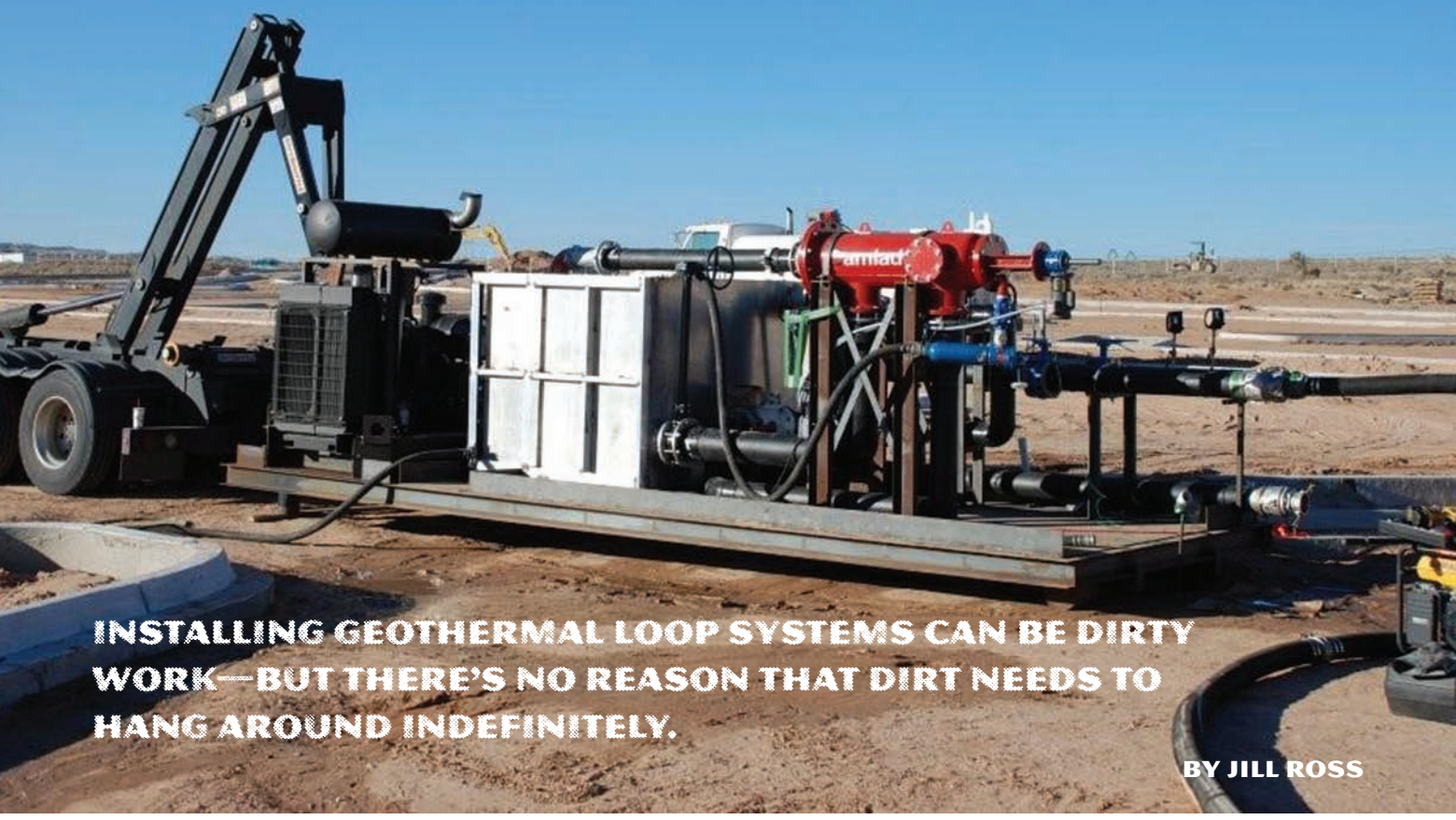
# CLEANING UP AFTER A DIRTY JOB



**INSTALLING GEOTHERMAL LOOP SYSTEMS CAN BE DIRTY WORK—BUT THERE'S NO REASON THAT DIRT NEEDS TO HANG AROUND INDEFINITELY.**

**BY JILL ROSS**

We all know that geothermal energy is a "clean" energy—but just how clean is the system itself?

It might not be as clean as you'd think. If debris is left in the system from its construction, it can ultimately reduce the efficiency and the life of the system.

Ralph Cadwallader, founder and CEO of Loop Tech International in Huntsville, Texas, a company specializing in geothermal installations, was surprised when he found this out. He then decided to do something to change it.

As he tells it, "Many years ago I was invited to speak at a conference on geoexchange. There was a session on problems with geothermal installations, so I made it a point to go to that one." To his surprise, he found out that of all systems that experienced failures, eight of 10 were attributed to debris.

Cadwallader realized he was on to something because his company didn't experience this rate of failure.

"I always made it a point to focus on getting my systems clean before I turned them over. I did not always have control of the entire system, but on the jobs that I was asked or allowed to flush and purge the building (in addition to the loops), I never had a callback," he explains.

Cadwallader left that conference with a new focus. "I was determined that dirty loops would not be one of my contributions to the industry," he says.

In the past, Cadwallader had used a modified flush and purge unit on jobs. "It was a workhorse," Cadwallader remembers. But, he explains, since he only used it infrequently, he didn't put a lot of money into it and it looked pretty rough.

A Class IV flush and purge unit was field tested at a $210 million new high school construction project in Rio Rancho, New Mexico, in April 2009. The unit flushed 160 loops at a time and cleaned them out after 25 minutes of circulating.

But as the jobs got larger and started coming more often, Cadwallader decided to build a bigger and better unit that would do more.

"It was difficult to justify the expense of something that was used only three or four times a year on larger jobs," he remembers. "Nonetheless, I continued to make changes and improvements on my 'workhorse' until it evolved into what we use today."

One of the redesigned units was recently put to the test in Rio Rancho, New Mexico, in April 2009 on a $210

*CLEANING UP| continues on page 22*

**Jill Ross** is a former editor of *Water Well Journal* and worked for the National Ground Water Association from 1996 to 2004. Today, she does freelance work from home. She can be reached at jillross72@gmail.com.

CLEANING UP/ from page 21

million high school construction project. The job required 640 loops 305 feet deep, four HDPE vaults, and four sets of 8-inch supply and return lines going out 700 feet from the main building.

"The new purge unit flushed 160 loops all at the same time, and they were clean after 25 minutes of circulating," Cadwallader says. After flushing, the debris is bagged and a filter is used to 'polish' the water down to 80 microns. The unit is equipped with a 160 hp Cummins that can move 1400 gpm. Overall, Cadwallader says the unit exceeded his expectations.

## Why It Works

Most ground source heat pump systems require start-up strainers and strainers on the inlet side of each heat pump, according to Cadwallader. "You will even find specifications that require the contractors to clean the strainers for six months," he says. "My question is, why specify failure? That's telling me that since no one knows how or has the equipment to clean the system, protect the heat pumps with strainers."

The installation process is certainly a dirty business. "Solids will get in the lines regardless of all the efforts to keep them capped; that is construction," Cadwallader acknowledges. This is especially true for large commercial jobs where pipe is stored on the job site long-term.

However, if the entire system is purged and flushed according to the procedures set by Loop Tech, no strainers are required because the system is clean and sealed.

In addition, because no strainers are involved, it follows that installers do not have to enter the building to continue to maintain them. The isolation valves and purge ports are located inside an outside HDPE vault, and the system can be cleaned from this location without ever having to drag hoses into the building.

Cadwallader says that dirt can cause serious problems in a geoexchange system, and the bigger and more expensive the installation is, the more likely it is to have dirt in it.

"Right now, industry standards (for flushing the system) are set for residential systems, where dirt is not a real problem," he explains. "We discovered that 2 feet per second (the current standard) will eliminate air, but it requires up to 6 feet per second to move debris."

"Many customers spend hundreds of thousands of dollars on installing a system, but do not have it purged and flushed correctly, which limits the performance and life of the system," he sums up. "It doesn't matter how much you spend on equipment and ground heat exchangers, it has to be clean and air-free to function as designed."

**An HDPE vault houses the purge ports so the operator never has to enter the building to clean and flush the geothermal system.**


> "Many customers spend hundreds of thousands of dollars on installing a system, but do not have it purged and flushed correctly."

## Spreading the Word

Cadwallader acknowledges that not everyone has the funds to build or purchase their own cleaning unit, or the interest in the details. That is why Cadwallader created a separate company—Purge Rite—to do all of the flushing and purging work for Loop Tech, and to offer its services to other loop and mechanical contractors.

"Purge Rite was launched to take the burden off the drilling and mechanical contractors and to stop the finger pointing (when things go wrong)," Cadwallader explains. "The customer deserves a working, trouble-free system without the callbacks and issues caused by air and debris."

One of these contractors was Thomas Downey, CWD/PI, president and CEO of Downey Drilling Inc. located in central Nebraska. He called Purge Rite after a system the company had drilled loops for was experiencing some problems. He became Purge Rite's first outside customer.

"The Purge Rite Class IV unit was quite impressive and confirmed our analysis that the system, notably the interior piping and heat pump units, had never been flushed or purged properly," Downey says in a testimonial letter. "Going forward, our firm will not bid, quote, or contract any ground loop heat exchange system without utilizing the services of Purge Rite to flush and purge the entire system."

To aid other contractors, Purge Rite has written extensive specifications and procedures for the flushing and purging of closed loop system water source heat pumps, which are freely available on the company's Web site at *www.purgerite.com*

Cadwallader also says the company will offer a Certificate of Assurance, if they

One of Purge Rite's Class III units, designed for 3-inch to 6-inch mains with unlimited circuits and 30 loops per circuit, is loaded for a job.


can flush and purge the complete system and flow rates can be reached.

Purge Rite operates four classes of purge units:

- Class I for small residential jobs up to 1.5-inch mains and 10 vertical bores
- Class II for 2-inch to 3-inch mains with unlimited circuits and 15 loops per circuit
- Class III for 3-inch to 6-inch mains with unlimited circuits and 30 loops per circuit
- Class IV for 6-inch through 14-inch mains with unlimited circuits and 160 loops per circuit.

Cadwallader says he will build a Class V if needed.

"Our units are not for sale, but we will build one if we had a purchase order," Cadwallader says. "The smaller units would run around $3200 and the Class IV would run up to $250,000 depending on how elaborate you wanted it." Possible options include an onboard heating and cooling unit—powered by a closed loop water source, of course—and a self-leveling feature.

To help get the word out about the importance of flushing and purging new installations, Cadwallader partnered with Dr. Steve Kavanaugh of the University of Alabama, a leading national expert on geothermal heat pumps who has developed software and manuals related to commercial geothermal applications. Kavanaugh conducted three workshops in conjunction with Loop Tech International in a four-month period spanning 2008-2009. The workshops took place in Lincoln, Nebraska; Albuquerque, New Mexico; and The Woodlands, Texas and attracted 260 attendees consisting of engineers, owners, and contractors (both mechanical and loop).

"Our plans are to build more purge units and spread them around the country," Cadwallader says. A main focus for the company is getting the word out. "The problem is that no one knows the value of our services. All they know is the heartache of callbacks (the heat pumps shut down on high head due to low water flow)."

What does the future hold for the industry? Cadwallader believes that the new focus should be on efficiency.

"This industry is growing, and there is always room for improvement. What is happening now is that to go geo is 'cool,' but just going geo is in most cases not efficient. Engineers design too much horsepower in fans and pumps, which puts it back to the efficiency of conventional equipment. Instead, the focus should be on the Energy Star rating."

In the meantime, Cadwallader says he will keep "banging away at the opportunities" and continue to refine current practices by keeping an eye on efficiency and keeping the customer first.

"I want to slow down, but the industry keeps pushing me," Cadwallader says. But to Ralph, it's really not a problem. "I want to leave something since I have received much," he simply says. *WWJ*

## About Loop Tech International

Founded in 1984, Loop Tech International specializes in vertical closed loop heat exchangers for ground source heat pumps. The company has installed systems in 15 states—Alabama, Arkansas, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Missouri, Nebraska, New Mexico, Ohio, Tennessee, Texas, Virginia—and Washington D.C., as well as internationally in Saudi Arabia and Mexico.

The company was founded by Ralph Cadwallader to diversify his growing water well company and because he believed strongly in the use of water source heat pumps as a natural means of energy conservation. Today, Loop Tech is one of the most experienced ground source loop installation and design companies in the United States.

Loop Tech provides full service for all types of commercial installations including site review, coordination of system design, drilling and special backfill, outside and inside piping, unit hookups, pressurizing, testing, and support. Loop Tech started the industry-standard five-year warranty on loops, and now offers an industry-leading 10-year warranty.

Loop Tech is led by co-owners Cadwallader and Russell Buras. Cadwallader is a licensed driller and the first drilling contractor to serve on the board of the International Ground Source Heat Pump Association (IGSHPA), a non-profit organization.

In 2009, Purge Rite was founded and launched by Cadwallader and is jointly owned by Loop Tech International and Charles Smith. Its motto is "Cleaning Up The Industry."