

RURAL & SMALL UTILITY SYSTEMS

PIONEERING WATER REUSE

The small New Mexico village of Cloudcroft holds more than one important distinction. At an elevation of 9,000 ft, it is home to the nation's highest golf course. But what makes Cloudcroft really stand out is the fact that it is addressing a serious water shortage. The local population agreed to implement an integrated water conservation and indirect potable reuse project that uses advanced membrane technology to supplement the existing raw water source consisting of spring and well water with treated wastewater effluent.

By John Koch

A New Mexico village implements a water conservation and potable reuse project using membrane technology

Faced with a drought that necessitated trucking in 20,000 gal of water up the mountain every day during the peak summer tourism season, the 1,000 local residents quickly let go of any concerns about using recycled wastewater. From the state's \$10 million initiative to promote innovative water conservation, the village received \$600,000 in 2004 to help fund its new \$2 million water reuse system.

The state-of-the-art system employs a second-generation membrane bioreactor (MBR) and a gravity-fed reverse osmosis (RO) system to treat wastewater flows that ultimately exceed drinking water quality standards. Most of the treated effluent is discharged into a manmade reservoir rather than pumped into a larger body of water such as an aquifer, river, lake or ocean.

What makes Cloudcroft unusual is that this reservoir serves as a raw water source for the town's drinking

water treatment system. Essentially, Cloudcroft is noteworthy for implementing a system that shortens the distance—and traces an obvious path—from the wastewater treatment discharge point to the intake point of the potable water treatment system.

Public Acceptance

The benefits of water recycling are clear: The village's water needs are met through an energy-efficient sustainable process that reduces water pollution, but the question is, why don't more water-strapped communities implement similar systems? The answer may have as much to do with public attitudes as it does with the science of water treatment.

In the old joke about four friends at a bar, the optimist says, "The glass is half-full" and the pessimist says, "The glass is half-empty." The accountant says, "The glass

WE BELIEVE IN MONSTERS

Problem: Trash collected throughout the process
Solution: Finescreen Monster®

Monster Separation System® helps make headworks operations neater and cleaner.

"It's unbelievable the difference it has made in cleaning up our facility," said this manager.

Operating this wastewater treatment plant in the small town of Cobourg just got easier for Stuart Dafoe, Operator-in-training, Bill Peeples, Manager and Rob Clow, Operator. JWC's high flow fine screen and ultra clean screenings discharge equal the best headworks you can get.

Read this success story and learn more about our fine screens: www.jwce.com/believe



Read the story at www.jwce.com/believe

write in 702

is twice as big as it needs to be,” and the water engineer says, “The glass contains billions of molecules—fascinating pieces of history that have each taken a remarkable 4.4 billion-year journey going back to the formation of planet Earth.” The problem is that unlike the water engineer, most people do not like to think in much detail about the history of their drinking water.

At Cloudcroft, the concerns are understandable, as the origin of the drinking water is clearly identifiable, the intervening time is relatively short and the proportion of recycled water is relatively high. The purified wastewater constitutes up to 50% of the drinking water supply. The effluent from the reclaimed wastewater treatment plant (RWTP) is pumped into the reservoir, where it is mixed with well and spring water. Prior to intake into the potable water treatment system, the reservoir water is stored for an average of 30 days for natural treatment by diffusion and sunlight. The use of an artificial reservoir and the blending with well and spring waters classifies the Cloudcroft integrated water treatment system as an indirect planned potable reuse system.

While the public has general concerns about water reuse, water engineers recognize that wastewater also contains pathogens and other so-called emerging pollutants of concern, including pharmaceutically active substances, endocrine disruptors and personal care products. For these reasons, it was believed that a multiple membrane barrier solution was a good choice.

Livingston Associates, Alamogordo, N.M., performed the engineering design for the project. The key elements of the system are the MBR and RO membranes supplied by Koch Membrane Systems. These membranes, which will be installed in the RWTP, will make the effluent discharged into the reservoir safe for human consumption. The integrated water treatment process also includes an ultrafiltration (UF) system to treat the reservoir water (a mix of RWTP effluent and well and spring water), an increasingly common treatment method for treating surface water.

Second-Generation MBR

The project involves the conversion of the original wastewater treatment plant to an MBR process. The MBR is designed for an average flow of 100,000 gal per day (gpd), with room for an additional 100,000 gpd in the future. The pre-existing 200,000-gal equalization basin is being retrofitted for the MBR process by being divided into two compartments: A 100,000-gal basin for flow equalization and the remaining 100,000-gal basin for the MBR.

Raw wastewater influent will enter the system and pass through a 1-mm rotating drum screen located at the existing headworks. The screened influent will flow by gravity to the EQ basin before being pumped into the anoxic basin. From there, the flow enters the aeration basin to receive aerobic treatment and then enters the four membrane chambers that house PURON submerged membrane modules from Koch Membrane Systems.

The system employs a second-generation MBR and a gravity-fed RO system to treat wastewater flows that ultimately exceed drinking water quality standards. What makes Cloudcroft unusual is that this reservoir serves as a raw water source for the town’s drinking water treatment system. Essentially, Cloudcroft is noteworthy for implementing a system that shortens the distance—and traces an obvious path—from the wastewater treatment discharge point to the intake point of the potable water treatment system.



Solutions for Small or Rural Systems



Pump Station Grinder With Screen

Put a stop to pump station clogging with a Channel Monster® model CMD1205! Reliable and hard working, Channel Monsters shred tough solids such as rags, flushables, clothing, branches and trash to protect pumps and reduce maintenance.

Stainless steel guide rails make installation easy, even in deep vaults. Close the lid on expensive and dangerous pump station repairs – use a Channel Monster grinder.

< Channel Monster CMD1205



All-in-One Headworks Screen

The Auger Monster all-in-one system combines a high-flow grinder, 3 or 6mm perforated screening trough, multi-jet washing system, custom auger lengths, integrated compaction zone and an auto-bagger at the discharge point.

The Auger Monster’s grinder and washing system break-up solids to remove more fecal matter, resulting in reduced odor and discharge that is easier to landfill.

< Auger Monster AME

Septage Receiving

The automated Honey Monster™ septage receiving system tracks, screens and cleans honey truck waste before it enters your facility. Unload trucks in 15 minutes or less. Optional MonsterTrack PLC allows for easy invoicing.

Honey Monster Septage Receiving System >



We’re At Your Service



With over 40 local Sales Offices and two regional Product Support centers, JWC is ready to assist you with many solids handling & processing solutions. Give us a call at (800) 331-2277 and put a Monster to work for you!



JWC Environmental®

Trust Monster Quality™

(800) 331-2277 • (949) 833-3888 • www.jwce.com

write in 701

RURAL & SMALL UTILITY SYSTEMS

The MBR system will produce a high-quality effluent with a turbidity of typically less than 0.2 NTU (1.0 mg/L TSS). The filtrate will be disinfected with chloramines and pumped to a new 75,000-gal water storage tank at the RWTP site.

The PURON technology is a second-generation submerged MBR system that

employs hollow fibers. A key advantage of the PURON system is its use of a single header with hollow fibers that are fixed only at the bottom. The sealed upper ends of the fibers are allowed to float freely. The free-floating membrane tip eliminates the buildup of hair and fibrous materials that can clog the upper end of membrane fibers in MBR designs that employ both a top and bottom header. Solids and particulates, including bacteria, are rejected by the membrane and remain on the outside, while permeate is drawn through the membrane to the inside of the fibers. Outside-to-inside technology such as this provides optimal solids management and a high flow rate while using up to 50% less energy than other MBR systems.

Another advantage of the PURON design is the introduction of air scour at the center of the fiber bundle, right where it is needed. Compressed air creates bubbles that shake the membranes and scour the outside of the hollow fibers, removing accumulated debris. The unique air-scour design is an improvement over older technology because it minimizes sludging around the membrane and reduces energy consumption. The high-strength fibers in the PURON modules also overcome the fiber breakage problems typical of first-generation systems that utilize nonbraided fibers. The free-floating tips of the hollow fibers in the single header design also place less mechanical stress on the fibers compared to double-header designs.

Unlike flat sheet membranes that do not support backflushing, the PURON modules resist fouling and maintain flux by introducing a small portion of the filtrate back through the fiber pores from the inside out at timed intervals. PURON hollow fibers provide significantly higher membrane surface area, and therefore higher filtration capacity within the same module footprint, compared to flat sheet membrane designs.

Pure Water from RO

The MBR is the first step in a multiple physical-barrier approach to reclaimed water repurification. The high-quality MBR permeate will be pumped uphill into a 75,000-gal storage tank. From there, some of the water will be diverted for nonpotable reuse (i.e., to irrigate the golf course and high school athletic fields).

Each day, 100,000 gal will flow downhill about 2.5 miles to the water treatment facilities that house the RO system. The force of gravity produces approximately 175 psi of residual pressure at the terminus of the 4-in. waterline—the pressure required to operate the RO system.

The RO system is a single-train, three-stage, one-pass system with five pressure vessels set up in an 2:2:1 array that contains Magnum 8822HR membranes, also from Koch Membrane Systems. These high-rejection, low-pressure, thin-film composite membranes have been successfully utilized in a number of reuse applications, and they have been shown to be effective in rejecting many emerging contaminants while achieving water recovery of about an 80% rate.

The RO system will produce an average of 80,000 gpd of permeate, with a total dissolved solids (TDS) content of about 50 mg/L from a feed quality of around 1,000 mg/L TDS.

Permeate from the RO system will receive peroxide and UV disinfection and will be discharged into a 1,000,000-gal lined and covered reservoir. From there, the reservoir water will flow into a 750,000-gal covered and lined reservoir, where it will blend with existing spring and groundwater. A portion of the RO permeate will be used for aquifer recharge during times of low water demand.

The concentrate from the RO process will be diverted to a 250,000-gal open and lined reservoir along with UF backwash water. This water is to be used for road dust control, construction, snowmaking for a nearby ski area, gravel-mining operations, forest fire fighting and other beneficial purposes.

High Quality, Safe Drinking Water

The final stage of the integrated water treatment is the ultrafiltration of reservoir water containing RO permeate, well and spring water. Each day, approximately 180,000 gal of blended water will be treated through the UF system. The permeate from the UF system will be filtered by granular activated carbon prior to receiving additional disinfection using sodium hypochlorite. The disinfected water will then go into the water distribution system.

Because the high quality, low TDS water from the RO process is to be used for blending, the overall water quality in the distribution system is expected to improve when Cloudcroft begins using reclaimed water.

This shows that it is not where the water has been that counts, but where it is going. The integrated membrane system and its multiple physical barriers provide protection that will give the residents and tourists in Cloudcroft confidence to enjoy high-quality, high-tech water as pure as a mountain stream. **WWD**

John Koch is MBR technical director for Koch Membrane Systems. Koch can be reached at 414.771.1124 or by e-mail at jekoch@kochmembrane.com.

For more information, write in 1106 on this issue's Reader Service Card.

Why Pay MORE For Submersible Pumping Hassles?

Save Thousands Annually with S&L Pump Stations.

Whether it's your staff or outside contractors maintaining and replacing your submersible pumps, you're likely spending a lot more money and resources than necessary.

Smith & Loveless Wet Well Mounted Pump Stations deliver:

- Documented savings of up to 60% annually in maintenance & repairs over submersibles
- Extreme ease of quick, safe & clean inspection - no routine confined space hassles!
- Standard & custom designs - complete delivery in little as 5 weeks
- Complete control options, including PLCs and relay logic
- Premium efficiency pumping with long-lasting S&L pumps
- Complete after market product support, forever after the sale

Call today to learn more!
800.898.9122 • smithandloveless.com

Smith & Loveless Inc.

write in 735

Hydro-Guard

Automate Your Flushing Program with Hydro-Guard's Patented Automatic Flushing Technology and...

- Increase Disinfectant Residuals
- Improve Water Quality
- Control THM's and Other Disinfectant By-Products
- Reduce Labor Associated with Water Quality Maintenance
- Reduce Customer Complaints and Associated Costs
- Reduce Water Usage during Flushing Program
- Flush Automatically Year Round

Automatic and Programmable

www.Hydro-Guard.com
(877) 864-8500

Add Hydro-Guard® To Your EPA Stage 2 Compliance Plan

The B.O.S.S.

The Safety-Guard® B.O.S.S. has been designed for maximum efficiency and long life. The B.O.S.S., housed in the industry's most durable and safest enclosure, offers optimum security, 360° accessibility, and maximum durability for extra-long life.

- ▶ 360° Accessibility
- ▶ Self-Locking
- ▶ Protected Sampling Point
- ▶ Self-Supportive
- ▶ 1" and 2" Blow-Off Models
- ▶ Customized ID Tags
- ▶ Curb Stop with Drain
- ▶ Internal Curb Stop
- ▶ Thermal Control Valves

Safety Guard

www.Hydro-Guard.com (877) 864-8500

write in 711

LEARN MORE

For additional articles on this topic, visit:
www.wwdmag.com/lm.cfm/wd010807