

Editorial



**Specialists from Lucerne for OSMOS**

Bernard Hodac, CEO of the OSMOS Group

They have drawn up technical specifications for bridge monitoring and maintenance for the Swiss Federal Roads Authority.

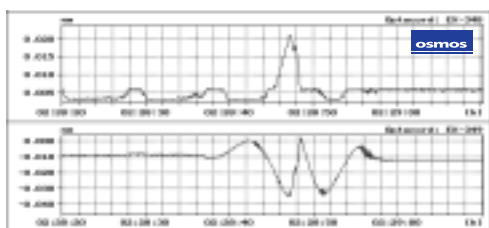
Andreas Steiger & Partner AG, based in Lucerne, has long been recognized in Switzerland for its engineering competence in areas ranging from maintenance of structures to soil engineering to quality assurance. Now Andreas Steiger has decided to become an OSMOS affiliate, thus enhancing its operations through OSMOS technology.



Side view of optical extensometer



Optical extensometer mounted on bearing during jacking operation



Several passings of a 25 ton test vehicle

Front page news

## Takanosu Bridge

### Maximum results for a minimum investment



The Takanosu Bridge, a 292-meter cantilever span over the Yoneshiro River, was constructed over 65 years ago. In recent years, the concrete has undergone significant deterioration. In view of the structure's condition, the client (Akita Prefecture) was studying the possibility of reconstruction.

However, as a result of loading tests conducted with the OSMOS system by the Fuji Technical Center (a JGC sub-licensee), it was determined that it would be possible to extend the structure's longevity through reinforcement work instead.

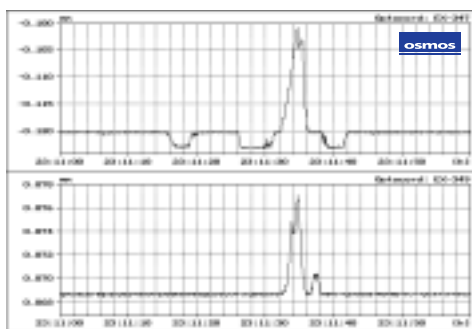
A major advantage of the OSMOS system is that it can measure even very minute deformations, in dynamic mode and on a long base line.

Thus the OSMOS system provided the solution not only for the initial evaluation of the structure's condition, but also for safety management during repair work and restored service.

Here, too, JGC and their partners have confirmed their leadership in the area of monitoring in Japan.



Scraping of a zone prior to repairs



Monitoring of tensile stress was conducted during the gouging operations on the deteriorated concrete.



Optical strand on the upper face of one span

# Monaco

## Preventive monitoring of the cliff of the Exotic Garden

**Situated underneath the Exotic Garden of Monaco is a stone bloc approximately 50 meters high. Its volume and mass are considerable: 1700 m<sup>3</sup> and 6600 metric tons, respectively.**

This mass of limestone from the Jurassic period undergoes precipitation and thermal variations. In regard to the cliff's position, it is situated directly above a two-way street with heavy vehicle traffic: a more-than-sufficient reason to warrant OSMOS preventive monitoring!

However, the monitoring of such a structure was a potential headache: the rock layers are heterogeneous and difficult to represent in the form of consistent models.

Nonetheless, the mission was successfully accomplished with an OSMOS solution: a combination of threshold detectors and high-precision sensors allowing the entire bloc to be monitored.

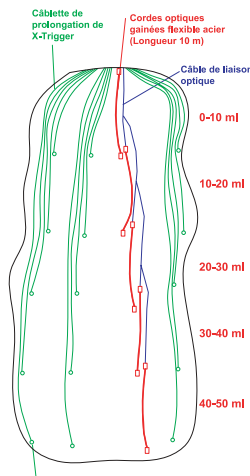
5 optical strands of 10 meters are lined up vertically over the entire height of the block. In addition, 3 «harps» of 5 cables of lengths of 10, 20, 30, 40 and 50 meters are spread out over the width of the block. These cables are connected to 3 groups of 5 X-Triggers. The data collected from the entire instrument package serves to confirm continually the absence of movement of the block.



View of the cliff of the Exotic Garden



Battery of 15 X-Triggers connected to the 3 «harps»



Arrangement of optical strands and binary threshold detectors on the block



Climbers at work during the installation



Optical strand in flexible steel sheath - deep anchorage with high-resistant resin



Monitoring station driven through a secure Internet connection



SERVICE DES TRAVAUX PUBLICS

## Safety measures at the Philips plant in Caen following fire damage

### OSMOS ensures workers' safety



Philips plant in Caen



Protective net on roof; optical strand installed on brace



Installation of an optical strand



One of the 10 inclinometers

**One third of the plant had been destroyed by the fire...part of the framework had caved in. In December 2003, this was the extent of the damages in one of the production facilities at the Philips plant in Caen. In order to ensure the protection of the workers during the reconstruction work, the apparently sound load-bearing structures (columns, beams and braces) were placed under OSMOS monitoring.**

In only two days' time, IPC and VERSANT installed 6 optical strands and 10 inclinometers. The slightest crossing of the programmed security threshold will automatically and immediately generate an SMS to the foreman and to the client. It will also alert the local fire department. In addition, at the site itself, any crossing of the threshold will activate a siren for the workers' evacuation.



Warning siren connected directly...



...to the monitoring station



# Essen - Underground car park of Bredeneyer Tor: Rehabilitation will be based on continuous monitoring



Cracks have appeared on the slabs of the underground car park of Bredeneyer Tor. Heavy vehicle traffic could lead to further development of the cracks.



Marking of the cracked zones prior to installation



Monitoring station



Optical crackmeter and temperature sensor

In order to remove all doubt regarding the criticality of the cracked zones and to establish a time-stable reference state, TÜV-OSMOS has placed part of the structure under monitoring. The instrumentation includes two optical crackmeters and temperature sensors. Observations will continue for at least one year. The data recorded will serve as a basis for the design of the structural reinforcement, as well as for the selection of the most appropriate coatings.



# Paris - Cassiopée Car Park, Quai de Grenelle: Dynamic measurements indicate reversible rotation of the slabs



The Cassiopée Car Park has been closed for one year. Since its opening, many structural problems have become apparent. One of the most important issues is the behavior of the slabs, particularly at the joints.

SCYNA 4, the design office, charged OSMOS with the mission of determining the actual behavior of the slabs from several perspectives (rotation under load, amplitude and reversibility). Five optical probes and one high-precision inclinometer were installed. Over a period of four weeks, various dynamic measurements were taken with a test vehicle as a standard service load. Under service loads, the slabs undergo considerable rotation. Nonetheless, this rotation is always reversible. The first reinforcement operations will be conducted with a view to stiffening the slabs.



Optical probe



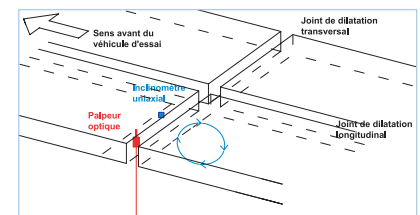
Detail view of one of the joints prior to site installation



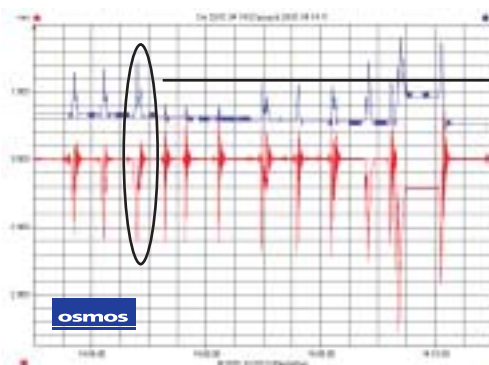
Test vehicle



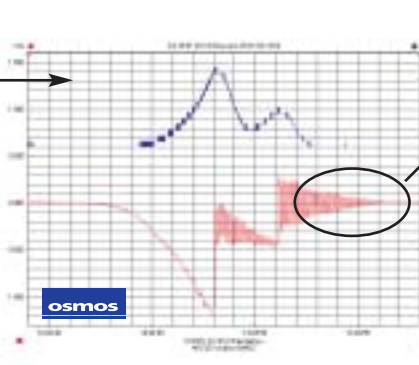
High-precision inclinometer



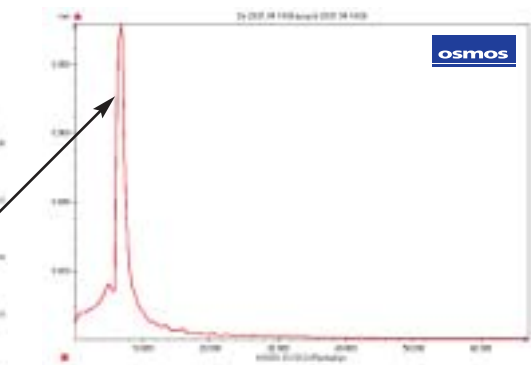
Expertise applied in situation



The different passages of the test vehicle show the reversibility of the inclination (blue curve) and of the vertical displacement (red curve)



Close-up view of one of the passages of the test vehicle. The inclination/sag ratio documents perfectly the slab's characteristic behavior



The software's "Fourier transformation" module automatically indicates the slab's natural frequency observed following unloading (in this case, 7 Hz)

# OSMOS monitoring via Internet:



Dr. Jürgen Braunstein  
Production and  
Development Manager

## A truly multitasking platform

*In the realm of measurements, OSMOS has set a new standard in quality and user-friendliness. For the OSMOS monitoring station is much more than a simple unit for entering, storing and processing data. It is a multitasking and multi-user platform.*

The dashboard can display up to 8 values simultaneously. For sites requiring a large number of measurement lines, it is possible to configure up to 15 screens available in real time.



For example, polar diagrams may be configured to display the displacement history on x-y axes (in slow or accelerated motion)

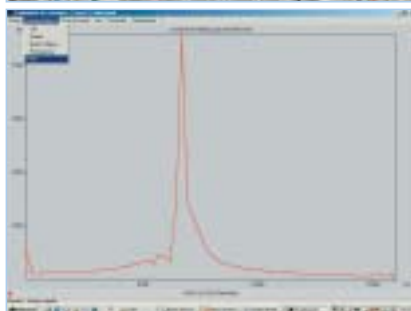
In regard to deferred data analysis, the OSMOS monitoring station affords infinite possibilities:



...from displaying one or several values as a function of time...



...to bar diagrams for counting and classifying...



...to Fourier transformations for modal analysis



The patented dashboard displays data in real time, concisely and legibly



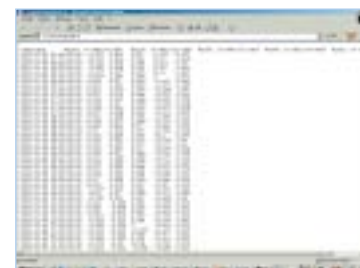
The «compass» diagram indicates an angle variation (for example, wind direction) and a second value (for example, wind speed)

But that's not all. Through the «formula» mode included in the analysis software, each user can define the parameters according to what interests him. Average values and standard deviations can be displayed automatically.



The sum of several optical strands installed in series can be displayed in order to obtain the total variation of the entire length of a structure, for example, here in yellow on the graph

The «formula» mode was designed with the user in mind: to allow easy access to analyses of all types, from the simplest to the most complex.



Finally, for all who work with spreadsheets, importing data in Excel format is immediate and very simple.

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Andreas Steiger  
Dipl. Ing. ETH SIA  
CEO

Andreas Steiger & Partner, Consulting Engineers, was founded in 1990 in Lucerne.

Its highly specialized experts are members of various normalization organizations and are active in working groups in the area of bridge maintenance.