MULTILEVEL MONITORING

Composed of many different layers, each made with various materials, road structure is far from being a homogeneous platform. Each layer has its own role in the pavement structure and reacts differently under moving loads. To get the picture at different depth, Opsens has developed a multi-level fiber optic monitoring system to evaluate road behavior.

The fiber optic strain cell (patent pending) is a unique innovative system efficiently adapted for structure strain measurements in pavement bound surfacing materials. It consists of a proof body holding one or two orthogonal fiber optic strain sensors designed to be incrustated in a laboratory prepared core ready to be retrofitted in existing pavements. Designed to provide all the required protection to the sensors, the fiber optic load cell annihilates stresses imposed to the strain sensors during pavement construction thus maximizing the rate of success of pavement instrumentation.

RETROFITTING STRAIN SENSORS IN EXISTING PAVEMENT

In the context of aging transportation infrastructures, the need for a better understanding of pavement behavior at middle age (before and during distress manifestation) requires good quality data on the mechanical response of existing pavement.

Strain sensors installed during pavement construction typically have a short service life and cannot be used reliably to monitor pavement response after a few years. Operations required to retrofit strain sensors in existing pavements tend to disrupt stress fields in the bound layers and have also typically resulted in unreliable strain data. This major problem was solved by combining the fiber optic technology with the exclusive design of Opsens’ patent pending fiber optic strain cell.

OUTSTANDING FIBER OPTIC SENSING SOLUTIONS FOR ROAD PAVEMENT ANALYSIS

KEY FEATURES

- Robust design optimized for installation in road structure
- Excellent accuracy and long term stability no drift over time
- Could perform both short test and long term monitoring
- EMI/RFI/Lightning immunity, intrinsically safe
- High linearity, excellent precision and resolution
- Scalable sampling rate between 100 to 1000 Hz
FIBER OPTIC STRAIN AND DISPLACEMENT SENSORS FOR ROAD PAVEMENT MONITORING

Measurement of strains and deflections in pavement structures is essential for the development and the validation of mechanistic pavement response models. It is also required to support pavement design and analysis methods. Designed to perform in harsh environments, Opsens’ fiber optic solution is ideal to monitor pavement structure performance. It combines Opsens’ ProSens signal conditioner, fiber optic deflectometer and strain sensors designed for accurate measurement of pavement response under a moving load and provide reliable data to Engineers in charge of improving structure lifetime. Fiber optic sensors assemblies are perfectly suited for road structure monitoring and are well adapted for measurements of horizontal strains and vertical deflection in existing pavements.

Some typical applications are:

- PAVEMENT BEHAVIOR ANALYSIS UNDER SIMULATED TRAFFIC
- MULTI-DEPTH STRUCTURE CRITICAL STRAIN AND DISPLACEMENT MONITORING
- PAVEMENT RESPONSE ANALYSIS DURING SEASONAL VARIATION LIKE SPRING THAW
- ANALYSIS OF TIRE INFLATION PRESSURE IMPACT ON PAVEMENT RESPONSE AND PERFORMANCE

Opsens’ fiber optic sensors are attractive for many reasons. Sensors assemblies are compact and easy to install. They are well adapted for measurements of horizontal strains and vertical deflection in new or existing pavements. Their capabilities to operate in harsh environments make them an attractive alternative to electrical sensors for road pavement response monitoring and similar applications.

This modular platform can accept up to 8 modules and is perfectly suited for strain and displacement measurement with Opsens’ OSP and ODP fiber optic sensors. Providing reliable results with high linearity, precision and resolution, the signal conditioner offers scalable sampling rate up to 1000 Hz.

OPERATIONS

**ODP SPECIFICATIONS**

- Linear stroke length: 25 mm standard
- Accuracy: 0.2% F.S. (@ 25 °C)
- Resolution: 1 micron
- Operating temperature range: -40 to 85 °C
- Operating humidity range: 0-100 %
- EMI/RFI susceptibility: Fully immune

**OSP SPECIFICATIONS**

- Linear stroke length: 230 µm diameter
- Gauge factor accuracy: ± 3 %
- Resolution: 0.15 µε
- Transverse strain sensitivity: Transverse strain insensitive
- Temperature operating range: -40 °C to +250 °C
- EMI/RFI susceptibility: Fully immune

**ODP DISPLACEMENT FIBER OPTIC SENSOR**

Opsens’ ODP fiber optic displacement sensor is designed to offer high precision in the most demanding applications. Combined with Opsens’ ProSens signal conditioner and with the inherent advantages of Fiber optics, the ODP delivers unprecedented repeatability, resolution and reliability required to monitor pavement mechanical response.

**OSP STRAIN FIBER OPTIC SENSOR**

The OSP fiber optic strain sensors, integrated in the optical fiber optic strain cell (Patent pending), provide the reliability and the accuracy required to monitor road pavement infrastructure with great efficiency. They are perfectly suited to measure any change in dimension due to mechanical response of pavements.

**OPSENS OFFERS OUTSTANDING FIBER OPTIC SOLUTIONS FOR ROAD PAVEMENT MONITORING**

**BENEFITS & ADDED VALUE**
To know more call us at 1.418.682.9996
or visit us at www.opsens.com

Key Features
- Robust design optimized for installation in road structure.
- Excellent accuracy and long term stability, no drift over time.
- Could perform both short test and long term monitoring.
- EMI/RFI/Lightning immunity, intrinsically safe.
- High linearity, excellent precision and resolution.
- Scalable sampling rate between 100 to 1000 Hz.

Outstanding Fiber Optic Sensing Solutions for Road Pavement Analysis

Retrofitting Strain Sensors in Existing Pavement

In the context of aging transportation infrastructures, the need for a better understanding of pavement behavior at middle age (before and during distress manifestation) requires good quality data on the mechanical response of existing pavement.

Strain sensors installed during pavement construction typically have a short service life and cannot be used reliably to monitor pavement response after a few years. Operations required to retrofit strain sensors in existing pavements tend to disrupt stress fields in the bound layers and have also typically resulted in unreliable strain data. This major problem was solved by combining the fiber optic technology with the exclusive design of Opsens’ patent pending fiber optic strain cell.

Retaining Strain Sensors in Existing Pavement

Composed of many different layers, each made with various materials, road structure is far from being a homogeneous platform. Each layer has its own role in the pavement structure and reacts differently under moving loads. To get the picture at different depth, Opsens has developed a multi-level fiber optic monitoring system to evaluate road behavior.

The fiber optic strain cell (patent pending) is a unique innovative system efficiently adapted for structure strain measurements in pavement bound surfacing materials. It consists of a proof body holding one or two orthogonal fiber optic strain sensors designed to be imbedded in a laboratory prepared core ready to be retrofitted in existing pavements. Designed to provide all the required protection to the sensors, the fiber optic load cell annihilates stresses imposed to the strain sensors during pavement construction thus maximizing the rate of success of pavement instrumentation.

Multilevel Monitoring

In the context of aging transportation infrastructures, the need for a better understanding of pavement behavior at middle age (before and during distress manifestation) requires good quality data on the mechanical response of existing pavement.

Strain sensors installed during pavement construction typically have a short service life and cannot be used reliably to monitor pavement response after a few years. Operations required to retrofit strain sensors in existing pavements tend to disrupt stress fields in the bound layers and have also typically resulted in unreliable strain data. This major problem was solved by combining the fiber optic technology with the exclusive design of Opsens’ patent pending fiber optic strain cell.