Embedded Sensor Technology for Real-time Remote Acquisition Of Load Measurement for Offshore Structures

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ABSTRACT

Offshore structures have been the backbone of the energy industry for a long time. But questions remain about how much strain, displacement, settlement, and other variables affect the various elements of the Offshore structure. How are these variables verified and compared to design loads? By mathematical and finite element methods only? With rapidly advancing sensor technologies, Offshore energy leaders have, out of necessity, started introducing advanced technologies like Smart Structures' Embedded Data Collectors (EDCs) for reinforced concrete pile foundation elements, as well as sensor technology for external contact monitoring on steel elements. How can EDC technology transform the integrity of Offshore structures?

METHODS, PROCEDURES, PROCESS

EDC technology involves the use of embedded sensors located inside structural and sub-structural elements, along with a wireless radio transmitter and laptop software to analyze data. On a number of projects by Smart Structures, sensor packages have been embedded in the harsh environment of concrete casting in numerous ways commensurate with the nature of superstructures and substructures. After the concrete sets, the concrete elements, embedded with sensors, are transported without damage to a construction site and installed. EDC further enables long-term remote acquisition of measured data and the real-time transmission of the data from an in-service structure through an IoT-based cloud system. This technology offers endless possibilities to connect and integrate with a host of IoT devices and a host of platforms for many applications with multiple data-gateway options.

RESULTS, OBSERVATIONS, CONCLUSIONS

Potential smart sensor technology applications in offshore structures include jack-up rig spud cans, legs, jack-house assembly, and pinions; wind turbine structure foundations, mooring-line suction piles, superstructures, bridges, and various monopod structures.

NOVEL/ADDITIVE INFORMATION

This paper discusses the potential for the broader application of EDC technology, already in use in surface transportation infrastructure, to the offshore energy industry. It enumerates multiple benefits related to real-time measured data.

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