Sunday
June 14, 2020

76 / 52 **Today** Partly cloudy | 78 / 63 **Monday** Partly cloudy | 82 / 65 **Tuesday** Partly cloudy

STORMCENTER 7
Full forecast by McCall Vrydaghs
Radio: Updates on 1290 and 95.7 WHIO. Live radar at WHIO.com

Dayton Daily News

Complete. In-Depth. Dependable.

DaytonDailyNews.com | $3.00

LOCAL & STATE, B1
KINGS ISLAND NEEDS EXCITED (BUT CAREFUL) COASTER FANS

LIFE & ARTS, E1
LOOK AT THAT
Popular area museums get ready to open again

LOCAL & STATE, B1
ROAD COULD REDUCE HEAVY SPRINGBORO HIGH TRAFFIC

LOCAL & STATE, B1
FOOD PANTRY A LIFELINE FOR THE HUNGRY IN MIAMI CO.

DAYTON DAILY NEWS INVESTIGATES

Cleaning up ‘forever’ chemicals no easy task

Engineers working to develop ways to deal with such substances.

By Ismail Turay Jr.
Staff Writer

Chase Nau-Hix, a doctoral student at Clarkson University, adjusts settings on a plasma reactor at Wright-Patterson Air Force Base. Nau-Hix was part of a team that traveled to Wright-Patt for a two-week field study on the Enhanced Contact Plasma Reactor. The plasma reactor is designed to degrade and destroy perfluorooctane sulfonate and perfluorooctanoic acid, known as PFOS and PFOA, in groundwater. JOHN VAN WINKLE / U.S. AIR FORCE

As researchers learn more about so-called “forever chemicals” in drinking water across the country and the Dayton region, engineers and scientists are scrambling to develop methods of combating the man-made substances.

The U.S. Department of Defense and the U.S. Environmental Protection Agency are paying for various research projects, including one tested at Wright-Patterson Air Force Base. The Air Force alone is expected to spend more than $2.2 billion to clean up PFAS-contaminated sites nationwide, according to the U.S. EPA.

The Dayton Daily News Path Forward project digs into solutions to the biggest issues facing our community, including the safety and sustainability of our drinking water. For this story, the newspaper examined three products that have been developed for PFAS remediation, and how effective experts say they are.

There’s been progress in finding treatments. Some such as a plasma technology are still in the developmental stage, while others like colloidal activated carbon have proven to be effective, local experts say.

Still, there’s a lot more to learn about PFAS, said Abinash Agrawal, a groundwater and soil remediation expert at Wright State University. As scientists become more knowledgeable, they will continue to develop better methods, as they’ve done in the past when new contaminants were discovered in drinking water, he said.

It is kind of a déjà vu for us old-timers,” said Agrawal, who has been studying ground water for more than 25 years. “We went through this discovery process in the 1980s when you started finding chlorinated solvents, and it took us at least 15 years before we had a good grasp of what’s going on. So we are in that discovery process with PFAS at the moment.”

Most common treatment method

Polyfluoroalkl substances – or PFAS – include substances known as PFOA, PFOS, and GenX. It can be found in firefighting foam, water-repellent fabrics, nonstick products, waxes, polishes, and some food packaging, according to the U.S. EPA.

Studies suggest that exposure to the chemical might affect pregnancy, increase cholesterol levels and cause some forms of cancer, according to the centers for Disease Control and Prevention.

PFAS is perhaps the biggest threat to the region’s drinking water system, Mike Ekberg, water resource and monitoring manager at the Miami Conservancy District, has said.

Firefighters trained for decades with foam in at least two sites in this region: Wright-Patt and the Dayton Fire Training Center. Both locations sit above the Buried Valley Aquifer, which has about 1.5 trillion gallons of water. It stretches from Logan to Hamilton counties, providing most communities in the region with drinking water.

The U.S. EPA has set a health advisory for the chemicals, recommending drinking water not contain PFAS above 70 parts per trillion.

But for the first time the agency in February said it will begin regulating PFAS in drinking water. In addition, the Ohio EPA has started testing the state’s 1,500 public water systems for PFAS.

Perhaps the most common approach around the country for PFAS remediation is the granular activated carbon method, ground water experts said. That method can be “100% effective for a period of time,” depending on serval conditions, an EPA research has said.

Wright-Patt uses this carbon method at its treatment facility to clean up contaminated water, which base officials say is below the EPA lifetime health advisory level. Since 2017, the base has treated more than 25 million gallons of drinking water for PFAS.

However, granular carbon is not the most efficient nor cost effective method, Agrawal and others say.

It requires that the contaminated water be withdrawn from the well or aquifer and stored in giant containers. Carbon is then poured in the container and it adsorbs the contaminants, leaving a toxic residue that must be hauled away and incinerated. All of that costs thousands of dollars, depending on the amount of water and other variables.

Plasma technology: Newest taxpayer-funded approach

One of the newest technologies for treating PFAS is the taxpayer-funded Enhanced Contact Electrical Discharge Plasma Reactor – or plasma technology. It can destroy the contaminant in water that’s in large containers, said Selma Mededovic Thargard, a chemical and biomolecular engineering professor at Clarkson University in New York. She and her colleague, Tom Holsen, a civil, and environmental engineering professor at Clarkson, invented the technology.

The Air Force Civil Engineer Center has provided nearly $1 million to help develop the technology. Mark Corell, deputy assistant secretary of the Air Force for Installations, Energy and the Environment, expressed support for the technology shortly after a two-week field study at Wright-Patt in September.

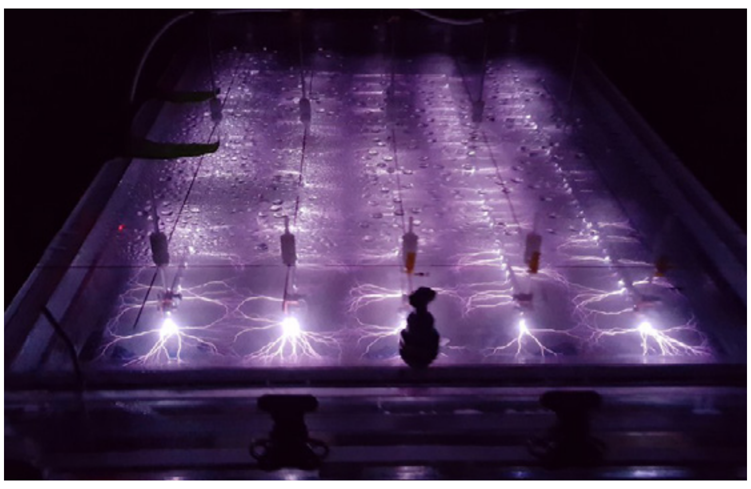
“PFOS/PFOA is a national issue, and research like this could lead to the breakthroughs we need to address potential contamination,” he said. “This demonstration is another example of the Air Force’s commitment to our nation, our communities and our environment.”

The tests conducted at Wright-Patt were successful, Mededovic Thagard said.

“We were able to reduce the concentration of (PFAS) to no detection limits within minutes,” she said.

Like the granular carbon method, the plasma technology requires that the water be pumped from the ground. But the reactor destroys the PFAS in the container, it doesn’t use chemicals or require disposal of a toxic residue, which cuts cost, said Mededovic Thagard and Stephen D. Richardson, principal engineer with GSI Environmental Inc. In Texas. Mededovic Thagard’s group hired Richardson and his company to design a 16-foot trailer that’s required to operate the plasma technology.

The team has not determined how much the reactor will cost. However, they said, it will be cheaper and the operating cost will be 40%-50% less than the granular carbon method.



A prototype of the Enhanced Contact Plasma Reactor – plasma technology – shows the device shooting high energy voltage into a container that destroys PFAS in contaminated water. CONTRIBUTED

Successful field test

The process of destroying PFAS starts when contaminated water enters the 16-foot trailer at one end. On top of the reactor are a series of discharge points where high voltage electrical energy enters the system. That energy is the catalyst for breaking apart the PFAS compound in the water, Richardson said. The reactor also causes gas in the water to form bubbles, which the PFAS sticks to. The bubbles float to the water surface and the high voltage electrical energy zaps them like lightning bolts, destroying the chemicals.

Hundreds of gallons of toxic water are treated under a variety of operating conditions during the trials at Wright-Patt. The result was that PFAS in the water was below the detection level of 10 parts per trillion, Mededovic Thagard said.

Currently the reactor is capable of treating 2 gallons of water per minute. However, using an EPA grant and other funding, the team is working to upscale the product so its capable of treating a minimum of 50 gallons per minute, Mededovic Thagard said.

“Once you get 2 gallons per minute, you can easily replicate it to even higher flow rates than 2 gallons per minute” she said.

The team is now working to make the system more efficient. They also will conduct more tests before commercializing the reactor in 2021, she said.

Dayton leaders said they are aware of the plasma technology and will continue to monitor it along with other treatment methods. The plasma technology has shown promise with small quantities of water, Dayton Water Director Michael Powell said.

“We are actively tracking current and emerging treatment technologies related to PFAS, particularly those which are scalable for application in high capacity treatment operations,” Powell said.

Dayton supplies drinking water to more than 400,000 people, including Montgomery County, which purchases water form the city.

Chemicals continued on **A2**

FROM PAGE ONE

Chemicals

Continued from A1

Agrawal, the Wright State expert, said the plasma technology is a positive step in terms of addressing small quantities of above ground contaminated water. But what will be most beneficial is technology that can treat PFAS in large quantities underground, he said.

"It has to show on a large scale that it can treat large volumes of water in a matter of minutes," Agrawal said. "At the rate they're extracting it from the aquifer, which is going to be hundreds of thousands of gallons per minute. Unless it's able to demonstrate that, this is a sort of blip on the radar."

Mededovic Thagard agrees that direct ground water treatment would be more convenient and less expensive.

"But until we find technology that works underground, we will have to rely on (above ground) technology," she said.

'It is kind of a deja vu for us old-timers. We went through this discovery process in the 1980s.'

Abinash Agrawal

Underground treatment approach

Agrawal said he prefers underground treatment methods such as colloidal activated carbon, also known as PlumeStop. It is a superior approach for PFAS remediation in aquifers because it's cost-effective, less disruptive, fast acting and has proven to be effective, he said.

PlumeStop was first tested at a contaminated site in Canada about five years ago said Scott Wilson, president and CEO of REGENESIS, a California-based company that has been treating a wide range of contaminants worldwide the past 25 years. In addition to PFAS, the product can treat multiple other contaminants, he said.

To create PlumeStop, they milled coconut fiber activated charcoal to the size of red blood cells, which are about two microns. They are then wrapped in a substance that keeps them from reforming into larger particles. Several holes are drilled into the ground and the substance is pumped into the aquifer. Gravity then moves the PlumeStop through the aquifer, sticking to the surface and forming a permeable treatment zone. It appears as if the aquifer surfaces have been painted black, Wilson said.

"When it does that, basically you've converted the polluted aquifer into a purifying filter," he said. "The carbon will pull all of the PFAS out and make it stick to the soil because the soil basically has been painted with this black carbon. So you've purified the water moving through this area and it becomes super clean."

One application of the PlumeStop can last decades, Wilson Said. Canadian groundwater remediation expert Grant R. Carey estimates it can last between 40 to 60 years. The product starts to take effect immediately while reducing PFAS to undetectable levels.

The cost of the product will depend on the size of the contaminated area, Wilson said. One application to a small site, for example, could cost about $72,000, he said.

'Only a matter of time'

PlumeStop was injected to a contaminated site at a Michigan Army National Guard base in the fall of 2018. Since then, REGENESIS has conducted quarterly sampling at the site, and the PFAS has remained below detectable levels. Applications are planned for other DOD sites in Pennsylvania and Colorado, and at private sites on the East Coast, Wilson said.

It's also being used on a U.S. EPA Superfund site in Connecticut. The Superfund law, passed in the 1980s allows the EPA to clean up contaminated sites and forces the parties responsible for the contamination to either perform cleanups or reimburse the government. There are several U.S. EPA Superfund sites in the Dayton area.

The city of Dayton has used PlumeStop on a limited basis, said Powell, the water director.

"We have employed this technology to deal with a different type of contamination, but we are aware of its potential utility for PFAS mitigation in groundwater," he said. "Currently we are assessing the chemical and biological conditions of our own aquifer to see if this technology would have sustained effectiveness."

Given the fact that the PlumeStop seems to be effective at combating PFAS, why isn't it widely used?

"The problem right now is that we do not have a standard to clean up to" Wilson said. "The U.S. EPA has not established a regulatory standard to clean up to."

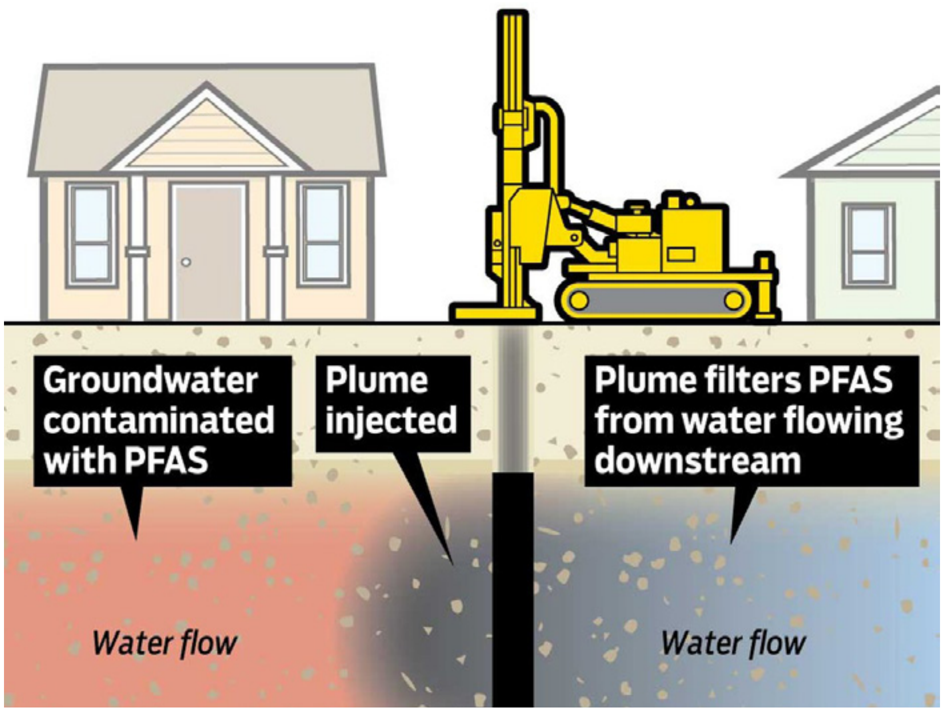
Agrawal believes that there's a lack of knowledge about PlumeStop because it's relatively new. Federal and local officials often are hesitant to take a chance on products they aren't familiar with, he said. Still, he's optimistic, saying it's only a matter of time before the underground method is more widely used.

The U.S. EPA has found a variety of ways to remove PFAS from drinking water, a spokeswoman said. But it recommends that municipalities do what's best for their communities.

"There are things to consider with each of these technologies, including costs and operational feasibility, which can vary, therefore would need to be weighed by the needs of the community," the spokeswoman said in an email. "We recommend that municipalities consult with their respective state drinking water programs and obtain approvals before installing any treatment technologies."

How PlumeStop treats water contaminated with PFAS

Holes are drilled into the ground and a filtering plume is injected into the aquifer. The plume purifies the water by eliminating PFAS in that area of the aquifer for 40-60 years



Source: REGENESIS

A groundwater remediation team drills into a contaminated site at a Michigan Army National Guard base in preparation to inject Colloidial Activated Carbon, or PlumeStop in fall 2018. CONTRIBUTED

Dayton Daily News Complete. In-Depth. Dependable.

1611 South Main Street, Dayton, OH, 45409

Thank you for supporting real journalism in your community. With your help, we investigate and report the local news, bringing you stories you won't read anywhere else. In doing so, we strive to preserve the community's moments, milestones, and keep you informed on what's really going on.

Jana Collier
Publisher

Jim Bebbington
Editor

Mike Burlingame
Senior Director of Operations

Suzanne Klopfenstein
Senior Director of Sales

ADVERTISING
■ 888-802-6964

NEWS TIPS
■ Our team breaks news 24 hours a day. Email tips to news@DaytonDailyNews.com or call 937-610-7502

Connect with us

Our goal is to have newspapers delivered to homes by 6:30 a.m. on weekdays, 7:30 a.m. on Saturdays and 8:00 a.m. on Sundays. If your newspaper is late, or you have any other service issues please let us know.

SUBSCRIPTIONS, HOME DELIVERY, DIGITAL OR BILLING QUESTIONS
■ **Online/digital:** daytondailynews.com/customerservice
■ **Email:** customercare@daytondailynews.com
■ **Call:** 888-397-6397

CUSTOMER SERVICE HOURS
■ **Monday-Friday:** 6:30 a.m. to 4 p.m.
■ **Saturday:** 7:30 a.m. to 11:30 a.m.
■ **Sunday:** 8 a.m. to Noon
■ **Holidays:** 7:30 a.m. to 11:30 a.m.

We care about your service. If using the steps above doesn't correct your problem, contact me for personal help.

Greg Smith
Subscriber Advocate
SubscriberAdvocate@DaytonDailyNews.com
P.O. Box 2805, Dayton OH 45401

DAYTON DAILY NEWS SUBSCRIPTION RATES

Type of subscription	1 month	Annual
7 day - Print + Daily Digital	$58.99	$707.88
4 day - Print (Thur-Sun) + Daily Digital	$51.99	$623.88
Sunday Print + Daily Digital	$29.99	$359.79
Daily Digital	$19.99	$239.88

About subscriptions

The first payment for all new subscriptions will include any outstanding balances.

Dates and prices are subject to change without notice.