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RAILWAY INNOVATIONS

TROLLEYBUS CHECKPOINT

REDUCE MAINTENANCE COSTS AND OPTIMIZE MAINTENANCE TASKS

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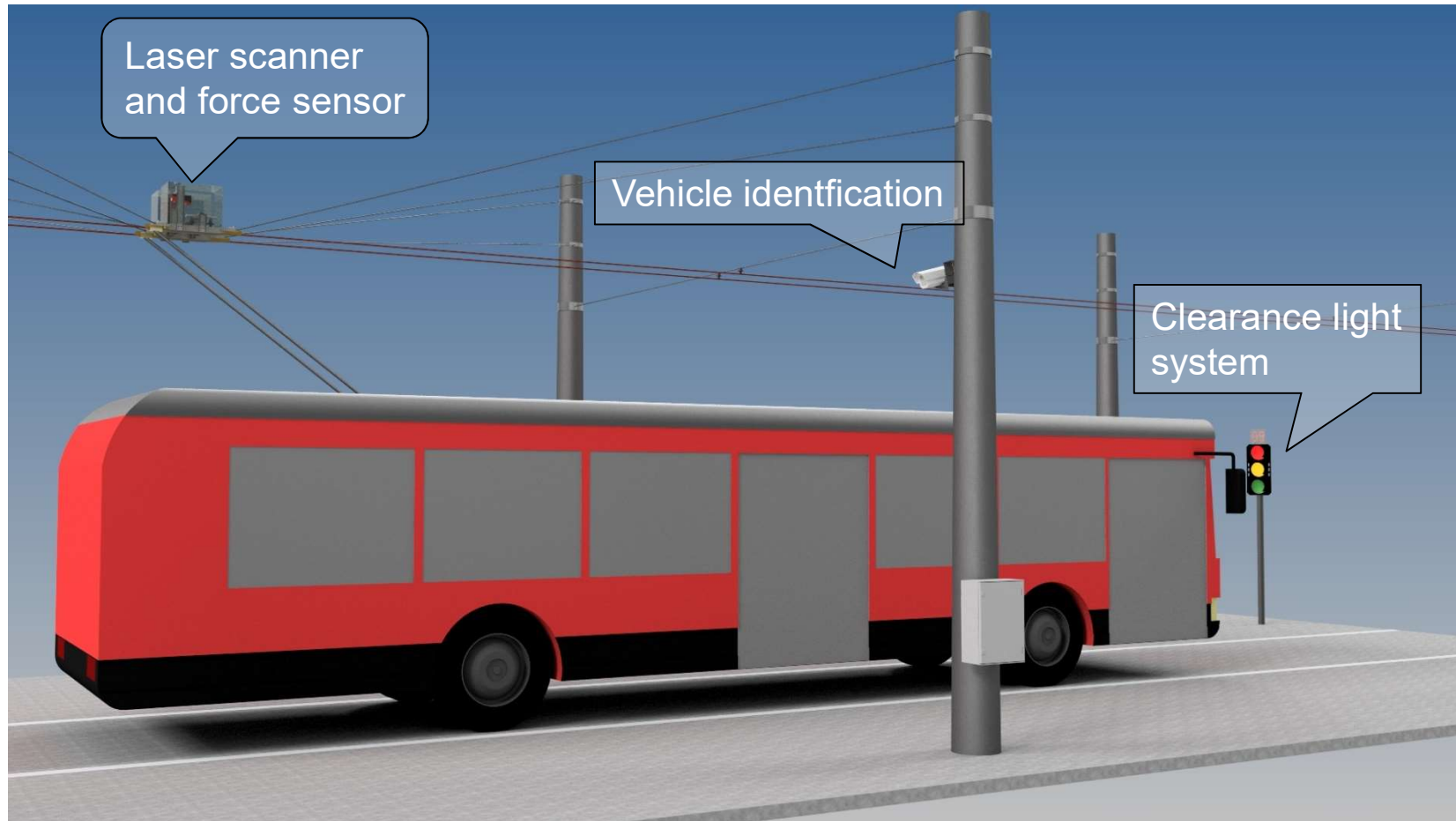
What is a Trolleybus Checkpoint?

A **Trolleybus Checkpoint** is a fully automatized inspection unit which measures the condition of the carbon stripes and the uplift force of the pantograph



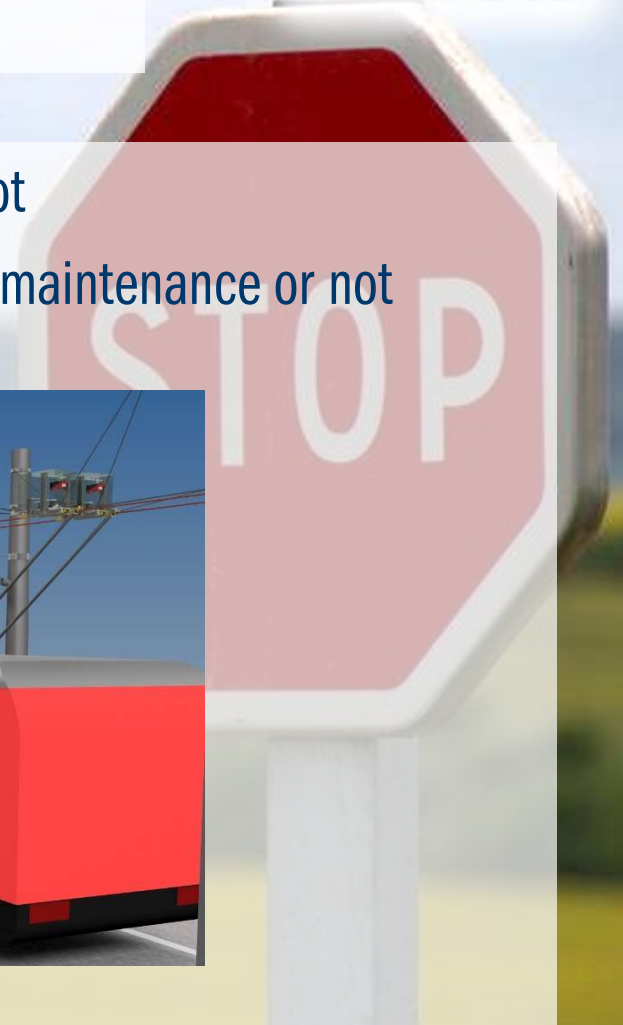
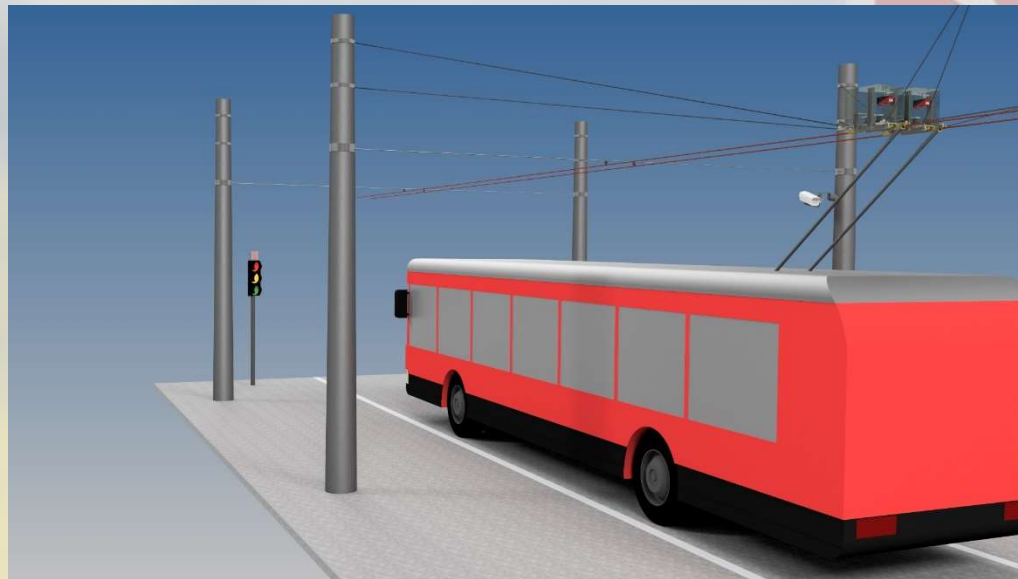
Picture by Ralf Roletschek / Roletschek.at

Main components



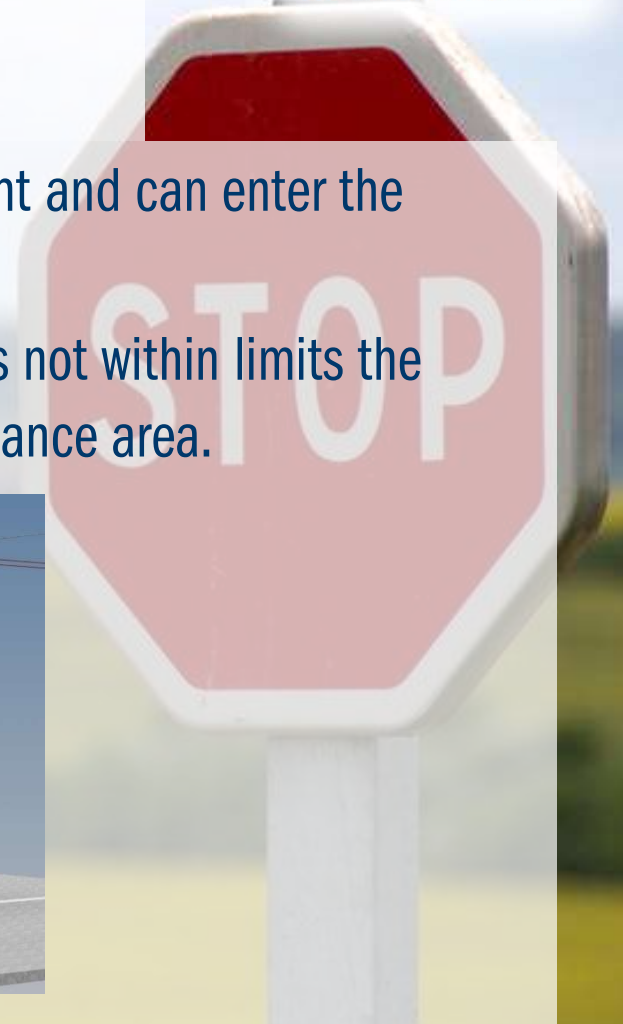
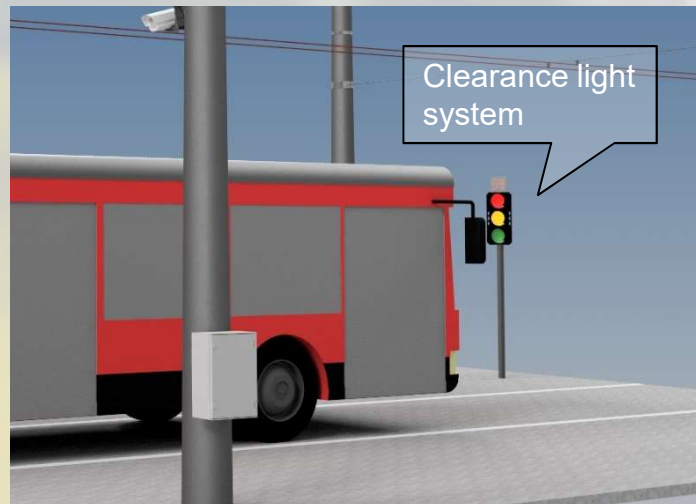
Where to position best?

- Typically installed at the entrance of a trolleybus depot
- It automatically determines whether a vehicle needs maintenance or not



Automatic detection of maintenance requirement

- If the carbon stripes are ok the driver gets a green light and can enter the parking or washing area.
- If the stripes are damaged / worn or the uplift force is not within limits the driver gets a red light and needs to enter the maintenance area.



How does a Checkpoint work?

- 1) The vehicle gets identified via camera system

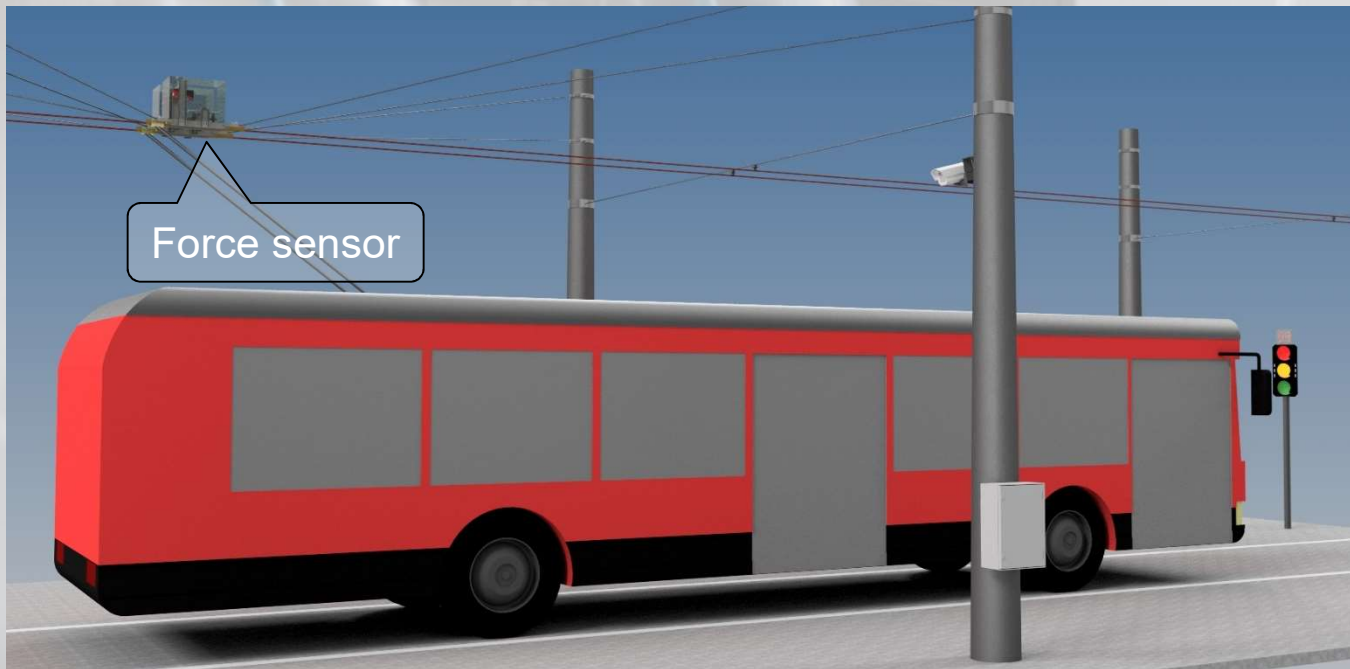


Trolleybus identification

- Graphical identification via video camera system
- Recognition of plates or id-numbers
- Comparison with trolley-id database
- Recording of date, time, measurements

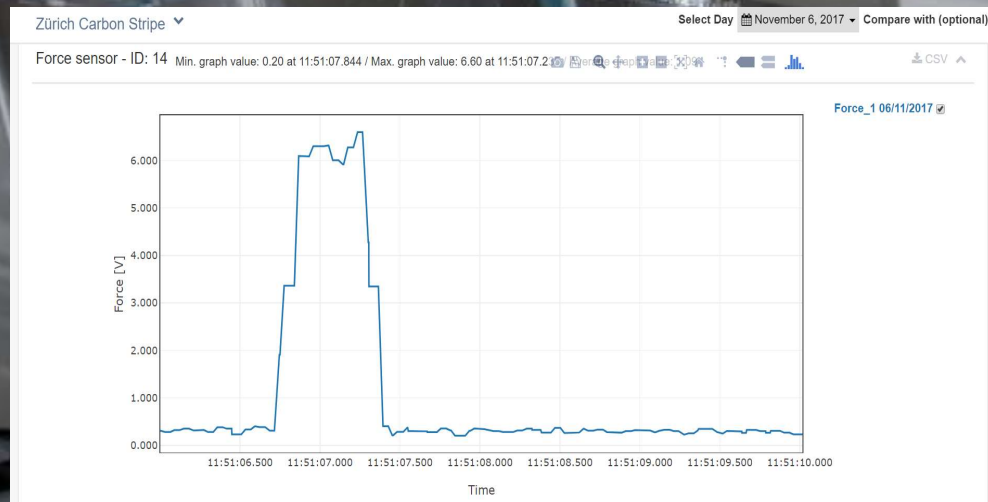
How does a Checkpoint work?

2) The contact force of the pantograph is measured



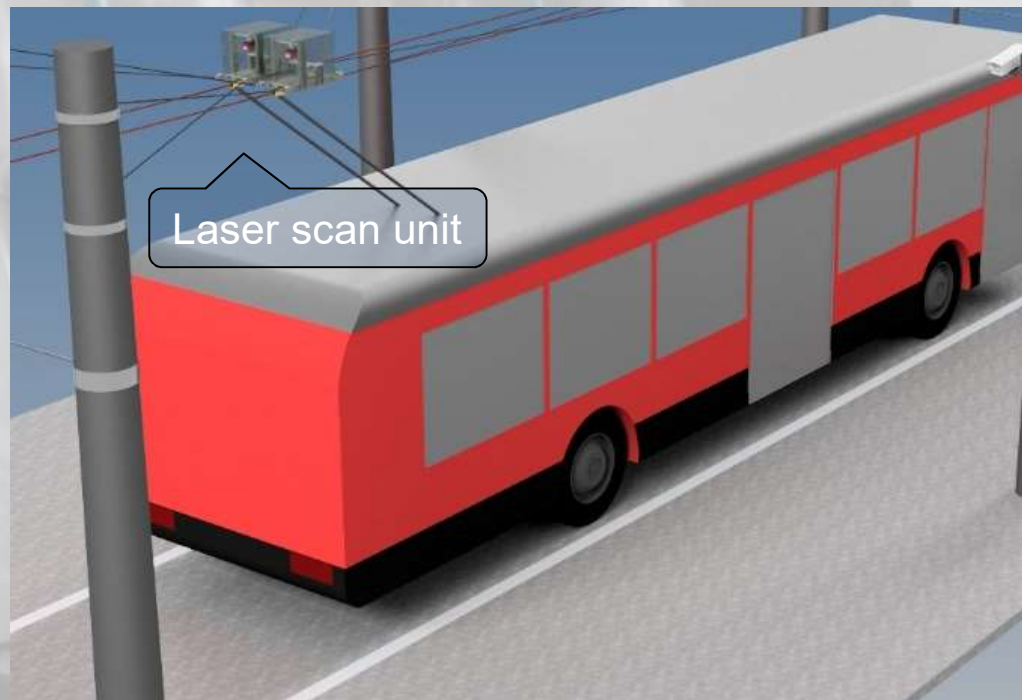
Measurement of contact force

- Interference-free contact force measurement
- Daily check
- Find damaging spikes



How does a Checkpoint work?

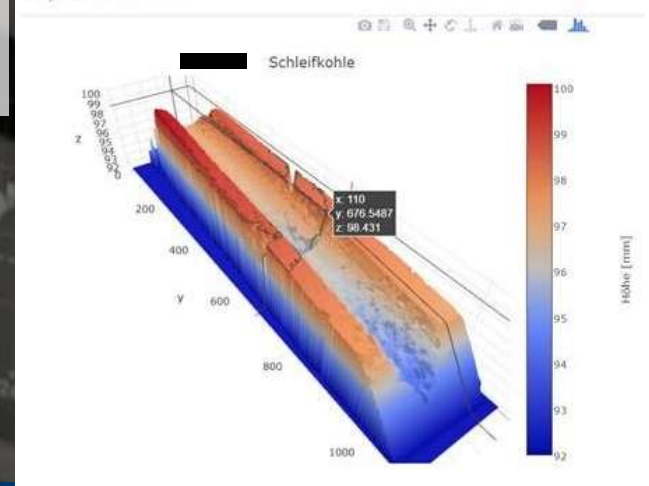
3. The carbon stripes are scanned with a 3D laser



Condition check of carbon stripes

- Optical 3D-Laser scan of carbon surface
- High resolution 8 kHz sampling rate
 - thickness
 - form / symmetry
 - cracks
- Immediate alarm if maintenance is required

Graphic3d sensor - ID: 7



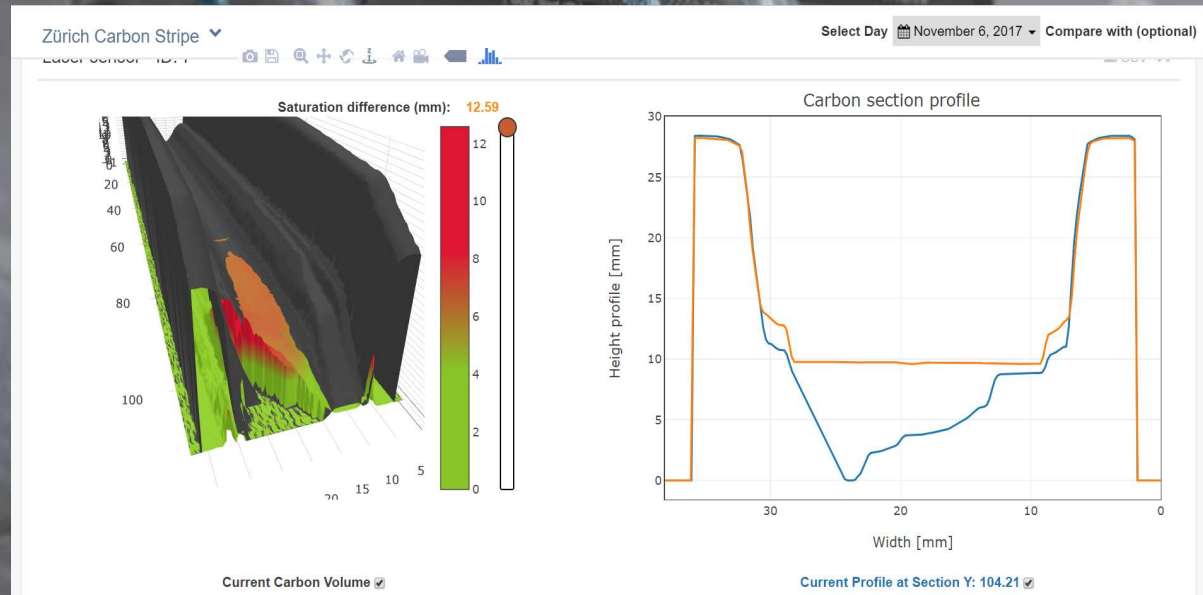
How does a Checkpoint work?

4. According to the results the vehicle is either directed towards the maintenance area or towards the parking area



Online data visualization

- Cloud based data visualization
- Get statistical information
- Comparison to a reference surface



Summary and Advantages

Operational:

- Automize pantograph inspection
- Improve labour safety
- Reduce maintenance cost – maintenance only on demand

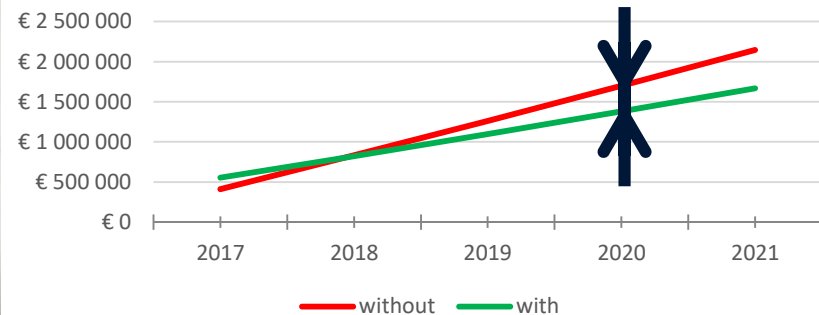
General:

- Increase bus availability
- Analyse which lines cause damages to the pantograph
- Increase overall vehicle reliability

Life Cycle Cost Calculation

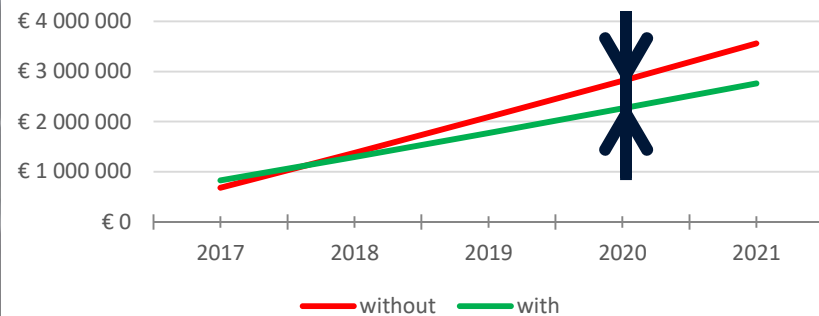
- Example 1:
 - 75 Trolleybuses
 - 1 Manual check per bus per day
 - 2 workers per task
 - 110€/h per worker
- Example 2:
 - 150 Trolleybuses
 - 1 Manual check per bus per day
 - 2 workers per task
 - 80€/h per worker

Costs with/without checkpoint



~€ 500.000,- after 3 years

Costs with/without checkpoint



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