Colorado DOT Employs Innovative Distillation Approach to Treat Wastewater

An innovative distillation treatment system is helping the Colorado Department of Transportation (CDOT) treat greywater from the floor drains of its maintenance facilities. This new system not only is showing environmental benefits but also is helping to cut costs.

This technology is made up of a portable water purification system powered by a hybrid solar/natural gas system that works to distill the dirty water, helping to separate the salts and other contaminants from the purified water. The treated water can then be reused for other purposes like washing trucks within maintenance facilities. The recovered salts can also be reused in deicing operations.

During winter months, snowplows can generate large volumes of ice melt and wash water, leaving CDOT with nowhere to send it, explained Theresa Santangelo-Dreiling, CDOT’s Hazardous Waste Management Supervisor. To meet federal requirements, CDOT needed to treat up to 1 million gallons of greywater from floor drains of 50 maintenance facilities. While other technologies were able to separate oil, chlorinate water, and filter suspended solids, the new distillation technology helped CDOT address the facilities’ biggest challenge: removing the salts.

The distillation system, which was recommended by a consultant, was originally used as a desalination solution for poor and underserved communities that lacked clean water. In more recent years, it has been used successfully to treat waste water produced from natural gas extraction processes.

CDOT decided to conduct a pilot test to determine whether the technology could provide a cost-effective solution to treat floor drain water at several of its maintenance facilities. If the method was successful, it could be implemented at maintenance yards statewide and help to offer a solution for a variety of challenges including treating stormwater and construction dewatering.

The technology was tested at several facilities in the state, including Fairplay and Blue Mesa, with impressive results. The vast majority of parameters tested – including total dissolved solids, total suspended solids, chloride, various metals, bacteria, and even uranium – achieved near 100 percent reduction from the influent to the distillate.

The pilot test found that the units were robust and dependable. Not only was the treated greywater suitable for washbay operations, it also met regulatory standards for surface discharge.
In addition, the characteristics of the concentrate brine suggested it would be suitable for re-use in deicing operations.

Santangelo-Dreiling said the solution was cost effective. Prior water treatment equipment costs for the maintenance facilities ranged from $200,000 to $300,000, compared to about $75,000 for the distillation treatment units.

**Lessons Learned and Next Steps**

Currently, CDOT has used the technology at four facilities, and is working on implementing a statewide program at 46 additional locations. As part of the statewide program, CDOT would not own the units, but would implement the program as a flat-rate “utility” based model. This means that the agency would rent the units and a consultant would be responsible for operations and maintenance. A monthly bill would then be generated based on the quantity of water treated.

Based on the characteristics of each location, the technology may be implemented either with fixed units or mobile units. Monitoring of the units would be done off-site with the assistance of operators via remote telemetry. The agency also will continue to consider this technology for other applications, such as stormwater treatment and dewatering.

Although the technology is still in the early stages, Santangelo-Dreiling said it has proven to be highly effective, and would she would recommend it to other state DOTs. She did note that CDOT is continuing to evaluate the system. For example, staff are looking into whether the correct amount of solar energy is being used, rather than relying on the natural gas backup system.

The pilots have shown that the solution is not only cost effective and environmentally sound, but helps to free up maintenance staff from having to handle wastewater treatment.

“It answered our prayers,” she said.

For more information, contact Theresa Santangelo-Dreiling, CDOT, at theresa.santangelo@state.co.us

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