

Project Profile – Big Dam Lock

Overview

Chickamauga Lock and Dam is located at mile 471 of the Tennessee River in the port of Chattanooga, Tennessee, USA. The Tennessee Valley Authority (TVA) built the project in the 1930's. The lock was placed in temporary operation in 1938 and was completed in 1940. The lock chamber measures 360' x 60' and the project also includes a hydroelectric dam/plant and a highway bridge.



The Lock has a history of structural problems as a result of "growing concrete", or Alkali Aggregate Reaction (AAR). This is a chemical reaction in concrete, which occurs when alkali in the cement reacts with certain silicate or carbonate minerals in the aggregate causing the concrete to expand. This growth results in increased internal stresses in the concrete causing cracking and movement of concrete monoliths. This movement causes equipment alignment problems as well as structural stability problems.

Numerous instrumentation programs have been commissioned and implemented over the years to provide data regarding the rate of concrete expansion and its effect on the lock structure, the largest completed in 1997. Additional programs since then have installed over-core stress cells, and in 2002 a network of (10) electronic pendulums were installed. At present the following instruments are being read by the network of 10 ADAS's installed at the Lock:

Vibrating Wire Crackmeters	44
Vibrating Wire Extensometers	128
Vibrating Wire Growthmeters.....	30
Vibrating Wire Inclometers and Tiltmeters	180
Vibrating Wire Jointmeters.....	6
Vibrating Wire Piezometers and Uplift Cells	44
Electronic Optical Pendulums	10
Vibrating Wire Strandmeters.....	135
<u>Vibrating Wire Over-Core Stress Cells</u>	<u>258</u>
Total.....	870

In addition approximately 620 temperature measurements (thermistors and vibrating wire) are also made.

What We Did

We have been tasked with supply of equipment and services for numerous phases of instrumentation work at the Lock. These include the following:

- Supply of the electronic pendulums and ADAS to automate the measurements. This required development of hardware and software components to facilitate automating measurements over the RS-485 pendulum network.
- Supply of MultiLoggerDB to manage all the systems, automate data collection and manage the data. The software is installed on the TVA LAN which allows data access to key TVA personnel. Use of MultiLoggerDB allows for a completely automated data collection and data access system.
- Creation of the initial MultiLoggerDB database for the project. This involved extraction of historical data, both electronic and manual (some extending back to 1960), extraction of formulas from numerous Quattro Pro worksheets, development of the project interface, resolution of numerous calculation issues, and development of over 1500 calculations to support the various types of instrumentation and the various data reduction methods. The database system was deployed in June of 2002 and has been in continuous operation since.
- Retrofit of all datalogging systems installed at the Lock with the Canary Systems VWDSP Vibrating Wire Interface, to provide improved reading reliability for the vibrating wire instrumentation.
- Retrofit of some datalogging systems with the Canary Systems MultiSensor Interface, to support more flexible measurement modes as well as sensors from other manufacturers.
- Supply of datalogging systems and components to provide for expanded monitoring programs.
- Investigation of numerous instrumentation issues, including long-term instrument reliability and specific instrument failures.



Who to Contact

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