RECLAMATION
Managing Water in the West

U.S. Department of the Interior
Bureau of Reclamation

# Demonstration Project to Implement Electro-Osmotic Pulse Technology to Stop Water Leaks Through Concrete

Evaluation of EOP System installed in the headgate shaft at Trinity Dam

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This project evaluated the EOP system installed to determine its effectiveness for preventing water seepage and reduce calcite buildup.

### Mission Issue

Electro-Osmotic Pulse (EOP) technology has the potential to stop water leaks through concrete. It appears to be an effective tool to consider when attempting to stop water leaks through concrete.


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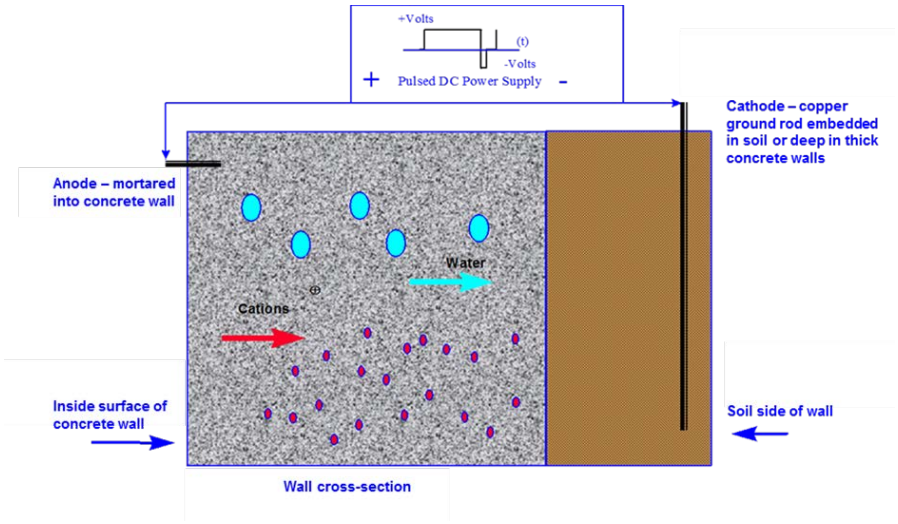
## Problem

Reclamation has many existing structures which are unique, due to the size and amount of cracks. These structures play a critical role and any type of damage due to water seepage through concrete can cause extensive and lead to expensive repairs. This damage can include, but is not limited to, corrosion from the resultant damp environment affecting the equipment operation (e.g., gate operating motors and pipelines), corrosion of the reinforcing steel causing cracks and potential structural failure, increased maintenance required to mitigate damage to equipment, removal of calcite, and mitigation safety issues. Chemically grouting leaks may only be a temporary fix and often takes a significant amount of time to completely seal the cracks. Grouting does not prevent seepage through the pores and very fine cracks.

## Solution

Electro-Osmotic Pulse (EOP) is a technology that in conjunction with grouting and concrete repair can potentially be a long lasting solution to water intrusion through concrete. This technology uses current and electric fields to drive water away from the anode towards the cathode. This results in essentially forming a barrier to water intrusion from the external surface or for thick sections of concrete a barrier in the concrete. One very important benefit of this technology is that excavation of the structure to prevent leaks is not required which can be a major ordeal and lead to accidental damage to the structure.

The goal of this study is to mitigate water leakage and additional calcite buildup.




*EOP technology schematic.*

***"Reclamation has many water leakage issues at concrete structures. Grouting alone does not always solve the issue. EOP can help with these problems in conjunction with grouting."***

Kurt von Fay
Civil Engineer
Reclamation

### Collaborators

Reclamation Trinity Dam site

### More Information

https://www.usbr.gov/research/projects/detail.cfm?id=4553

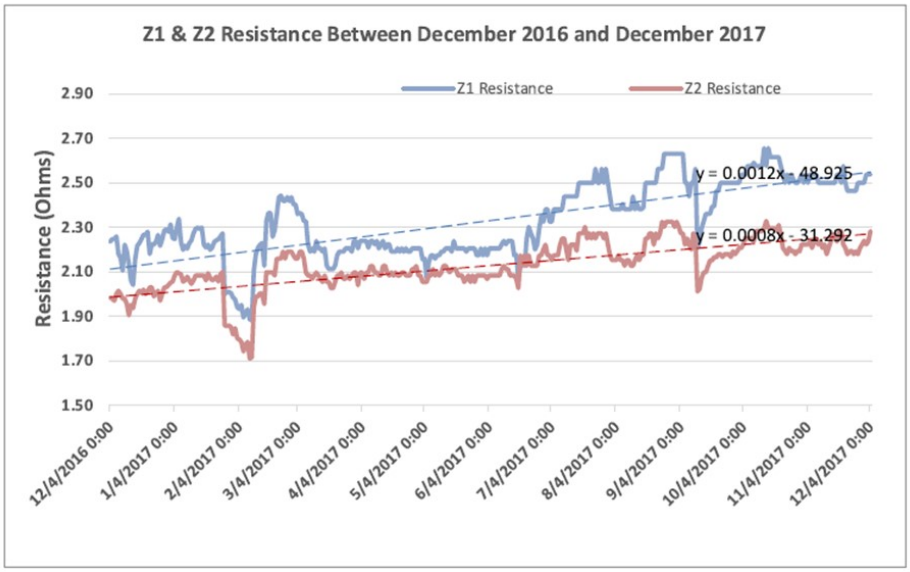
https://www.usbr.gov/research/projects/researcher.cfm?id=1275

## Application and Results

The system involves inserting anodes (positive electrodes) into the concrete surface on the side of the structure that needs to be dry and placing cathodes (negative electrodes) in the soil or water directly outside the structure. In the case of thick concrete walls or accessibility issues, the cathodes can be inserted into the concrete to a given depth. Results of the installations at Trinity Dam to reduce seepage and dry out the concrete walls of the Bonnet Cover Chamber and Headgate shaft show that EOP technology can mitigate many water-related problems from the interior of affected areas. Overall, the EOP system seems to be working as intended and appears to be an effective tool to consider when attempting to stop water leaks through concrete.

## Future Plans

This trial was specific and limited in scope, hence recommendations for further investigations at other Reclamation facilities to determine the effective limits of the technology. Further investigations are also recommended to determine if this technology can prevent or deter other common problems due to water intrusion observed at a number of Reclamation facilities (e.g. freeze-thaw and alkali-silica reaction (ASR)). EOP may also be effective in diverting water into a drainage system.




*Graph of applied resistance over time indicating a decrease in moisture in the concrete.*

*Image showing the physical dryness of the walls.*