Warszawskie (2018)

WONROS technology

Lifecycle cost reduction

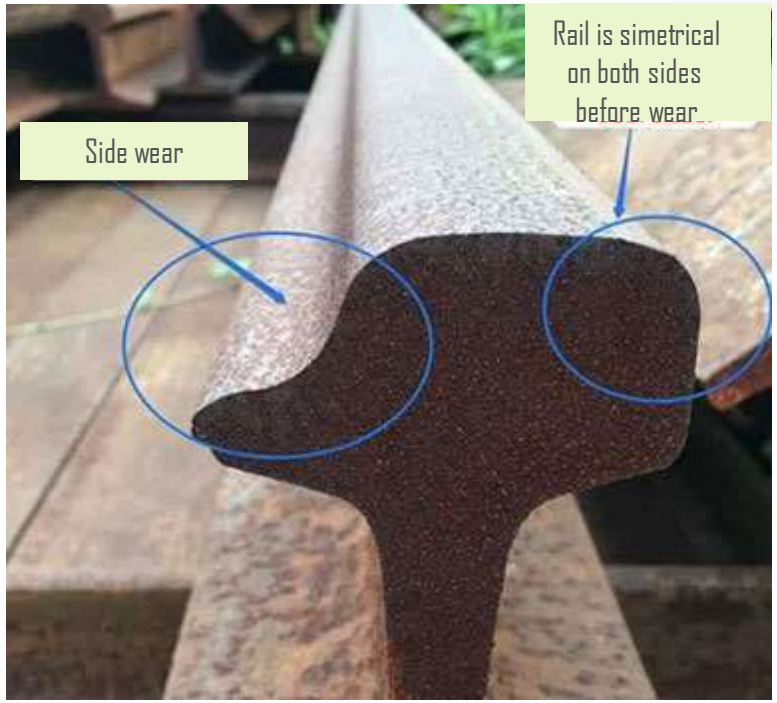
National railway infrastructure

Investment in trackside unit in a curve R=600 m.

Results:
- ✓ Rail grinding/milling (1800 m) reduced: every 2-3 years instead of every year.
- ✓ Rail replacement 100 m every 6 years instead of every 2 years

Net savings every year 10.900 €
Reduction of rail loss: 1.439 kg/year

Investment can be returned in cca. 2 years.



Environmental aspect: Wear of rails emits heavy metals into the air and soil + CO2 emissions at producing steel.

WONROS™ technology

Lifecycle cost reduction

Example: a city with 250.000 inhabitants

- ✓ Tramway lines maintaining 25 trackside units (from competitor X)
- ✓ Devices had to be maintained/refilled **every 14 days**
- ✓ Consumption of lubricant was cca. **700 kg/year** per device

After introducing CL-E1 devices + CHFC material: maintenance every 6 months – **annual labour cost reduced** by several times to **720 € per device.**

CHFC consumption around **100-150 kg/year** per device – refilling only required **2-3 times per year.**

WONROS™ technology

The lowest levels of soiling

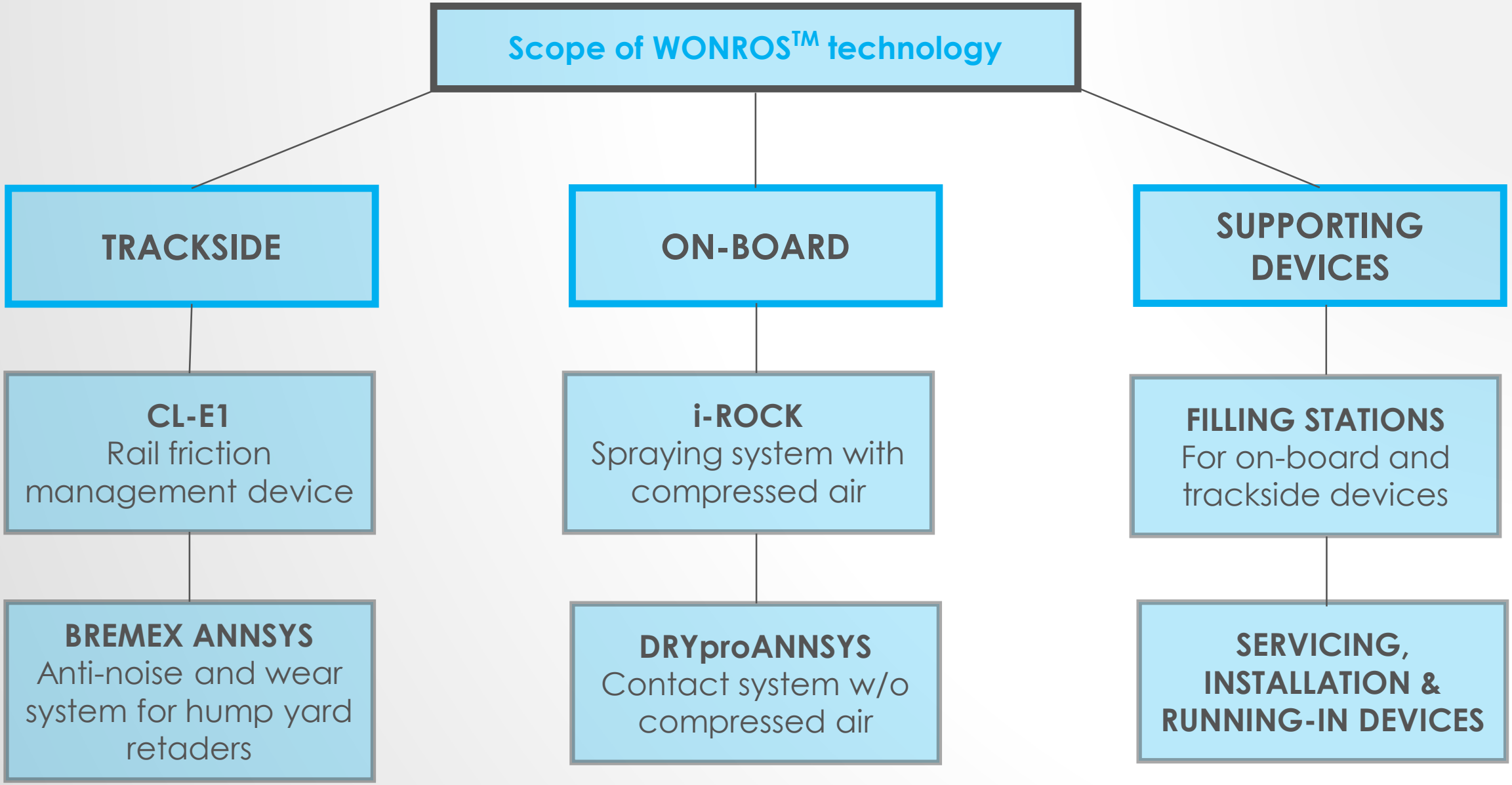
The technology (composite materials + devices) keeps tracksides and vehicles‘ bottoms unsoiled. CHFC materials do not drop or leak. Trackside devices have double „overdosing“ protection systems. It is the **cleanest of all available technologies.**

Scope of the technology

✓ TRACKSIDE DEVICES

✓ ON-BOARD DEVICES

✓ MARSHALLING YARDS SYSTEMS

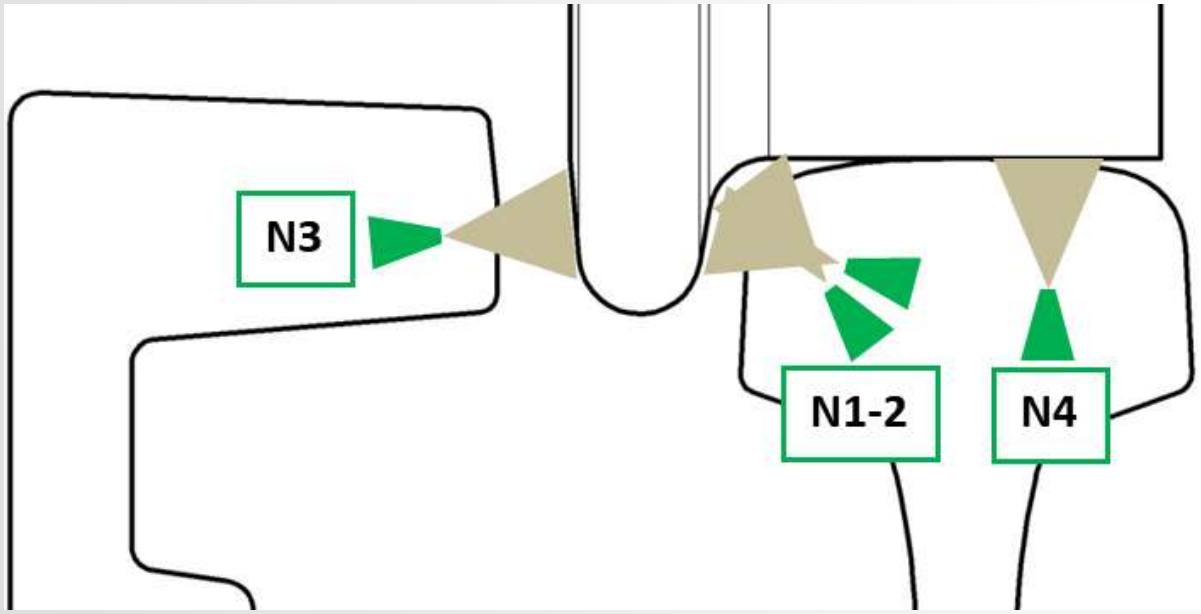

Scope of WONROS™ technology
TRACKSIDE
ON-BOARD
SUPPORTING DEVICES
CL-E1
Rail friction management device
i-ROCK
Spraying system with compressed air
FILLING STATIONS
For on-board and trackside devices
BREMEX ANNSYS
Anti-noise and wear system for hump yard retaders
DRYproANNSYS
Contact system w/o compressed air
SERVICING, INSTALLATION & RUNNING-IN DEVICES

Trackside devices

WONROS trackside technology (6 min)

- **Reservoir refilling only 2-3 times per year** – CHFC exhibit very high effectivnes with very low levels of consumption.
- Low maintenance costs: **preventive servicing required only twice per year.**
- **Highly accurate application** to all parts of the wheel-rail interface.

On-board devices



Complete conditioning (unique on the market) – all parts of the wheel are addressed with one composite material:
CHFCs works both as top of rail friction modifier (TOR FM) and as wheel flange lubricant (WFL), and wheel flank lubricant.

Compressed air system (i-ROCK)
No compressed air system (DRYproANNSYS).
High precison applyication to chosen parts of the wheel.
Operation modes: curve mode, straigt track mode, stand-by mode.

Marshalling yards
friction noise reduction/elimination

- **Bremex Annsys is a globally unique solution.**
- Efficient reduction/elimination of noise generated by trackside brakes.
- Noise is reduced (eliminated) by up to 99,9% or 30 dBA.
- Brakes wear is reduced by 8 times.

The only environmentally acceptable and efficient solution to solve problem of high frequency noise on hump yards. The squealing noise usually exceeds 130 dBA and is heard for many kilometers.

European Business Awards for the Environment

About the company

ELPA is a long-standing regular member at UNIFE.

ELPA‘s deputy is a member of the expert group of Railway supply industry at the European Commission.

Accepted technology

ELPA is a first tier supplier to major infrastructure operators.

About the company

Vision of the green future…

Sustainable and **environmentally conscious mindset** has always been at the core of the WONROS™ technology**. Rail friction noise** has been in its focus long before it came under the spotlights of wider public, railway sector and legislators.

Vision driven persistence in solving longstanding problem of RFN resulted in an **advanced technology system** that addresses all negative impacts of railway friction. Main mission is to distribute this large body of knowledge to global markets and contribute to **environmentally friendly railways.**

Railway friction management

Headquarters: ELPA Ltd, Environmental management and tribotechnology, Paka pri Velenju 39d, 3320 Velenje, Slovenia,
Telephone: +386 3 898 63 30, Fax: +386 3 898 63 38, E-mail: info@elpa.si