US Army Corps of Engineers®
Engineer Research and Development Center

Electro-Osmotic Pulse (EOP) Technology

Technology

EOP technology mitigates water-related ("wet basement") problems from the interior of affected areas without the cost of excavation. An EOP system consists of three essential parts: (1) anodes (positive electrodes), inserted into the concrete wall or floor, (2) cathodes (negative electrodes), staked into the soil outside the structure, and (3) an electronic control unit that delivers electric pulses to the anodes. The pulses of electricity draw water away from the anode, toward the cathode, reversing the direction of water seepage. The system causes water to actually flow out of the basement walls, away from the building.

Problem

In older buildings, severe damp-basement problems can increase maintenance requirements and make affected areas uninhabitable or even unusable. Below-ground masonry and concrete structures, such as basements, can sustain structural damage from chronic water seepage through floors and walls. Water corrodes steel reinforcement bars, cracks concrete walls, and erodes mortar. Intruding water raises the interior relative humidity, accelerating the corrosion rate of mechanical equipment in the area and creating unacceptable air quality due to the rapid growth of bacteria and mold. The usual approach to solve such groundwater intrusion problems in problem areas is the labor intensive and costly "trench and drain" method, which involves excavating the exterior to expose the wall area and the base of the foundation, replacing damp-proofing on the wall surface, and installing a drain tile system around the building or affected area.

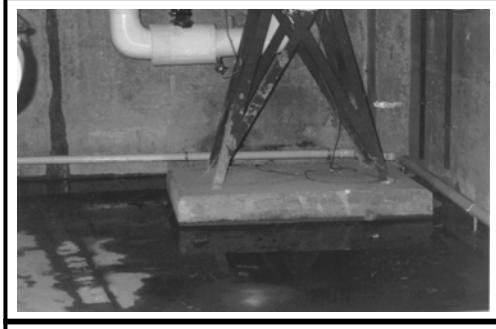
Expected Cost To Implement

Field experience at two Army sites showed the average cost to install an EOP system to be $188.49/sq ft, 40 percent lower than the cost of the alternative conventional trench and drain approach. The operating or energy cost of the EOP system is negligible—on average, about the same as burning a 60W light bulb (i.e., a 1200 sq ft area would require up to a maximum of 60W; a 2000 sq foot area up to 105 watts; in all cases, when the concrete is dry, zero watts).

Benefits/Savings

For concrete applications, EOP technology significantly outperforms conventional technology. EOP offers a long-term, cost-effective alternative to the trench-and-drain approach to mitigate water-related problems. System installation is quick (typically about 1 week). The EOP system is installed from the interior (negative side) of affected areas, avoiding the cost of excavation and interruptions to normal operations.

The use of EOP technology offers several additional benefits. It can eliminate corrosion damage to mechanical equipment and improve



Wet basement before EOP treatment

Dry basement after EOP treatment

indoor air quality by maintaining the relative humidity on the interior wall and floor surface at a level below 55 percent, which prevents mold and bacteria growth. This technology can also prevent mineral deposits (efflorescence), and eliminate rising damp in walls.

Status

EOP technology is a commercially available product. (See the Distribution Sources below.) CERL has partnered with Drytronic, Inc. (a subsidiary of Osmotech) to further develop and monitor innovative EOP designs that met specialized needs of government users. In 2003, Drytronic installed an EOP system in 100 feet of a Washington, DC, Metropolitan Area Transit Authority (WMTA) tunnel. Because the tunnel was constructed in bedrock and the concrete walls were greater than 2 feet thick at that point, the cathodes were placed deep in the tunnel walls. A year's monitoring of the WMTA application showed the average relative moisture content at a 2-in depth in the wall had decreased by 70%.

CERL and Drytronic are currently monitoring the performance of EOP technology in two lock and dam structures on the Mississippi River (with concrete walls about 8 feet and 17 feet thick, respectively) and in a buried military command/control bunker. For these applications, CERL contributed innovative designs of probe electrodes for submerged applications to adapt EOP to control water flow in large, deeply-buried underground concrete structures, or submerged structures such as lock walls.

CERL and Drytronic also successfully installed EOP systems in a total of 382 basements of family housing units at Fort Sill, OK, Fort McPherson, GA, Fort Gillem, GA, and Bolling AFB. EOP was selected for its low cost, and its superior ability to control water and indoor humidity problems (to prevent mold growth and improve air quality).

ERDC POC(s)

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Distribution Sources

Electro Pulse Technologies, of Greenwich, CT, administers the licensing of the patented EOP technology in North America. System components and necessary parts are available through other sources. The CERL demonstration projects used the following suppliers:

- OsmoTech, Inc., 17295 Chesterfield Airport Road, Suite 200, Chesterfield, MO 63005, tel. 636-733-7570
- Drytonic, Inc., 709 Gillette Street, La Crosse, WI 54603-2286, tel. 800/497-0579
- APS Materials, APS Materials, Inc., 4011 Riverside Drive, Dayton, OH 45405.

Available Documentation

A more detailed description of EOP technology, and links to technical literature (white papers) that describe its history and applications are available through OsmoTech web site, through URL:

http://www.goosmo.com/

Available Support

Direct general questions and requests for support to OsmoTech, Inc., 17295 Chesterfield Airport Road, Suite 200, Chesterfield, MO 63005, toll-free: 866-GO-4-OSMO; voice: 636-733-7570; fax: 636-733-7571; e-mail:

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