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Distributed Fiber Optic Sensing Technology in the Extreme Range of Civil Engineering

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SUMMARY

The foundation assessment plays an equally important role in assessing the current state of the building, the current structural safety and the remaining lifespan of civil engineering structures as well as the assessment of the above-ground structure. One of the biggest problems of the continuous monitoring of subsurface foundation elements is the reliable data acquisition over a 3-year lifetime. Relevant experience of the last decades shows that the reliability of the measuring results e.g. due to the decreasing quality of the instruments is lost over time in the case of the essential long-term measuring methods in the field of special underground engineering, or an interpretation of the results is difficult. Other measurement and test methods, e.g. fiber optic Bragg grating sensors permit only point-specific statements about the load-carrying behavior of the monitored object. Based on this, in 2016, a new innovative anchor and pile monitoring system was used for the first time in addition to a classical instrumentation in order to demonstrate and promote the applicability of fiber optic measurement technology to the construction site. Furthermore, the distributed fiber optic sensing technology can be used as a "sleeping" sensor. Based on the measuring principle, it is now also possible to carry out measurements over the entire lifecycle of the structure and to classify the current actual state.



Abstract

The foundation assessment plays an equally important role in assessing the current state of the building, the current structural safety and the remaining lifespan of civil engineering structures as well as the assessment of the above-ground structure. One of the biggest problems of the continuous monitoring of subsurface foundation elements is the reliable data acquisition over a 3-year lifetime. Relevant experience of the last decades shows that the reliability of the measuring results e.g. due to the decreasing quality of the instruments is lost over time in the case of the essential long-term measuring methods in the field of special underground engineering, or an interpretation of the results is difficult. Other measurement and test methods, e.g. fiber optic Bragg grating sensors permit only point-specific statements about the load-carrying behavior of the monitored object. Based on this, in 2016, a new innovative anchor and pile monitoring system was used for the first time in addition to a classical instrumentation in order to demonstrate and promote the applicability of fiber optic measurement technology to the construction site. Furthermore, the distributed fiber optic sensing technology can be used as a "sleeping" sensor. Based on the measuring principle, it is now also possible to carry out measurements over the entire lifecycle of the structure and to classify the current actual state.