

Health Care for Structures: Dynamic High Precision Monitoring with BRIMOS Recorder

Health Care for Structures

BRIMOS is health care for bridges and other structures. Comparable to a patient seeing a medical doctor, measurements are taken by highly sensitive instruments, whose results are interpreted by an expert. The BRIMOS Recorder is such a sensitive instrument with the conception of simple use and operation. The diagnosis is taken by an expert through interpretation of the measurement results in combination with information about the patient (structure). The process is simple. The BRIMOS Recorder is placed at the structure to be analysed and a measurement is taken. The data are transmitted together with information about the structure, the conditions during the measurement and the existing pains (damage assumptions). The raw data are evaluated and reconciled with the symptoms. This either results in a clear classification or a recommendation for a deeper examination.

Applications

Monitoring and assessment - the health care for structures - has gained considerable importance worldwide. In the meantime the applications have covered a wide field from maintenance of infrastructure to disaster prevention. Currently the most important purposes are:

- Classification of quality of structures
- Determination of vibration intensities (kB-values)
- Identification of seismic vulnerability
- Assessment of structures upon earthquake resistance
- System identification of engineering structures
- Lifetime prediction of bridges
- Vibration and noise problems on railways
- Vibration and damage assessment of cables
- Damage detection in post-tensioned bridges
- Classification of traffic induced vibrations
- Condition rating
- And many more

An Economic and Simple Tool

In order to make these new methods economically competitive VCE has designed and built the BRIMOS Recorder[®] which combines high precision monitoring with data acquisition and storage facilities.

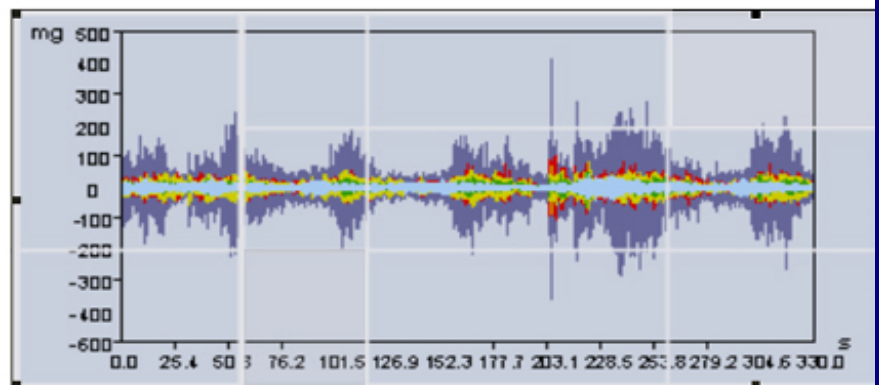
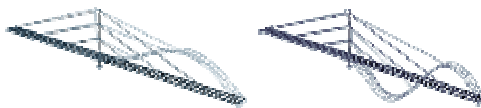
This simple instrument makes high precision measurements possible for virtually everyone. Most of the applications can be directly carried out by the structure owners and local authorities themselves. However in case of state-of-the-art methodology cooperation with VCE is recommended.

The advantages of the equipment are: *It is simple, it is robust and last but not least it costs only 50% of compatible monitoring equipment.* Therefore this method enables the investigation of a large number of structures in short time, which leads to a higher safety level for the users.

Assessment Approach

The base for applied vibration monitoring is that each structure has its typical dynamic behaviour, which may be addressed as vibration signature (see picture below). Any changes in a structure, such as all kinds of damages which lead to a decrease of the load-carrying capacity, have an impact on the dynamic response.

This suggests the use of *the dynamic response characteristic for the evaluation of quality and structural integrity.*



The measured vibration signature of the structure gives information about the current condition, the structural integrity and the quality of the structure. Practicing engineers highly desire a feedback from structures for more economic design and better understanding of the performance.

The BRIMOS-Recorder® monitors ambient vibration and allows acquiring knowledge on the *current condition of the examined structure very quickly*. The vibration signal is measured in three dimensions and is saved on the internal data loggers for further assessment.

How to use the recorder

The application of the BRIMOS Recorder® is very simple. It can be managed even by laymen. In long-term benchmark tests and research projects VCE found out that only one sensor, located at a specific point of the structure, leads to a *good impression about the structural performance*.

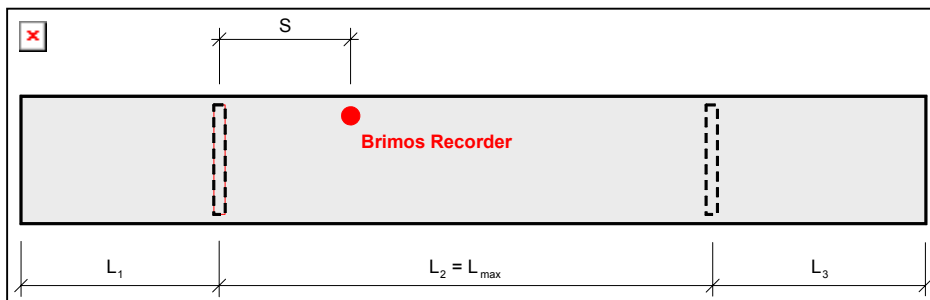
Therefore locating the sensor is one of the major tasks for a correct assessment and classification of the investigated structure. The best location was found by assessing the results from the artificial damage tests. The following rule was defined for placing the BRIMOS recorder on the structure: $S = 0.4 \cdot L_{\max}$

Technical Data

- **Size:**
390 mm x 245 mm x 170 mm
- **Resolution:**
19 bit with 1 kHz sampling rate
- **Sensor :**
 - Triaxial Epi-Sensor forced balance accelerometer
 - Full scale range: $\pm 2g$
 - Bandwidth: DC to 200 Hz
 - Dynamic Range: 155 dB



- **Temperature:**
-20°C up to +60°C
- **Humidity:**
0% up to 95% at +50°C, non-condensing



▲ Location of the Brimos Recorder on the Structure



■ Reliable Data Acquisition

The **BRIMOS-Recorder®** provides reliable data acquisition of the highest quality. It has the added convenience and flexibility that today's monitoring technology offers. Thus it has a high value for the interpretation by structural engineers.

■ Superior Equipment

The standard **BRIMOS-Recorder®** is equipped with an internal 3-dimensional Forced Balanced Accelerometer built by Kinemetrics, which provides superior technology for structural health monitoring, seismic applications and vibration monitoring

■ "All-in-one" Solution

Our **BRIMOS-Recorder®** represents an entirely new conception in compact monitoring and assessment equipment. The main innovation of our development is the design as "all-in-one" equipment containing all required component parts as well as a simplified and very user-friendly operating concept.

■ Quick and Easy Data Transfer

Developed for Microsoft Windows, the BRIREC software provides quick and easy data transfer to your home office and also covers a user-friendly environment, providing fast and accurate knowledge about the dynamic characteristic of the structure.

Contact

Helmut Wenzel
VCE Vienna Consulting Engineers
vce@atnet.at

More information:
<http://www.brimos.com>
<http://www.vce.at>

