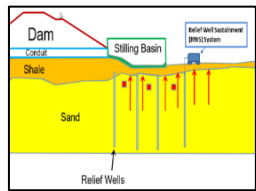


## Mobile Relief Well Bleach Treatment System demonstration 14-16 March with Mississippi Valley District 2<sup>nd</sup> field testing and abstract presentation forthcoming European Geosciences Union-(EGU23) conference 24-27 April.

*Impact: The addition of chlorine infused water (bleach) treatment for field design protocols helps improve the relief well risk management to dams and levees, which in turn reduces the cost, time and manpower required to control relief well biofouling and encrustation.*

The most common technique for controlling relief wells that are incorporated into the infrastructure of dams and levees in the field involves treatment with oxalic acid to alleviate hydrostatic pressures when encrusted biofouling occurs. When encrusted biofilms are chemically treated and broken up, the



*Figure 1: from left to right: A visual representation of the new technique utilized extracting water and cycling the water with chlorine gas infused bleach production on demand in the field with a mobile cart; The current oxalic acid trailer treatment system next to the relief well drainage ditch parallel to the levee at Eagle Lake Levee and Tara Wildlife Area, MS, the photo also shows the RWS system that is planned to be incorporated on a trailer treatment system; The top of the relief well at the levee (the well is 90 ft in depth); and an ERDC scientist and engineer collecting water samples to investigate the biofilm presence before and after treatment.*

relief wells are relieved of pressures that can build up in the dams or levees foundation infrastructure. Two Water On Wheel (WOW) Cart-Relief Well Sustainment (RWS) systems have been designed as a new alternative to mitigate encrusted biofilms by producing bleach from salt and water (Figure 1). On 14-16 March the ERDC team encompassing GRL, EL, and CERL; MVK District, US EPA and WaterStep Org. led by Dr. Clint Smith collaborated to treated 32 relief wells at Eagle Lake Levee near Vicksburg, MS, to study methods for evaluating best treatment to decontaminate levee biofouling in the relief well infrastructure. The team has had follow up discussion for a future add to the Value to the Nation Book. The 3<sup>rd</sup> field assessment is being planned for August to assess an added UVC deployable into the well for no invasive exposure and treatment follow up. Protocol design knowledge was collected, integrated into preliminary laboratory test and now field protocols to understand maximizing the pH and concentration to effectively treat the encrusted biofilms with chlorine infused water (bleach). A UVC attachment/deployable unit paired with the RWS system is under development and test protocols are being established for the 3<sup>rd</sup> field assessment. ERDC EL team members are designing the UVC lab protocols and establishing the field test assessment experimental designs. ERDC EL and MVK District team members participating in the 1<sup>st</sup> field assessment (Figure 2). The findings of the first assessment were accepted for presentation at the European Geosciences Union-23 conference at the end of April. The title of the abstract submitted is, "Effectiveness of a Mobile Chlorine Gas Generator as a Treatment for Biofouling in Relief Wells" by Clint Smith et al. Session NH9.16. As performed in the first field assessment the third-party independent laboratory analyses will be established for this second field assessment. Additional samples will be sent to the partnering EPA laboratory for confirming encrusted biofilm constituents, which will aid in effective treatment protocols. The laboratory testing is being conducted to better understand the use of the bleach treatment with UVC design protocols and can provide initial feedback towards the field testing planned for fiscal year 2024.

The RWS Systems include a mobile cart with a framed treatment train including dual fuel power supply, pumps, filtration, bleach generation and water production for providing drinkable water and recirculation for concentrating the chlorine gas infused water for encrusted biofilm treatment. The cart is designed through a CRADA between the EPA and WaterStep Organization and has incorporated ERDC into a partnership to utilize the system towards Flood and Coastal Risk Management R&D efforts. The CRADA will be updated in 2023 to include ERDC, the EPA and WaterStep Org. Two systems have been delivered to the districts along the Mississippi Valley for training and field-testing August 2022. The 2<sup>nd</sup> field assessment will be used to provide development of a modified standard operating procedure compared to the current standard operating procedure. The current treatment methods use oxalic acid versus Chlorine gas infused water and bleach to establish initial treatments. The demonstrations are aimed at improving preventative relief well treatment. The effort is seeking to embed the RWS mounted onto a trailer and 1000 gallon holding tank mobile unit to aid in treating multiple relief wells as possible by the operational teams' standards. The addition of pre/post-treatment with UVC before/after chlorine gas infused water and/or bleach will be investigated. A novel plasma technology (winner of the X-Tech Challenge-partnered with the Army) for water will be investigated at no cost to the project. New modifications for the joint effort among the partners will be sought under a new CRADA among the partners. Data collection and post analysis will assist in establishing new design treatment protocols and physical set up for the treatment process by field engineers. Data collected will help determine overall efficiency and limitations. The development and demonstration of the WOW Cart-RWS system is supported by USACE Flood and Coastal Systems R&D (funded through GI R&D) in response to SoN 1636. POC: Clint Smith [Clint.B.Smith@usace.army.mil](mailto:Clint.B.Smith@usace.army.mil)



*Figure 2: Engineer and scientist deploying hose into relief well at the toe ditch for treatment of encrusted biofilm.*