



DaisAE Necklance Strings

DaisAE™: Suspension Cable Monitoring System for Bridges

WHY MONITOR YOUR BRIDGES CABLES?

Cable supported bridges are unlike normal bridges where cracks are typically visible during inspection. Cable defects are hidden, and in most cases, hidden for many decades. One bad panel in a cable is like a weak link in a chain. However, cables are typically difficult and expensive to visually inspect. Typically, opening and wedging only checks 3-5% of the cable, which means more than 95% of the panel's conditions are unknown. Wedging only reveals some small percent of the broken wires, thereby reducing the Probability of Detection (POD) to less than 1%. Using a risk-based monitoring program yields quantitative results as to the cables condition. By utilizing Acoustic Emission (AE), 100% of the cables volume is monitored for wire breaks and a cumulative history is developed so that bad panels are located and repaired. AE also builds a life-deterioration model, so installing it prior to dehumidification and opening will allow owners to make an accurate assessment before spending millions of dollars. Recent discussions show most wire breaks are from Hydrogen Embrittlement and not corrosion.

THE ECONOMICS

Suspension bridges are typically found in important economic areas and their health is critical to the region. Funding is often difficult for bridge owners. It is the duty of engineers to persuade capital from resources to ensure safety and prevent long-term risk. It is typically only a matter of reallocating funds from opening and wedging to monitoring. Deferring opening and wedging inspection

would save over a million dollars. This easily justifies an AE Monitoring program. Most importantly, AE will show exactly what panels require making future inspections 100 percent effective instead of only 3-5 percent.

DAISAE™ SYSTEM

MISTRAS recognizes that time is money. Installation, lane closures, access equipment and cabling are high expense components of monitoring projects. The new DaisAE is a snap-on, single-channel node and single data cable system. It is more reliable since it uses less sensor cabling. Using the Golden Gate Bridge as an example, the sensor cabling would be reduced by as much as 30 miles based on wiring sensors back to several large multi-channel systems. The DaisAE system cuts installation time by more than half. DaisAE uses system-on-a-chip technology (SoC) and Power over Ethernet (PoE). SoC allows for less power, lower cost and higher reliability than the multi-chip systems that they replace. PoE reduces cabling and allows communications. Primarily the DaisAE use PoE/Gigabyte Ethernet but can also use Wi-Fi or cellular, making it wireless. However, for permanent installations, wired is always preferred over wireless, as battery and solar panel maintenance is expensive. The new DaisAE brings the best of wired (reliable power) and wireless (less cabling). These new technologies are non-proprietary and are set to become the industry standard.

SUSPENSION CABLES – DAISAE™-2 SYSTEM

The DaisAE-2 is a 2-channel node, which can be used on the main suspension cable and suspender cables. With an even lower cost per

System Specifications

Operating Temperature: -22° F to 150° F
System frequency bandwidth: 10 kHz – 600 kHz
Sample Rate: 10 MSamples per second
Max AE processing rate: 200 – 400 Hits/second
Max Daisy Chain modules on 2 strings: 16
Max distance of Daisy Chain: 1000 ft. (300 m) with 8 DCM's attached, 4000 ft. Physical max (with very few DCN's)

Note: More chains can be added to increase to system to hundreds of channels

Daisy Chain Node Specifications

Power Requirements: 20 mA @ 24 Volts DC
Box dimensions: ... ~4x6x3.2 in. (~100x150x80 mm)
Connectors: ... 1 Gland per AE Sensor connection 2 RJ-45 outdoor connectors for "in-out" cable
Daisy Chain Cable Requirements: Standard Ethernet, Cat. 6 Shielded, Twisted Pair

Daisy Chain Controller Base Station Specifications

Description:.... NEMA-4, wall mount enclosure, provides remote communications, data management, alarming and remote access and setup of the nodes.

channel, suspender rope can benefit from the same monitoring program.

M-MODULES FOR DAISAE™

M-Modules are very low cost upgrades that allow for one or all of the DaisAE nodes to utilize GPS, Vibration, Wi-Fi, strain, LVTP, Tilt, etc. Vibration of a suspension or cable stays can be monitored along with wire breaks.

Call MISTRAS today to discuss your Suspension Cable Monitoring needs.