monitoring  advising  problem solving

DEUTZER
Technische Kohle
MEASUREMENT SERVICES

DTK exhibits at the InnoTrans 2012 ∙ hall N°9c • stand N°143
Introduction:

Systems developed by DTK to measure…

tracks:

- Gauge
- Shocks in three different directions
- Wear of the left and right rail
- Groove depth
- Groove width
- Direction of driving (course angle)
- Over height ramps
- Superelevation and cross level
- Torsion of the tracks
- Interaction between wheel and rail
- Position (via GPS)

vehicles:

- Hunting oscillation
- Passenger ride comfort
- Running clearance (e.g. space between vehicle and platforms)
- Flats on wheels (under development)

third rails:

- Exact position of the current shoe on the rail
- Pressure and shocks between the current shoe and rail
- Ramps
- Running smoothness
- Height
- Current and its direction
- Direction of driving (Course angle)
overhead lines:

- Stagger
- Exact position of overhead line(s) on the pantograph
- Shocks between overhead line(s) and pantograph
- Running smoothness of the pantograph on the overhead line
- Height of the overhead line
- Current and its direction

We always record the position along the route (via radar), and the actual speed for all our measurements. Waymarks may be set (with voice recording) during the measuring.

All of these systems can be used together and with a customers (passenger) vehicle at a normal driving speed.

wear of overhead lines:

DTK also has a system to measure the thickness (wear) of the overhead line. This system must be mounted on a hi-rail vehicle.

temperature of overhead lines:

- measuring of temperature on the overhead line and pantograph

special solutions for individual problems
1990  Establishment as Company (GbR)  
development, production of pollution free, innovative contact strip for pantographs

1993  Establishment of the GmbH

1996  Completion of the first measuring system “Shock”

1997  Supplement, additional measuring of “Stagger”

1997  Increasingly active as service provider for public transport enterprises, main field of activity: measurements on pantograph- and overhead line systems (position, shocks, driving dynamics etc.)

1997  Establishment as individual problem solver for public transport enterprises  
development of: grease scraping-off device, railway catenary smoothing system...

1999  First measurement with the additional developed system “contact wire thickness”

2001  Headquarters in Zeuthen (Brandenburg)

2002  New system “wheel-rail” to measure interactions between wheel and rail

2003  New system “third rail” to measure third rail characteristics

2004  New system to measure flats on wheels

2005  New system for measuring the track geometry and wear

2005  New system for testing of pantograph characteristics

2006  First time use of a gyroscope system for measuring the track, the position and the ride comfort

2007  New system to measure the running clearance of a route

2008  New system “platform measurement”

2008  development of the “explorer” software

2009  New system to measure trolley bus overhead lines

2009  New system infrared thermal imaging measurement

2010  New system to measure contact quality during the current transmission
Speed, distance and position

- The speed of the vehicle will be measured with a radar sensor.

- The path is calculated from the data for speed and time.

- The time and position are recorded synchronously. Thus an exact location of each measured value is possible.

- Manually recorded salient waymarks, like stations, road crossings, switches etc. provide additional information about the location of a measured value.
The gyroscope system and differential GPS are used to record the driving direction and position of the vehicle.

- The gyroscope is mounted under a vehicle and used to measure the driving direction and accelerations (shocks) in three dimensions.

- GPS antenna to determine the exact position
Installation of track measuring system under a customer vehicle

1  laser unit left
2  shock sensor left
3  controller
4  gyroscope
5  additional fixation
6  mounting
7  shock sensor right
8  laser unit right

The system can be mounted under a regular (passenger) vehicle.

The measurement can be accomplished under regular vehicle load running conditions.

A laser system is mounted above each rail.

Via software the laser will be analysed.
The following parameter can be measured:

The gauge, the width and depth of each rail, the track super elevation, the geometry of the track, the wear of each rail (rail profile and flank angle) the curve radius (direction of driving), the torsion, the smooth run of the wheels on the rails, shocks between wheel and rail, and the position as GPS coordinates as well as over height ramps.

The different parameters are displayed on up to six monitors.

As for all other DTK monitoring systems the time, speed and way marks are recorded.

The measuring data and 4 videos are recorded synchronously.

First analysis can be made during the monitoring run.
DTK running clearance measurement

DTK uses a self-made trolley which can be adapted to all kinds of track gauges.

This measurement can be performed at speeds up to 40 km/h (25 mph).

The system records the surroundings along the route in a distance of 8 meter around the centre of the track.

It is possible to programme and evaluate several clearance profiles in a single measuring file.

Any encroachment of the clearance profile will be marked in red in the representation of the route.

The software displays the corresponding video sequences.

DTK trolley can be used for additional measurements, e.g. of the smooth running on the tracks or the wear of the rails.
DTK system for platform measurement makes it possible to check the specified dimensions of handicapped-accessible platforms, in particular:

The distance between the platform edge and the track (either left-hand or right-hand, depending on which side of the train the platform is located)

The height of the platform edge in relation to the track.

So far employees of public transport companies had to carry out random checks manually with a ruler, e.g. every 5 meters.

DTK system instead measures these values in a comfortable contactless way every 5 cm (20 data set per meter).

To perform this measurement, DTK installs two laser/camera units on a sliding carriage, whose lateral guiding device is fixed to the vehicle’s front bumper.
DTK measurement system polygons and wheel flats

The system is fitted onto the rails and measures wheel flats and polygons by “listening” to the wheels as they pass over the sensor.
The DTK flat spring system is a special economic solution of clearance monitoring. The clearance will be measured only in the spring-mounted area. If now the clearance in this area will be disturbed the springs move and a potentiometer sizes the interrupts.

The system is used to:

- detect the reasons for wheel chant cuts
- find places where brakes hit the ground
Three sensors installed in the first and last row of seats as well as in the middle of the train record the vibrations to which the passengers are exposed.

Software calculates comfort indices according to UIC 513 to determine if the vehicle offers a sufficient comfort level.
DTK infrared thermal imaging system makes it possible to check the temperature at the contact point between overhead wire and contact strips.

- 60 measurements per second
- Accuracy: 0.1 °K

This system is useful in all cases where energy can be transformed into heat as a result of an insufficient electric contact, e.g.:

- energy recovery systems
- control boxes
- 3rd rail connections etc.
- to control brake pads
DTK measurement system
third rail

- Measurement of acceleration, movement and pressure of the current collector on the rail, etc.
- Determination of the effects when the current shoe impacts on the third rail ramp
- Measurements of the conducting parts

- Image shows the system during the measurement in the vehicle
- Using extensive evaluating software for analyses etc.

Speed during the test travel
Height of the current rail
Acceleration at the current shoe in x- and z-direction
Acceleration of the current shoe holder in x- and z-direction
1. and 2. stretch measurement points on the current collector
3. and 4. stretch measurement points on the current collector
Route distance
Data values at the cursor positions
Contour of the conductor rail is recorded by a laser unit.

Hence wear and the actual contact area with the current collector can be determined.

Thus changes in position or other problematic sections are recognized.

Even slight lateral height changes of the current collector arm’s pivot point may have a large impact on wear.

This current rail is mounted too high, which initially results in a one-sided wear of the outer edge of the rail. Gradually an inclined wear along the whole contact area of the current rail is recordable.
DTK system for pantograph monitoring allows for the check-up of the pantograph’s kinematics and dynamics as well as of its interaction with the overhead line.

DTK measures the pantograph’s contact force up- and downwards over its complete operating range, which is divided in 10 cm (3.94 in) high steps.

This measurement will be repeated at different speeds between 2 and 30 cm/s (0.8-12.8 in/s).

The same procedure, carried out at a very slow up and down motion (0.3 cm/s; 0.12in/s), delivers the so called pantograph response curve.

This curve provides useful information about the pantograph’s optimal working position and contact wire’s height. It also helps to determine whether it is necessary to readjust the pre-set contact force at the customer’s depot.
The measuring equipment can be fitted onto the pantograph of a revenue service vehicle.

The data will be transmitted into the vehicle via fibre optic cables.

Inside the vehicle data and videos will be recorded, displayed and saved on hard disk.

Via a manual key press additional way marks can be entered during the running measurement.

Way marks can be named via a microphone.
Current and voltage can be measured at the same time as position-shock (stagger).

The current being drawn and returned (if an energetic recovery system is available) will be determined for each contact strip.

The catenary voltage can be measured (in place of the shock measurement).
The System can be fitted to a hi-rail vehicle or to a revenue service vehicle.

The thickness of the overhead line is measured to an accuracy of 0.1 mm.

The wear can be calculated. Problematic sections are identified.

The remaining service life of the overhead line can be estimated.
Synchronization of DTK systems

• If two or more systems are installed in example the track-monitoring system and the overhead line system, data for exactly the same position can be analysed for the overhead line and the track.

• This saves time and money, since only one measuring run is necessary to get all needed data.

• It also allows for the identification of problems which are caused by the interaction between tracks, vehicle and overhead line.

• The software shows close connections between rail and overhead line problems.
DTK rail profile software and route overlay on maps

• The rail profile software shows the rail profile condition at any point on the measured route and allows an exact analysis of the rail wear.

• At same time a gyroscope and DGPS determine the track position and coordinates

• route coordinates can be assigned to digitised maps
The DTK explorer was developed:

• for easy comparing of measurements routes
• for route digitalisation on maps and a better orientation
• for listing of all measured routes (the corresponding route section will be highlighted in red on the map after selecting a file in the list)
• to show the number, the direction of driving, and the date of measured routes
Results after the examinations

Immediately after each examination clients receive:

- Measurement data, video and audio files
- The DTK software as DVD
- Instruction in the use of the analysis software
- Approx. 4 weeks after measurement client will get an investigation report

DTK can provide additional software training if required
Some examples of specific solutions to our customer’s problems:

- We found the causes why wheel shunts on the tram wheels were cut (Frankfurt/Oder - Germany)

- We developed a system to scrape grease off the wheel flange (Berlin Underground - Germany)

- We supplied contact strips to scrape off ice of the overhead line (Würzburg - Germany)

- We made comparative measurements of various vehicles and pantographs (Berlin - Germany, Basel - Switzerland and other rail systems)

- We found the cause of vertical vibrations of vehicles (Brandenburg/Havel - Germany, for Rhätische Bahn – Austria and Melbourne – Australia).

...
Publications of DTK GmbH

Der Nahverkehr 2011 issue 7+8 Assessing the position of the wheels contact point to the rail and the hunting oscillation during service operation

Verkehr und Technik 2011 issue 5-6 capturing of the clearance profile and

Der Nahverkehr 2011 issue 1-2 determining the actual clearance between operating railway vehicles and their surroundings

Verkehr und Technik 2010 issue 10-11 The Influence of the rail conditions on ride comfort

Eb Elektrische Bahnen 2010 Heft 10 Determination of the transition resistance from the overhead line to the collector strip

Eb Elektrische Bahnen 2010 Heft 8-9 Inspection and improvement of third rail current collector systems

Verkehr und Technik 2010 issue 3 Wear measurement on trolley bus catenaries

Verkehr und Technik 2009 issue 12 Measurements on current rail plants

Verkehr und Technik 2009 issue 11 Contact quality valuations of overhead line or current rail and contact strip by help of thermal imaging investigations

Der Nahverkehr issue 10/2009 Bilbao has proven new measurement-systems for overhead line and wheel/rail

Verkehr und Technik 2009 issue 10 Tests for the smooth run of wheels on rails

Verkehr und Technik 2009 issue 6 Concept for a system to measure the wear of trolley bus overhead lines

Verkehr und Technik 2009 Issue 4 and 5 Analyses for contact quality advantage between contact strips and overhead line

Eb Elektrische Bahnen 2009 Heft 3 Contact advance between overhead line and contact strips
System analysis – current drawn of the overhead line
Influences of the track, of the vehicle and of the pantograph onto the catenary system

Current and voltage measurement on the overhead line of the city Brussels

Accurately Measuring

Measuring track while traction mode under load for site evaluation

New concept to optimize wheel-rail profile

Measuring the track and overhead line with a normal (passenger) vehicle

Measuring system for track wear

Tests of overhead line and current collectors

Overhead line and current collector test system

Detecting of flat points on wheels during the passage of a train

Measuring system to test a metro current rail system and a third rail current collector

Causes for the wear of the overhead line

Új felsővezeték-mérései (new overhead wire measurement technology)

Measuring the overhead line thickness as Service of DTK- GmbH

Some results of overhead line measurements
<table>
<thead>
<tr>
<th>Publication</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verkehr und Technik 1999 Issue 5</td>
<td>New system for testing overhead lines and current collectors</td>
</tr>
<tr>
<td>Verkehr und Technik 1998 Issue 10</td>
<td>DTK concept of measuring the thickness of the overhead wire</td>
</tr>
<tr>
<td>Verkehr und Technik 1998 Issue 5</td>
<td>New current collector for difficult driving conditions</td>
</tr>
</tbody>
</table>

and more…
Do you have a problem which needs to be solved?

• If you have any problem please ask us, our standard solution may be of use

• Also, if needed, we can adapt or design a special system to meet your requirements

• We would be very pleased to be of assistance

Please do not hesitate to contact us.