CAVE SPRINGS WASTEWATER TREATMENT

Planned 1495 home community with downtown and golf course

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DESIGN CHARACTERISTICS

OVERVIEW

Can you imagine a city receiving a brand new $8.5 million dollar state-of-the-art wastewater treatment system without adding additional taxes or incurring any credit risk to the town? Cave Springs, Arkansas did precisely that.

On February 21, 2008, the city of Cave Springs, Arkansas, took title to a new asset – a wastewater treatment plant modular in design and scaled to the demands of the community. This was the result of an inventive public/private partnership to carefully develop land in an environmentally sensitive area. A mutually beneficial arrangement like this can only happen with cooperation and trust between government officials and the developers.

BACKGROUND

Tucked away in the northwest corner of Arkansas, the headquarters of three corporate giants are within 20 miles of one another: Wal- Mart in Bentonville, Tyson Foods in Springdale and JB Hunt in Lowell. Spurred by Wal-Mart's rise and the continued success of the other two, this region has become one of the fastest growing residential areas in the United States.

Because it is minutes from the Northwest Arkansas Regional Airport and within easy commuting distance to all of those cities, Cave Springs became the next small town to develop. As its name suggests, the rocky topography is filled with lakes, streams and, of course, caves, which are home to many endangered species including the Ozark cave fish, gray bats, cave crayfish and the bald eagle.

The plan included 1495 new homes, a golf course, a downtown and a secondary commercial area. The total area was about 1000 acres and would be divided into 10 separate subdivisions. Brett Hash, Owner of Northwest Services, LLC, was the lead developer who had the vision to forge this creative partnership that was designed to minimize conflict and benefit both the public and private sectors. He realized there was an opportunity to have a superior wastewater treatment solution for the entire area as well as capture water for irrigation.

"I started to investigate alternative wastewater treatment solutions for the areas I was building because the city had no money to hook up any of the planned developments to a central system," said Mr. Hash. "Initially, each developer was responsible for handling the wastewater in his own subdivision. I thought if we used one large decentralized system it would make more sense financially – kind of like getting a quantity discount."

"This is truly a good deal for everybody involved," explained Mr. Hash, who spearheaded pulling together the 10 separate subdivisions under one decentralized wastewater treatment system. Obviously, this new approach took cooperation and extra

work between government officials and Mr. Hash. But the result was undeniably worth the effort.

Turning this idea into reality had its challenges. “As you might suspect, when this was first proposed there were lots of concerns and questions. Imagine 10 very successful business owners with strong opinions and big egos. Each developer was dealing with a multi-million dollar project and had a lot at stake. But, once they understood that we would get a better treatment system, have the opportunity to offer the city an asset AND save money, they realized this would be a win-win-win scenario. They accepted the technology and were very supportive,” said Mr. Hash.

One of the key steps was to designate the area to be developed an Improvement District by the state of Arkansas. Because there was no existing wastewater infrastructure, the developer took the risk of building the treatment plant with the understanding that it would be sold to the city. The city was then in a position to issue a bond that would be covered by an existing user tax levied against each lot using the system.

“We had a terrific opportunity in Cave Springs to make a public/private partnership work. It allowed us to find the best treatment solution, fund it through a bond and ultimately create a revenue-generating asset for the community. Other states may use different names, but the concept behind “Improvement Districts” makes it possible to pay for decentralized wastewater treatment systems,” he added.

KEY CONSIDERATIONS

Beyond the initial hurdle of getting all the developers and city to agree to the plan, the actual implementation of the system was not difficult at all.

At full build out, the system will handle 412,000 gallons per day (gpd). Initially, however, only a small number of homes would be contributing wastewater to the system. According to Josh Lindell, Project Manager for AquaPoint, “Low flow rates can be problematic for some treatment technologies. This system had to be versatile enough to handle extreme fluctuations and still be easy to maintain and cost effective to operate.”

“Typically, the disposal method for treating this volume of wastewater would result in a surface water discharge either into a lake, stream or ocean. Because of the sensitive environmental issues with endangered species, such as blind cave fish, Mr. Hash really wanted to discharge underground.”

There are several environmental advantages to using subsurface drip irrigation because it:

- Provides additional treatment and natural filtration
- Captures water for irrigation
- Avoids sending wastewater downstream
- Protects wildlife

“That is a key difference here – we’re not sending anything to our neighbors down the creek. All our wastewater is treated and disposed of right here, where it was generated. I think it’s the responsible thing to do and people should be doing this everywhere,” said Mr. Hash.

THE AQUAPOINT SOLUTION

Because of the required hydraulic capacity, the AquaPoint design team determined their Lotus™-AquaCELL™ fixed film moving bed biological reactor (MBBR) treatment process was the best technology for Cave Springs.

MBBRs were originally developed to improve the treatment performance and/or hydraulic capacity of large multi-million gallon per day (MGD) municipal wastewater treatment plants. The goal was to develop a process that could expand easily to retrofit existing activated sludge basins and better perform cold climate nitrification. Successful implementation of fixed film, MBBRs at many major facilities has led to wider acceptance and use of this efficient process.

AquaPoint’s Lotus-AquaCELL MBBR incorporates proprietary components and is scaled down and designed for the demands of the decentralized marketplace where flows tend to be measured as gpd instead of MGD.

In a Lotus-AquaCELL MBBR, microorganisms attach themselves to submerged moving plastic media forming a biofilm. Air is transferred into the water, mixing the media and providing oxygen to the bacteria. The biofilm absorbs, oxidizes and reduces the organic and inorganic materials in the waste stream.

“The flexibility, simplicity and efficiency of AquaCELL allows us to effectively value engineer and adapt the process for flows below 500,000 gpd” explained Mr. Lindell. “In fact, selecting technologies that have been effective on a large scale and packaging them for the decentralized market makes Aquapoint somewhat unique. Because we customize the design for each site, we tend to have economy of scale and Operation and Maintenance (O&M) advantages over competitors that try to scale small flow technologies up for larger applications.”

According to Mr. Hash, “We felt really good about AquaPoint’s technology and track-record. We did a lot of research and we found Lotus-AquaCELL was the best fit for our project for many reasons because it:

- Has a small footprint
- Can handle flow rates of 412,000 gpd
- Is cost effective due to low life cycle costs
- Has simple installation requirements (modular vessels)

“Of course we looked at other companies. But either their treatment capabilities didn’t meet our needs or their O&M was more cumbersome and costly,” said Mr. Hash.

“One of the key challenges for any community system designed to treat hundreds of thousands of gpd is managing the process costeffectively at the beginning of build out when the flows are low and intermittent. The fixed film MBBR process is unmatched when it comes to simplicity, ease of O&M and efficiency especially under these conditions.

Because the biology adheres to the media and is retained in the treatment basin, the bio-reactor is self regulating and will adjust naturally over time to the organic and hydraulic loading on the system,” said J. Lindell. “Suspended growth processes don’t have this luxury and are costly to operate during a development build out.”

For the most part, the Cave Springs WWTP is comprised of modular pre-fabricated vessels. The Lotus-AquaCELL reactors are constructed of 100% stainless steel and many of the ancillary components and tanks are fiberglass. Using high quality materials ensures a long life cycle and saves the municipality from costly repairs and rehab in the future.

Another big part of the AquaPoint deliverable is providing remarkable customer support.

“I couldn’t have received better service from the people at AquaPoint. If I had a question in the morning, I had the answer in the afternoon. They supported us from the initial meetings in New Bedford, MA to being on site during the installation.

In fact, we had one small part that didn’t work quite right and AquaPoint took care of it immediately and replaced the part without any question,” said Mr. Hash.

RESULTS

To date only a small percentage of homes are currently on line as the developments are still under construction. But the savings of building a combined system netted a low capital equipment and installation cost of only $5,000/home.

Like Cave Springs, many towns and counties across the country are including decentralized and distributed wastewater infrastructure in their water resource management plans. Using a distributed network of municipally operated systems allows communities to provide cost effective infrastructure when and where it is needed. The systems can be designed specifically to achieve the standards required by their surrounding environment and treated water can be used as a resource.

The public/private partnership approach used by Mr. Hash and the city of Cave Springs makes it possible for any small community with limited resources to acquire assets and grow. “We think Cave Springs is a model for the way wastewater and water infrastructure will be built in US for years to come. It truly is a winning scenario for all involved,” said Josh Lindell.

Mr. Hash feels especially good about his efforts to bring all the developers together to put in the ‘right kind’ of wastewater

treatment system and be able to give the decentralized plant to the city. “They now have an asset they can use to generate revenue for other needed town services,” he added.

“Honestly, I believe in this technology and think decentralized wastewater treatment systems should be used everywhere. The largest pipe we used was 10 inches. Compare that to the costs and land disruption to put in ‘big pipe’ sewer systems. I predict, over time, people will see the advantages and this kind of decentralized system will be heralded. It will be popular because it’s ecologically friendly and it’s the best way to handle sewage cost-effectively,” stated Mr. Hash.

PERFORMANCE DATA

2012	BOD5 (mg/l)	TSS (mg/l)	Nh3 (mg/l)
JAN			
FEB			
MAR			
APR			
MAY			
JUN			
JUL			
AUG			
SEP			
OCT			
NOV			
DEC			

SYSTEM DIAGRAM