Bridge weigh-in-motion system and Structural Health Monitoring using fiber optic sensors

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Structural Health Monitoring (SHM)

SHM is a means to enable a structure to generate and communicate information concerning changes in its structural health condition, potential damage and deterioration.
Structural Health Monitoring (SHM)

Detect
Recognise
Localise
Quantify

Pain

Exam and Diagnosis

Cure

Detect
Inform

Defect

Inspect

Diagnosis

Repair

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Bridge Weigh-in-Motion (B-WIM)

Bridge WIM Concept:

\[ M^\text{th}_A = W_1 \times I_1 + W_2 \times I_2 + \ldots \]
WHY?
Increased loading:

• A large amount of the bridges across the world are reaching the end of their design lives
• the intensity and type of loading induced is very different from those anticipated at design stage
• There is a requirement to retain infrastructure for longer and enhance its capacity
**Structural Challenges:**

- Materials have inbuilt imperfections/flaws
- Degradation and wear from corrosion, fatigue or systemic overloading
Structural Challenges:

- Some older structures were not designed for modern demands
- Changes in the environment impose higher loads such as wind loads
- Extreme events such as impact damage, flooding or vandalism
Our Solution
Bridge site Loughbrickland, Co. Down:
B-WIM System development

- Lab trials and Finite Element modelling carried out to determine critical sensor locations and predict bridge behaviour
B-WIM Installation layout

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B-WIM Installation

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B-WIM Calibration

DVA Weigh Station

Bridge Site
$B(10)$

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Successful new method of axle detection

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THANK YOU

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