TAUNTON
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What do scientists say about Taunton gasification plant? Is it safe? Can we know?

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TAUNTON — Aries Clean Technologies and its supporters say its gasification plant, which would deal with the region's sewage sludge and could net millions of dollars for the city, is safe for public health and the environment.

Environmental and public health groups say the opposite, warning that the plant, which would be built on a part of the former landfill site on East Britannia Street, could have toxic air emissions, and would further burden a community that already had to deal with the negative impacts of the landfill, such as smell, noise and pollution.

But what do independent scientists have to say about the plant?

Aries engineer: 'I wouldn't do it if it wasn't safe'

First, it's important to understand Aries's claims.

Aries has hired chemical engineer Dale Raczynski of Epsilon Associates, a New England-based environmental engineering and consulting company specializing in securing environmental approvals, and his team to help them get state approvals and explain the gasification process and why it is safe.

Much of the discussion of safety has and will continue to center around PFAS. Though PFAS (per- and polyfluoroalkyl substances) are far from the only toxic chemicals found in sludge that Tauntonians should be worried about, according to independent scientists, they are a good case study for evaluating the potential environmental and public health risks of dealing with sludge in any particular way.

PFAS are known to collect in sludge, and exposure is known to lead to cancer, low infant birth weights and immune system disruption.

According to Raczynski, the amount of PFAS that would come in the biosolids would be between 10 and 100 parts per million. He said those chemicals would be destroyed by high heat in three places during the process: when the sludge is dried, when the sludge is gasified at 1250 degrees Fahrenheit and when the syngas that results from the gasification goes through a thermal oxidizer at 1800 degrees Fahrenheit.

While PFAS are designed to withstand high heat, being used on non-stick pans and in firefighting foam, Raczynski said they cannot withstand heat of those levels.

More: Tauntonians split on supporting or opposing gasification plant, want more info

The gasification process will create three products: the wastewater that evaporates off the sludge in the dryer, which will go into the sewer if permitted by the city; the biochar, which will be mixed with concrete; and the syngas which will partially be used to power the plant and some of which will go through the thermal oxidizer and come out a smokestack.

Raczynski claims that, based on the best available data, the system will be so efficient at destroying PFAS that a conservative estimate would say .01% of the PFAS that was in the sludge when it came to the plant will go out the smokestack. He said that these substances will be so dilute that they won't cause negative health effects.

Despite claims otherwise by environmentalists, Raczynski said there is good data on what amount of PFAS is safe in air emissions. And while Massachusetts doesn't have standards for PFAS emissions in the air, Raczynski said, Michigan and New York do, and the Aries facility would emit far less than the allowable amounts in those states.

"We'll have to test it and prove it. And so we're confident that that will pass any standards that the DEP (Massachusetts Department of Environmental Protection) comes up with," he said. "We're confident that the emissions are so low, coming off the stack, that they will be safe."

As for the biochar, any PFAS found in the biochar, which he said is good at absorbing toxins, would be mixed with concrete after being sold to the construction industry. He said cement has long been used to stabilize toxins, and that the PFAS would not leach out, contrary to environmentalists' claims.

Raczynski also said the wastewater from the plant would go back into waste systems and have no way of getting into Taunton's groundwater.

Not only will Aries have to test these claims at the Taunton site, Raczynski said, but it will be able to test comparable air emissions and biochar from the plant they are currently building in Linden, New Jersey, to submit to the city and the DEP before they are permitted, Raczynski said. These will either support or weaken Aries's claims.

"I wouldn't do it if it wasn't safe," he said. "...I stake my professional reputation on that. And like I said, I've been doing this for 40 years."

Scientists explain what could go wrong and what we do and don't know

But what do other engineers have to say about sludge gasification?

Loretta Fernandez, an associate professor of civil and environmental engineering at Northeastern University, said that thermal treatment such as gasification can break down PFAS, but that it's not easily done and may only partially destroy those chemicals.

"We can break down the chemical just by increasing the temperature, but the temperature has to go really high in order for this to happen," she said.

When incinerators do not burn at a high enough temperature, Fernandez said, the PFAS can get released into the air.

For this reason, she said, it will be extremely important to do good air quality monitoring of what comes out of the smokestack.

Fernandez said the 99.99% PFAS destruction rate advertised by Aries would also require that the plant is always operated at its highest efficacy.

"Are they saying that it's possible to remove 99.9%? Or that they're going to ensure that it's always operated under these most optimal conditions? Is that a maximum or is that an average?" she said.

She also said that though PFAS can definitely be destroyed at very high temperatures, it would take a lot of energy to achieve that high a temperature.

James Yeh, a biomaterials and engineering professor at Fisher College, agreed with Fernandez about this, and said he is skeptical that Aries would really be able to create enough energy to get to those high temperatures just with the syngas produced, and so they might have to resort to natural gas.

If that were so, the plant would not be a carbon neutral closed system as Aries claims. He also worried that Taunton might not have the infrastructure available to provide that much natural gas.

Fernandez agreed with Raczynski that PFAS and other chemicals can strongly absorb into biochar. Still, she said, some PFAS stick to biochar better than others. She said larger PFAS stick very well to char, while smaller PFAS are more water soluble and not as easily absorbed.

Thus, she said, Aries will need to test the resulting biochar to make sure the chemicals are being well absorbed into the char.

Similarly, she said, they will want to test the PFAS leach rate of the concrete, as there will definitely be some leaching as the concrete breaks down over time, it's just a question of how much.

Still, Fernandez said, putting dangerous heavy metals such as lead and mercury in concrete is something we already do, and it matters what the concrete is used for. Concrete for a bridge or sidewalk might break down faster and leach more easily into water supplies than concrete inside a building.

As for the plant emitting "safe" levels of PFAS, Fernandez said she would like to know what amount of PFAS Aries would consider "safe," and how widespread the emissions of the smokestack would be.

"The mid-last century mantra, which was 'dilution is the solution to pollution,' I think, our experiences, have shown it is not so," she said.

Fernandez seemed to agree more with environmentalists on this issue, saying she doesn't think there is a current consensus about what concentrations of PFAS are safe, and that any current determinations might change in the next decade as scientists learn more about PFAS.

"There was recently a request for proposals put out by the EPA looking for ways that we could even understand what PFAS levels are in sludge and understand what safe disposal practices were. It was released last year," she said.

"So if they're releasing a request focused on this area, it acknowledges that they do not have a strong understanding of how much PFAS is in sludge, how to even measure how much PFAS is in sludge and how to measure how these disposal practices or treatment processes are even affecting the PFAS levels in sludge."

For this reason, Fernandez said if a plant like this were put in her community, she would feel a bit like a guinea pig.

But, she said, she wouldn't just say no to it. She said she would want to learn more about Aries's operating procedures, current studies on this topic and data from other similar plants. She said she'd want assurance of a high degree of scrutiny of the plant.

But what is the alternative?

Fernandez said Tauntonians should also keep in mind that landfilling is not a great solution either. While it is safer in terms of air emissions, she said, it creates a larger reservoir of PFAS that could be extremely harmful if it were ever released, since landfills also leach.

It is also, at best, a temporary solution, she said, as landfills only last around 100 years.

"What happens after that 100 years? How well encapsulated is this stuff? Are we kicking the can down the road in terms of dealing with these chemicals in the future?" she asked.

John Durant, a civil and environmental engineer, largely agreed with much of what Fernandez said.

"The question is, have they identified all the possible pollutants that are likely to be produced in the gasification process, and do they have an adequately designed system that will remove those pollutants down to low enough levels that when stack gas is released, and the pollutants start to move downwind and get dispersed by the wind, are those concentrations going to be still high enough to cause health detriment in the downwind communities?"

It's largely a matter of doing good engineering and testing, he said. But he also agreed with Fernandez that while some toxins coming out of the smokestack are well known and studied, scientists are still figuring out what toxic levels of PFAS are.

"If you're a community like Taunton, what do you do? Do you release some small amount of PFAS and risk finding out five, 10 years down the road that the level you are releasing is simply too high and make an adjustment then?" he asked. "But by then the damage has been done already. Or do you just cancel the whole project entirely because you can't live with the risk?"

But Durant urged Tauntonians to also look at the environmental and health impacts of what the city is currently doing with its sludge. Right now, the city is trucking its waste approximately 150 miles to an incinerator in Naugatuck, Connecticut — a town of around 30,000 outside Waterbury, which is certainly worse for climate change than keeping the sludge within the city.

"I would wonder, 'OK, what's happening to Taunton's biosolids in the Naugatuck, Connecticut, incinerator? Are the PFAS chemicals being released into the environment in Naugatuck, Connecticut? And therefore should Taunton be concerned about that?" he asked.

"If you simply export your waste to another community, and then you're paying for that waste to be to be treated in the other community, are you absolved of all responsibility for toxins that are released into that community?"

Accountability is key

That being said, Durant said he believes it's a good thing that environmental and public health groups are so skeptical about the plant and are raising concerns.

"The level of oversight, the level of scrutiny that this issue is getting feels right to me as part of the process," he said. "You need these kinds of outside forces to push on the decisionmakers and the engineers to spend more money, to do more studies, to improve the engineering design of the biochar plants such that air pollution controls are really going to be adequately protective."

Durant said it will also be important to keep a watchful eye on the plant over time to make sure it continuously delivers on its promises, especially because regulatory agencies are often underfunded and understaffed.

"You need community members to sort of step up and say, 'Okay, we're gonna take a look at this and make sure everybody's doing their job," he said.

One thing to keep in mind though, Durant said, is that everyone is still being exposed to PFAS. He and other scientists consulted for this article agreed that in communities not burdened by specific PFAS contamination in their water, most of the PFAS humans ingest comes from food that has PFAS in it due to sludge being used as fertilizer on agricultural land. There are many other ways humans are exposed to PFAS as well.

It is also worthwhile to explore alternatives to landfilling sludge, Durant said, as ultimately, society will need a way to cut down on the volume of sludge, and landfills often leak and ruin groundwater.

Durant said that were the facility proposed in his community, he would be interested, but he would want to see Aries's studies and data to determine if the plant was safe based on the current best science.

"But you still have to make decisions, right? The PFAS has to go somewhere, right? We're not going to stick it in some giant container underground and wait for 1,000 years till the science catches up and says, 'Yep, here are the levels. Now go ahead and treat it,'" he said.

"You've got to do something with it now because the sewage is being produced continuously, every single day. So the question is, how do you act? What actions do you take in the face of uncertainty, when you cannot sit on your hands and do nothing?"