

Leica Geosystems **TruStory** Monitoring of Rail Tracks and Construction Site



■ Reconstruction of the 100 years old railway bridge carrying two railtracks.

BSF Swissphoto AG has developed a powerful tool for permanent monitoring applications called DeTraS (Deformation Tracking System). Sensor controlling and database revert on Leica's GeoMoS Software.

Close to the the Oerlikon Railway station a 100 years old bridge has to be renovated. The steel bridges get replaced by a prestressed ferroconcrete bridge. Moreover, the current span width gets increased from 15 up to 38 m. In order to excavate the existing bearings, pillars, undercrossing as well as the rail dam on the eastern site assistant bridge elements have been established. These temporary bridges lay 80 cm higher than the old tracks and create the required space to build the future bridge.

During the first construction period rail settlement and their resulting torsion changes were manually measured in a weekly cycle. But aside the risk potential when entering the railtrack area it is laborious and for that reason cost intensive.



■ Monitoring prisms on the temporary bridge for deformation tracking.

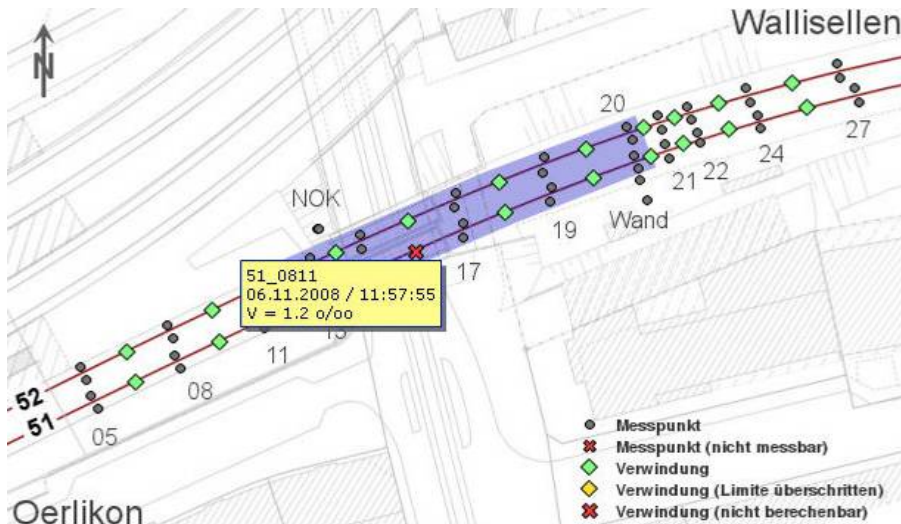
Due to the compact and fast installation possibilities of DeTraS, the entire monitoring system could be set up by 2 persons in 1¹/₂ days and deliver first results.

- Company
BSF Swissphoto AG, Zurich
- Challenge
Rail track, bridge and site monitoring under dense railway traffic
- Customer
Swiss Federal Railways
- Date
2008-2009
- Location



- Project Summary
 - Instruments
 - Leica TM30 0.5"
 - Meteo sensor
 - Leica monitoring prisms
 - WebCam
 - Software
 - Leica GeoMoS Monitor options 1 & 2
 - BSF Swissphoto's client portal
 - Aim
 - To monitor settlement and torsion of tracks and 3D deformations of pylon and bulkheads





Start view of BSF Swissphoto's own client portal. The interactive map which comes up with all monitoring points and their actual state of measurements. The red lines stand for the two rail tracks where the green rhombus indicate the specific torsion.

The site equipment includes a Leica TM30 tachymeter, metro sensor, 55 monitoring prisms, and a communication box for remote control and data delivery via mobile communication network.

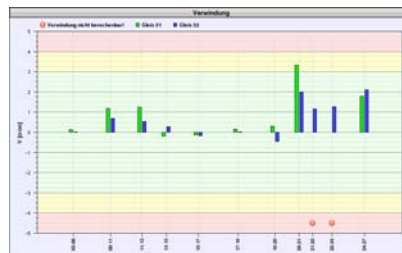
Actual deformations of rail geometry (settlement, torsion, and longitudinal profile) are based on the positional change of each monitoring prism. After the automatic transmission of the measurements from the site to the Leica's GeoMoS Software in the office the results are automatically computed. In case of exceeding the restrictive limits of the railway company SMS and e-mail alarms will be sent to responsible persons.

According to the results mechanical rail alignments can be ordered to recover the ideal rail geometry.



Single point settlement and uplift after mechanical track alignments on the dam.

The torsion acts as one of the most critical factor in the rail track geometry and describes the twisting of the tracks. Thus, a torsion requires 2 inclination values and their separating distance along the track. Using 2 settlement measurements at one cross section enables to compute one inclination and results in the torsion when compared with its change along the track axis taking the next inclination value.



Torsions at the different sections show when they exceed the two limit classes.

Main advantages compared to manual monitoring are safety aspects because no more field crews have to enter the track area. Whereas labour costs can be significantly decreased.



Benefits

- Safety through SMS and e-mail alert for the railway traffic
- BSF Swissphoto client portal for 24h access to get the real time data
- Survey the construction process and their impact on crucial infrastructure
- No more manual measurements on the tracks which are dangerous and labour intensive which comes up with cost savings
- Coordination of rail alignment actions according to the torsion calculations



During digging off parts of the fundament of the power line pylon it was automatically measured to detect 3D deformations and the resulting change in tilt.