Environmentally Sealed Bridge Completion Modules

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MR-Series Bridge Completion Modules from VPG's Micro-Measurements brand are sealed in a water-resistant casing by BDI to create its Foil Gage Completion Modules. The modification to the traditional MR-Series modules allows the company to install gages in adverse field conditions for laboratory-grade measurements, while decreasing the amount of time and skill required to complete a quality field strain gage installation.

Company/Institute: Bridge Diagnostics, Inc. (BDI**)**

Industry/Application Area: Civil, Aeronautical, Heavy Industrial

Product Used: Bridge Completion Modules MR1-350-130, MR1-120-133

The Challenge

Long lead wires within the active arm of a Wheatstone Bridge circuit can cause significant error in one's measurements, including attenuation of low-level signals and unwanted thermal output. Micro-Measurements offers the "nearly perfect" solution with its MR-Series Bridge Completion Modules. These very simple devices are used to complete quarter- or half-bridge gage configurations and are a cornerstone of BDI's operation, allowing the company to execute its laboratory and controlled-environment work in an efficient and cost-effective manner. However, in field applications, bridge completion modules can be damaged by extreme cold, heat, wind, rain, hail, and mechanical impact, and require field soldering to complete intra-bridge wiring. As a large part of BDI's business is providing testing services in harsh outdoor conditions — ranging from the extreme cold of the upper Canadian artic to the extreme heat of Saudi Arabia — the company needed a way to more easily bring the benefits of MR-Series devices to in-field installations.

The Solution

To simplify installations in the field, BDI developed its series of Foil Gage Completion Modules. At the heart of each module is a Micro-Measurement MR-Series Bridge Completion Module, sealed in a water-resistant casing. For foil strain gage field installations, both the pre-wired foil strain gages (glued or welded installation) and BDI Foil Completion Modules are equipped with M8 mating

connectors, allowing engineers/technicians to show up on site with ready-made kits that can be installed without the need for soldering. These simple modifications to MR-Series units allow users to take advantage of the devices' laboratory-grade measurements in less than desirable environments.

The User Explains

Sealed cables and connector-terminated modules enable the technician to simply install the foil gage and connect the preassembled lead wire to the BDI Foil Completion Module to complete installation. This modification to the traditional Micro-Measurements MR-Series module decreases the amount of time required to complete a field installation, reduces the skill level required to obtain a quality field strain gage installation, and allows gages to be installed in adverse field conditions for laboratory-grade measurements.

The effectiveness of the BDI Completion Module was made apparent during the Westinghouse Electric Corporation (WEC) Proof Test Project in the summer of 2014. In collaboration with Barnhart Crane and Rigging, a full-scale proof load test of a mechanical system was performed to 1.1 times the maximum haul load, or 1.5 million pounds. The application had 144 quarter- and half-bridge foil gages installed on the WECX 800 Schnabel Railcar system, which was the world's largest train car. Since no field-soldering was required, three BDI technicians were able to install all foil strain gages, completion modules, and data acquisition systems in less than three days. Torrential downpours, high humidity, and high temperatures were experienced throughout the installation and test procedures. Since all weldable gages were weather-proofed ahead of time as dictated by standard BDI practice, and IP67 connectors were used at all transitions from foil gages to PCs, there was zero fallout in the installation even under such harsh environmental conditions.

BDI relies on the customized MR-Series modules for its consulting strain gage services and sells the units through its BDI Instruments division. The modules are available in quarter, half, and interchangeable configurations and they can be ordered with or without thermistors for on-site temperature measurements. Leadwires can be pre-built by BDI or connector information can be provided so the client can build their own.

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