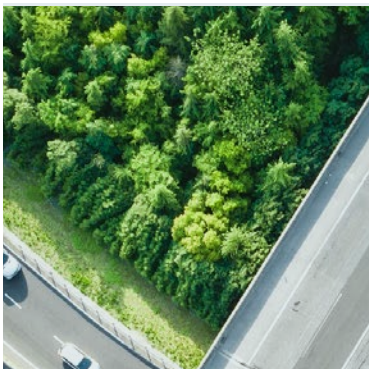
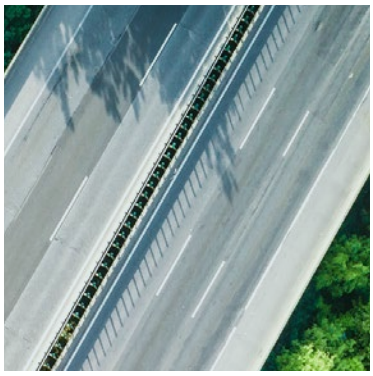
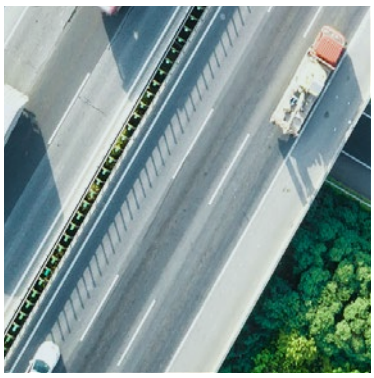



INFRASTRUCTURES



OSMOS continuously monitors structural health and supports your asset management processes.

Safe WiM + D

80%

of elected municipal and district officials have reported that the state of certain bridges is a source of concern*

* Source: Survey conducted by the French Senate as part of the fact-finding mission, "Bridge safety: Avoiding tragedy" (2019)

OSMOS

STRUCTURAL HEALTH MONITORING

A subsidiary of Eren Group, an expert in natural resource efficiency, OSMOS aims to extend the lifespan of structures by optimizing their upkeep, in order to save energy and economize on the materials needed for new builds. With recognized expertise in France and abroad, the company has made a name for itself as a major player on the structural health monitoring (SHM) market. Thanks to its innovative technology and its expertise, OSMOS gives managers of structures and engineering and construction companies the possibility of continuously monitoring changes to their structures, in real time.

Since its creation, OSMOS Group has been working to continuously improve its processes and services, in the interest of customer satisfaction.

ISO 9001 BUREAU VERITAS Certification

OSMOS Group is ISO 9001-2015 certified.

ASSISTANCE WITH ASSET MANAGEMENT & PRESERVATION OF LEVELS OF SERVICE

The State, regional authorities and private transit companies that are responsible for bridge management and maintenance are faced with a scenario of aging assets. The accelerated deterioration of the structural health of bridges has, in some cases, led to costly closures to traffic that affect user movements. Given these challenges, OSMOS's solutions remain the most reliable on the market for continuous monitoring. Our systems go beyond traditional sounding techniques, which are often limited to periodic inspections and/or physical/chemical (non-mechanical) assessments.

OSMOS, A HISTORICAL SHM PLAYER

Engineering works today are subject to periodic visual inspections to monitor their structural health and their changes over time. However, this method of assessment only identifies visible damage. Monitoring offers the advantages of being precise and non-intrusive and of functioning continuously. It provides direct access to essential quantitative information about structures' actual mechanical behavior and the impact on their operation. For managers, this is an extremely helpful tool for asset management.

OUR SUPPORT

OSMOS solutions respond to the challenges associated with aging infrastructure thanks to the early detection of pathologies and/or structural risks. The information derived from our services are of precious help in improving bridge management and upkeep. By redefining maintenance operations and targeted repairs, based on the points of fragility identified in each structure, managers can optimize the use of their budgets and avoid closures that may be unnecessary and that are terribly costly and restrictive for users.

CRITICAL INFORMATION FOR YOUR DECISIONS

■ RECEIVE REAL-TIME STRUCTURAL HEALTH ASSESSMENTS

Our monitoring systems make it possible to quantify and track the behavior of your structure, without interruption. This gives your accurate information about its state of health and allows you to adapt its level of service accordingly.

■ CONTROL STRUCTURAL RISKS

Thanks to continuous, real-time monitoring, OSMOS offers early detection of signs of structural anomalies that could have an irreversible impact on your structure and on your users' safety.

■ ENJOY A LONG-TERM VISION AND AVOID THE NEED FOR URGENT ACTION

Thanks to OSMOS's analyses and the comprehensive expertise we offer, you can be proactive, maximizing the targeting and scheduling of your maintenance and upkeep operations, as well as the associated budgets.

■ OBTAIN AN EXPANDED VISION OF YOUR STRUCTURES WITH SAFE WORKS

SAFE Works, our dedicated interface, provides an overview of your structures' general state of health, allowing you to prioritize the necessary actions and help you in your decision-making.

■ RELY ON OSMOS FOR YOUR CONSTRUCTION MANAGEMENT AND AVOID NEEDLESS CLOSURES

OSMOS lets you optimize your operating and maintenance costs. Interruptions in operations and costly repairs conducted in urgent and crisis situations can be anticipated through the proactive management of your structure.

ACTUAL BEHAVIOR OF YOUR STRUCTURES IN THE LONG TERM

STUDY OF LONG-TERM CHANGES

The measures taken in the short, medium and long terms allow us to detect any structural anomalies and obtain conclusive information about the health of your engineering works. In the long run, the quantity of data recorded will also enable forecasts about a structure's future mechanical behavior and its estimated remaining life.

Easy to install, causing no damage or operation interruption in service

See the presentations of OSMOS LIRIS and OSMOS EDAS on **osmos-group.com**

All types of bridges

Static (cyclical) analysis

CORRELATION WITH THERMAL EFFECTS

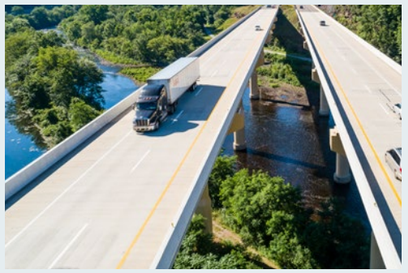
Thanks to our temperature compensation algorithm, the bridge's deformation measurements can automatically be corrected to account for the effect of temperature fluctuations, in order to identify its actual mechanical behavior and obtain exact knowledge of long-term changes caused by the natural aging of the structure.

Information communicated via reports and the SAFE Works Dashboard

See the presentation of SAFE Works on **osmos-group.com**

Safe Works

CONTINUOUS LEVEL-OF-SERVICE MONITORING AND RISK CONTROL



DETECTION AND ANALYSIS OF THE IMPACT OF DYNAMIC STRESSES

Engineering works are exposed to a large number of specific constraints, associated with their operating conditions, traffic and environment. Thanks to these continuous, real-time measurements, OSMOS can not only analyze the structure's long-term behavioral trends, but also the impact of dynamic stresses and overall resilience. Among those stresses, the repeated passage of heavy vehicles is a major factor in a bridge's accelerated deterioration.

Dynamic (instant) analysis

WIM+D™: WEIGH-IN-MOTION REINVENTED

The OSMOS WiM+D™ (Weigh-in-Motion + Deformation) solution measures the weight of each passing heavy vehicle and evaluates its effect on the structure. Each vehicle traveling over the bridge is automatically identified, and the impact of its passage is recorded.

ANALYSIS OF WEATHER CONDITIONS

The natural environment and the weather are sources of external strain on a structure. OSMOS analyzes the effects of dynamic events related to environmental conditions.

FATIGUE ANALYSIS

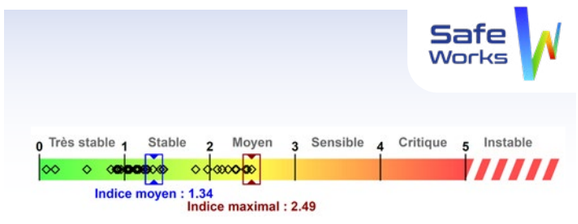
At OSMOS, a fatigue analysis involves studying the structure's responses to the accumulation of dynamic stresses to which it is exposed and anticipating changes in its state of health.

THE SOLUTION TO YOUR ISSUES: THE RESULTS OF OUR ANALYSES

Stability control

STATE OF HEALTH AND CHANGES TO THE STABILITY INDEX

OSMOS's methodology consists of exploiting the continuous measurements recorded, looking at different time scales (from instant to seasonal cycles), in order to deduce the relevant indicators for the bridge's structural behavior and to establish a concrete assessment of its stability.

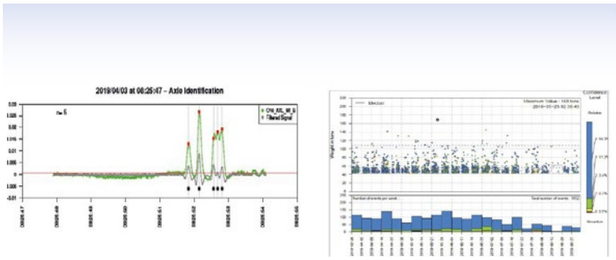


The result is a single, overall score for each sensor. The usual scale is from 0 (stable) to 5 (unstable), appearing in the form of the letters A to F in the SAFE Works interface.

Overload control

CORRELATION WITH THE EFFECTS OF TRAFFIC

Heavy vehicle traffic has a major influence on the health of bridges and contributes to their deterioration over time. Our WiM+D™ system records each event caused by a passing heavy vehicle and calculates its impact on structural health. Thanks to these deformation measurements, it is possible to verify the deck's normal structural behavior under moving loads.

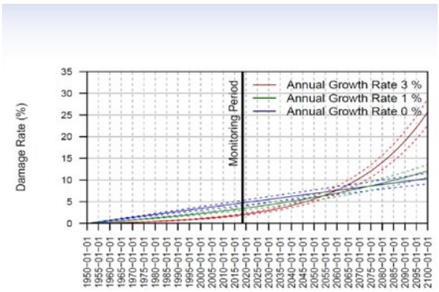


OSMOS SAFE WiM+D™ provides comprehensive information about the structure's usage. You have access to a variety of information, such as speed, length, driving direction, distribution per axle and total vehicle weight.

Fatigue control

ESTIMATION OF THE LIFE OF A BRIDGE

OSMOS tracks various parameters to evaluate wear and tear on the structure and its evolution over time. This allows us to anticipate the future mechanical behaviors of metal bridges and establish a precise assessment of the life of this type of structure.



Extrapolation for the past and future, based on different assumptions about growth in loads over time.

SIX REASONS TO CHOOSE OSMOS

OSMOS
helps with your decisions, so you can:

1 SIMPLIFY YOUR ASSET MANAGEMENT PROCESSES

Verify your bridge's stability at any time, anticipate the structural risks specific to your structure and prioritize your management actions.

2 KEEP YOUR BRIDGE IN WORKING ORDER

Ensure your structure's availability, thanks to preventive management, by taking action in the right place, at the right time, so you can prevent urgent situations.

3 CONTROL PERSONAL AND PROPERTY SAFETY

Our monitoring systems function in real time and immediately detect any abnormal behavior, for optimal control over your structure's safety.

4 AVOID THE COST OF DOWNTIME AND THE NEED TO MANAGE DETOURS

Put an end to urgent responses: avoid critical situations that could force the closure of your structure and the substantial expenses associated with protective measures and detours.

5 EXTEND THE LIVES OF YOUR STRUCTURES

Define appropriate maintenance actions for your bridge and adapt its level of service, for a longer life.

6 SCHEDULE MAINTENANCE AND REPAIRS

Tailor your maintenance policy to your structure and manage your priorities, so as to significantly reduce the costs of your bridge's upkeep.

OUR SIGNATURE PROJECTS

Sylans Viaduct, Ain, France
Structural monitoring of critical parts of the structure that are showing signs of aging, and detection of any harmful phenomena

Austerlitz Viaduct, Paris, France
Verifications and production of a behavioral log for the structure

Elevated Metro viaduct, Nationale to Chevaleret Stations, Paris, France
Expert assistance as part of the modernization of the Metro line

Seki Ohashi Bridge, Oita, Japan
Monitoring to determine the nature of fissures in the deck slabs

Irleau Bridge, Irleau, France
Installation of an OSMOS WiM+D™ system to detect overweight vehicles

Yuan-Shan Bridge, Taipei, Taiwan
Structural monitoring of a large-scale urban highway bridge

Sidi Maarouf Bridge, Casablanca, Morocco
Measurement of the cable-stayed bridge's behavior during load testing and in normal service conditions

14 bridges, Greece
Monitoring of an inventory of structures that are part of a new railway line located in a seismic zone

Champlain Bridge, Montreal, Canada
Monitoring of a high-use structure (traffic, difficult weather conditions, corrosion, etc.)

Mauves Bridge, Loire-Atlantique, France
Monitoring of the behavior of the entire bridge before the demolition and reconstruction of its deck

Pont Neuf, Meaux, France
Calculation of the overall evolution of the bridge deck, to anticipate any abnormal deviations

Libourne Bridge, Gironde, France
Continuous monitoring of deformations in the stone bridge

Lucey Bridge, Savoie, France
Removal of suspicion of undersizing of part of the structure

Millau Viaduct, Millau, France
Research project

Seyssel Bridge, Ain, France
Monitoring of the structural behavior, under service loads, of a cable-stayed bridge showing signs of abnormal aging

Saiso Bashi Bridge, Fukushima, Japan
Monitoring of the solidity of deck slab joints

Hasam Agawa Bridge, Miyagi, Japan
Monitoring to ensure safety during the replacement of damaged deck slabs

Mont Blanc Tunnel, France-Italy
Monitoring a strategic road tunnel

OUR SATISFIED CUSTOMERS

APRR Highway Operator

RATP Paris Metro Authority

Japanese Ministry of Land, Infrastructure and Transport

Deux-Sèvres Departmental Council

Sanlien Taiwan and RSI National Freeway Bureau Taipei

SEPROB Engineering Co. & Ministry of Equipment and Transport, Kingdom of Morocco

Ergose SA Greece National Railway Operator

The Jacques Cartier and Champlain Bridges Incorporated

Loire-Atlantique Departmental Council

Town of Meaux

Gironde Departmental Council

Savoie Departmental Council

Compagnie Eiffage du Viaduc de Millau

Ain Departmental Council

East Nippon Expressway Co., Ltd.

European Mont Blanc Economic Interest Group

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