Low-Frequency Cable-Vibration Monitoring And Cause Investigation In A Cable-Stayed Bridge

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Low-frequency vibrations of cables were identified from a recently built cable-stayed bridge. The stay cables showed two types of vibrations: high-frequency and low-frequency vibrations. The engineers could quickly locate the high-frequency vibrations as vortex-induced vibrations. However, the observation of low-frequency vibrations was an extraordinary event for stay cables, not reported before, and uneasy to explain the cause of vibration. Accordingly, we performed a series of field monitoring for the stays subjected to the excitations. We choose camera-based image processing to identify oscillation characteristics of vulnerable cables. An operational modal analysis also identified the dynamic properties of the superstructure. We concluded that the small amplitude of vortex-induced vibration of the bridge deck induced the cables at a lock-in wind speed. Furthermore, the long-term videos accumulated from the CCTV provided a decisive clue supporting our assumed vibration scenario. This paper demonstrates the investigation procedure, use of sensors including camera and CCTV, interpretation of monitoring data, and cause investigation from the wind engineering point of view.