RESEARCH
PROJECT CAPSULE [20-2ST]

June 2020

TECHNOLOGY TRANSFER PROGRAM

Skew Detection System Replacement of Vertical Lift Bridges (Phase I)

JUST THE FACTS:

Start Date:
March 9, 2020

Duration:
9 months

End Date:
December 8, 2020

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Sponsored jointly by the Louisiana Department of Transportation and Development and Louisiana State University

POINTS OF INTEREST:

Problem Addressed / Objective of Research / Methodology Used / Implementation Potential

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PROBLEM

Louisiana, along with many other states with vertical lift tower drive movable bridges, has experienced issues with replacements for their Selsyn legacy technology bridge skew detection systems that are no longer manufactured.

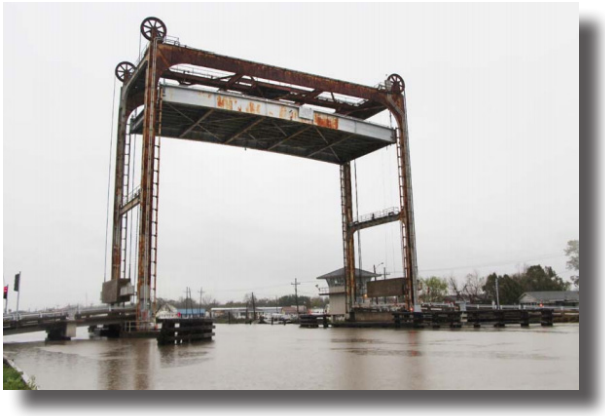

Figure 1
Bayou Lafourche-Golden Meadow Bridge, LA 308, Lafourche Parish

In renovating and replacing aging bridge control systems and associated skew detection systems, some owners and agencies have replaced their systems with microprocessor-based programmable logic controllers (PLC). This form of bridge control, although providing additional and more accurate control functionality, does require specially trained technicians to maintain, repair, and program such control systems. In many instances, owners do not possess such technological expertise and the cost of recruiting and training such personnel or contracting third parties is cost prohibitive.

One inherent and critical control function of a tower drive vertical lift bridge is its ability to ensure that the moving span is maintained level throughout its operating travel. Failure to maintain level operation over its length is known as span longitudinal skew. When occurring, this skew condition can lead to jamming of the movable span in its guides and, unless protected against excessive skew, a catastrophic bridge failure can occur. Vertical lift tower drive skew detection and monitoring was previously satisfied with the use of a differential Selsyn as indicated above. A differential Selsyn consists of a transmitter in each tower that monitors and transmits angular rotation of each tower drive to a differential receiver that produces a rotational output that is a measure of the difference in angular rotation of the two tower drives and hence a measure of skew. This measure of skew being used to alarm skew and trip the bridge drive system, which is no longer readily available.

The problem to be solved as part of this research assignment is to identify a substitute to this legacy technology skew detection and monitoring system that does not rely on advanced microprocessor-based systems. The identified substitute must have the reliability, maintainability, and longevity to satisfy the operating criteria for this critical highway and marine traffic infrastructure.

OBJECTIVES

The prime objective of this research assignment is to provide a thorough literature search and evaluation of alternatives and a solution to the problem of replacing the legacy technology skew detection and monitoring system. One of the goals of the assignment is to select a system that does not require the Louisiana Department of Transportation and Development (DOTD) maintenance electricians to possess any additional expertise for its operation, maintenance, repair, or programming other than they possess today.

An additional objective of the study is to identify a system or alternative systems that do not require sophisticated electronics but provide accurate and reliable information of span skew in the long term without excessive and frequent maintenance.

METHODOLOGY

To meet the objectives of this study, a comprehensive literature review will be completed. As part of the literature review, interview with bridge operators and maintenance personnel will be conducted to gain insight into operating procedures, concerns, and operational shortcomings of current control systems as well as the amount of required maintenance for these systems. Information gathered will also include the design and vintage of installed skew detection systems in Louisiana, across the United States, and worldwide. Additionally, bridge control system vendors will be surveyed to determine both current practices and current available technologies.

Deliverables include (1) recommended alternative to the existing legacy Selsyn skew detection and monitoring system; (2) a realistic assessment of impediments to successful implementation of recommended alternatives; and (3) criteria for judging the progress and consequences of implementation.

IMPLEMENTATION POTENTIAL

The results of this project will enable DOTD to determine the best path toward replacing current legacy Selsyn skew detection and monitoring systems.