Optimizing structural health monitoring

USING OPTICAL TECHNOLOGY

Cristina Barbosa
Introductions – Cristina Barbosa

- Product Manager, Optical Business
- Degree in Civil Engineering
- 15 years of experience in optical measurement solutions within HBM FiberSensing

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Challenges of SHM

WHERE OPTICAL TECHNOLOGY CAN HELP
Challenges of SHM

- Long periods of operation

## DURABILITY

## STABILITY

## RELIABILITY

Upon installation

After a few years

Silica Resistant
Challenges of SHM

- #DURABILITY
- #STABILITY
- #RELIABILITY

OPTICAL TECHNOLOGY

- Long periods of operation

![Graph showing wavelength and amplitude comparison]

- Wavelength
- Insensitive to losses
Challenges of SHM

Referenced measurements

OPTICAL TECHNOLOGY

Wavelength

Absolute

#DURABILITY

#STABILITY

#RELIABILITY
Challenges of SHM

- **#DURABILITY**
- **#STABILITY**
- **#RELIABILITY**

Trusted measurements

**OPTICAL TECHNOLOGY**

Interrogators with built-in reference → No Drift
Challenges of SHM

- Harsh Environments
  - Water
  - EMI/RFI
  - Salt
  - ATEX
Challenges of SHM

Signal transmission

OPTICAL TECHNOLOGY

Data acquisition system installed far from sensors
Challenges of SHM

- Signal transmission

  OPTICAL TECHNOLOGY

  - Low attenuation of the optical fibers

Long distances
Challenges of SHM

- Large sensor count

OPTICAL TECHNOLOGY

- Multiplexing
- Multifunctionality

Replicated sections
Challenges of SHM

- Cabling complexity
- Replicated sections

Optical Technology

- FBG sensors
- Conventional sensors

- 45 FBG sensors
- 128 Wires
- 4 Wires
- 32 Conventional sensors

Challenges of SHM

- Installation efficiency
  - OPTICAL TECHNOLOGY
  - Preassembled arrays of sensors
  - ZERO Splicing on site
Challenges of SHM

Data management

OPTICAL TECHNOLOGY

Catman software

- Automatic processing
- Automatic reporting
- Alarming
- Cloud
- Data centers
Challenges of SHM

Cost Effective
Challenges of SHM

Cost Effective

Sensor

Accessories

DAQ

Software

FULL MEASUREMENT CHAIN
Challenges of SHM

Cost Effective

TECHNOLOGY:

- Conventional
- Optical
Challenges of SHM

Cost Effective

TECHNOLOGY:
- Conventional
- Optical
Challenges of SHM

Cost Effective

TECHNOLOGY:
- Conventional
- Optical

Graph showing the cost of Sensor + Device + Accessories as a function of sensor count.
Challenges of SHM

- Cost Effective

Cost vs. Sensor Count

- Sensor + Device + Accessories + Installation

Technology:
- Conventional
- Optical
Challenges of SHM

Cost Effective

Sensor + Device + Accessories + Installation

TECHNOLOGY:

- Conventional
- Optical
Challenges of SHM

Cost Effective

TECHNOLOGY:

- Conventional
- Optical

"Special" Applications
Hybrid concept

THE BEST OF BOTH WORLDS
Hybrid concept

Using conventional and optical technology combined

Optical

Electrical
Hybrid concept

Using conventional and optical technology combined

Under the same interface
Hybrid concept

Using conventional and optical technology combined

- All data collected simultaneously
- Best available solution for each measurement
- Synchronized equipment
The new MXFS
The new MXFS

- BraggMETER
  - 100 nm wavelength range
  - 8 optical connectors; 16 channels per connector

- Two sample rate modes
  - 100S/s
  - 2000S/s

- Smart Peak Detection
  - SPD
The new MXFS

QuantumX

- Reduced size and weight
  - 2 Kg
  - 174 x 88 x 135 mm

- Scalable
  - Ethernet
  - FireWire
  - Backplane
  - Analog
  - CAN

- Synchronization
  - NTP
  - PTPv2
The new MXFS

Catman Software
The new MXFS

Precise

Stable

Integrable

For Successful Structural Health Monitoring Projects
Thank You

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