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# USACE SMART Gate: Structural Health Monitoring to Preserve America's Critical Infrastructure

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**ABSTRACT**
This talk focuses on structural health monitoring of the downstream miter gates on the main channel of Lock and Dam 27 just north of St. Louis, Missouri. Miter gates are the most prolific gate type employed by the United States Army Corps of Engineers (USACE), used at more than 75% of all lock and dam sites throughout the United States. Structural health monitoring of these gates is important, because it provides a method for detecting damage, including degradation of boundary conditions, fatigue cracking, dragging of debris, or discrete occurrences of damage,such as barge impact, which may otherwise go unnoticed until the damage propagates and costly repairs become necessary. By knowing in real time the extent and location of damage, a better informed decision can be made as to whether or not the gate is in immediate need of repair. The initial Structural Monitoring and Analysis in Real Time of Lock Gates (SMART Gate) study of Lock and Dam 27 is focused on achieving several specific condition monitoring targets. The target that will be addressed in this paper is the ability to detect contact degradation between the lateral edge of the lock gate and the wall of the lock chamber. Preliminary results from finite element models show that contact degradation is a localized phenomenon, which is empirically known to occur over time. Initial field results have revealed seasonal changes in strain readings as well as non-linear strain behavior during the beginning of a chamber fill event. This talk presents initial efforts to combine these findings synergistically to detect contact degradation between the quoin and wall boundary on the downstream miter lock gates at Lock and Dam 27.

**KEYWORDS:** *civil, infrastructure, damage detection, decision making, sensors, finite elements*