



## CIVIL ENGINEERING

SMART STRUCTURE AND  
STRUCTURAL HEALTH MONITORING

- 01 REMOTE CONTROL & REAL TIME MONITORING
- 02 OPERATION & MAINTENANCE
- 03 EARLY DETECTION & RISK REDUCTION
- 04 COST / BENEFITS



LUIGI GIURA -1832 -  
FERDINANDO 'S BRIDGE  
ON GARIGLIANO RIVER



**S**TRUCTURAL HEALTH MONITORING (SHM) is adopted in many applications of various engineering fields: civil (bridges, dams, tunnels, buildings, airports, railways, commercial/industrial facilities, offshore platforms, telecommunications lifelines, liquid and gases transmission systems, etc.), naval (cruising ships, luxury yacht, ports and harbors), aerospace (civil airplanes, unmanned air vehicles, military supersonic planes, space vehicles and stations). The fiber optic technology methods are able to predict structure failure conditions enough time before they happen. Fatigue stress is an important parameter especially on hard environment conditions.

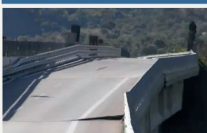


## FIBER OPTIC SENSING SOLUTIONS & SMART SYSTEMS FOR BUILDING APPLICATIONS

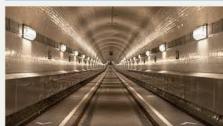
DAMS



BRIDGE



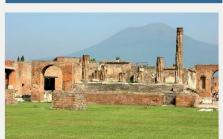
TUNNEL



LAND & SUBSEA PIPELINE

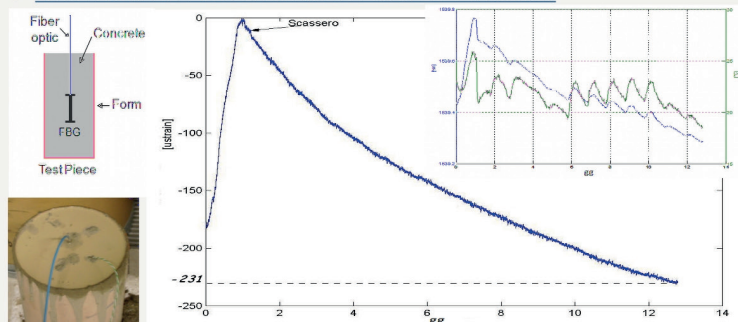


CULTURAL HERITAGE



**UNTIL 60  
DIFFERENT  
SENSORS ON**

### • CONCRETE SHRINKAGE MONITORING



### • POINTS SENSORS

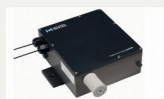
FBG SENSORS  
ON SINGLE FIBER

- 01 TEMPERAT
- 02 STRAIN
- 03 HUMIDITY
- 04 INCLINOMETER
- 05 TILT

SURFACE STRAIN



DISPLACEMENT



EMBEDDED STRAIN



TEMPERATURE



ACCELEROMETER



### • DISTRIBUTED TEMPERATURE

PERFORMANCES

APPLICATIONS

Range 5-30 km  
Spatial Resolution 1m  
Temp. Resolution 1 °C

Leakage detections  
Temperature mapping

### • BENEFITS

- Large Area
- Complex Structure
- Real Time Monitoring/Analysis
- Multiparametric Sensor Network
- Custom Solution
- Model Tracking
- Performances Observation
- Drift Computation
- Early Warning

OPTOSMART IS ABLE to provide specific tests to get long/short-terms on-line monitoring of structural parameters (displacements, pressure, strains, forces, vibrations) and thermal parameter. Many sensors can be directly embedded in the concrete to test new materials and track the structural performances of the building, so to increase the life time, improve the Operation & Maintenance procedures and avoid structural failures.

## Fiber Optic Solution

Civil Application

historical building

new building



**Design**

Parameters of interest  
Design the multisensor network on fiber.



**Construction**

In Concrete  
Control of Concrete and steel



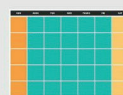
**Continuous Remote Control**  
Real-Time parameters observation



**Checking**  
Structural Test



**Safety**  
Monitoring the construction



**Operation and Maintenance**  
Optimized Scheduling



**Safety & prevention**  
Safety in operating life



**Benefit**  
Earthquake detection  
Structural monitoring  
Safety & Prevention  
Cost  
Large area solution  
Multisensing

optosmart

*“On large area and multiparametric observation, the fiber optic technology is the best in cost/benefits”*