KINEMETRICS

Advancement through Innovation

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Why Kinemetrics Products and Solutions for Dam Safety?

Since 1969, Kinemetrics and its subsidiaries have been the global market leaders in designing technologies, products, and solutions for monitoring earthquakes and their effects on people and structures.

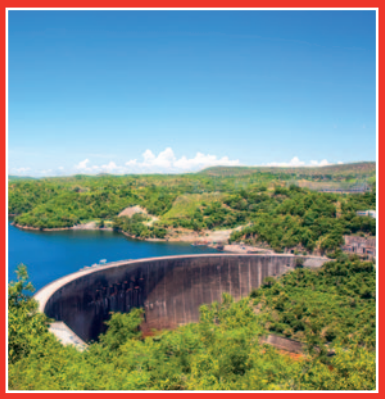
A dam's strength and serviceability can be considerable - even terminally - reduced by natural or human-made events, such as earthquakes, extreme levels of operation, uncontrolled structural changes, and various other effects. Deploying seismic instrumentation and structural monitoring systems provides timely and actionable information about potential problems

Kinemetrics offers a variety of products to monitor your dam(s) effectively, from classic to innovative:

- *Smart, IP-ready, communication-link agnostic sensors maximizing flexibility and scalability*
- *Standalone free field stations or networked in (common) trigger or realtime streaming mode*
- *Real-time FFT & PSD with alarm notifications*
- *Automatic generation of engineering reports*
- *High-availability data acquisition, processing, and information/alarm dissemination platform*
- *Kinemetrics' Management Infrastructure platform provides APIs to digital twin technology*

Seismic Monitoring

- *Monitor earthquakes and structural response with business continuity decision making*
- *Provide installation, training, maintenance, operational support for very high system availability*
- *Deliver services from seismic hazard and risk assessment to performance-based earthquake engineering*



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Our comprehensive solution KMIDam (Kinemetrics Management Infrastructure system for Dams), is an end-to-end product consisting of intelligent, IP-based accelerographs, high-availability data acquisition and processing framework with APIs to effectively disseminate information and feed digital twins. The high-performance and compact accelerographs leverage the latest technology to maximize flexibility and scalability. Besides command & control of the monitoring sites, KMIDam can inform operator(s) and emergency personnel on the real-time status of many dams by feeding data into modern infrastructure management systems, for example, the generation of digital twins.

Importance of seismic instrumentation of Dams

The use of seismic instrumentation and monitoring, especially in the last decade, is a result of the increasing need for the monitoring of hazards and associated risks as well as better management of the safety issues concerning dams.

Such development is further enhanced by the ongoing development and sophistication of sensors, data acquisition systems, communication, and other advances in technology.

Reservoir Induced Seismicity (RIS): In the past, we have seen significant structural failures in dams due to earthquakes, such as at the Kremasta Dam, Greece, in 1965, where once the impoundment of the dam began, two magnitude 6 events occurred within 120km of the dam. The largest induced earthquake (M6.5) occurred at the Koyna Dam, India, in 1967, killing roughly 200 people and injuring over 2,000. This happened in a region of low natural seismicity.

Dynamic Monitoring: Despite progress in the dynamic analysis of dams, it is still not possible to reliably predict the behavior of dams during very strong ground shaking due to the difficulty in modeling the inelastic behavior of dams, the insufficient information on the spatial variation of ground motion and other factors. The factors that eventually lead to failure and their severity and effect on the structure can be measured and monitored with seismic instrumentation in real-time, providing a current state of the dam. Therefore, timely notifications about potential problems can be generated, and the dam's behavior can be visualized with KMIDam leveraging the emergence of digital twin technology.

Actionable Information: A comprehensive infrastructure management system like KMIDam satisfies the needs of many stakeholders within the Dam monitoring community:

- *Policymakers - Improve safety mandates*
- *Dam Owners - Save money by reducing downtime*
- *Facility Managers - Better manage decisions and save life/property*
- *Nearby Residents - Increase confidence in safety*
- *Operators - Receive immediate status on dam safety and functionality*
- *Engineers - Receive immediate status on network conditions*

Providing actionable information tailored for users with different requirements in terms of content and timeframe is critical for any monitoring system for Dams. Kinemetrics is addressing this demand with its product line.

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