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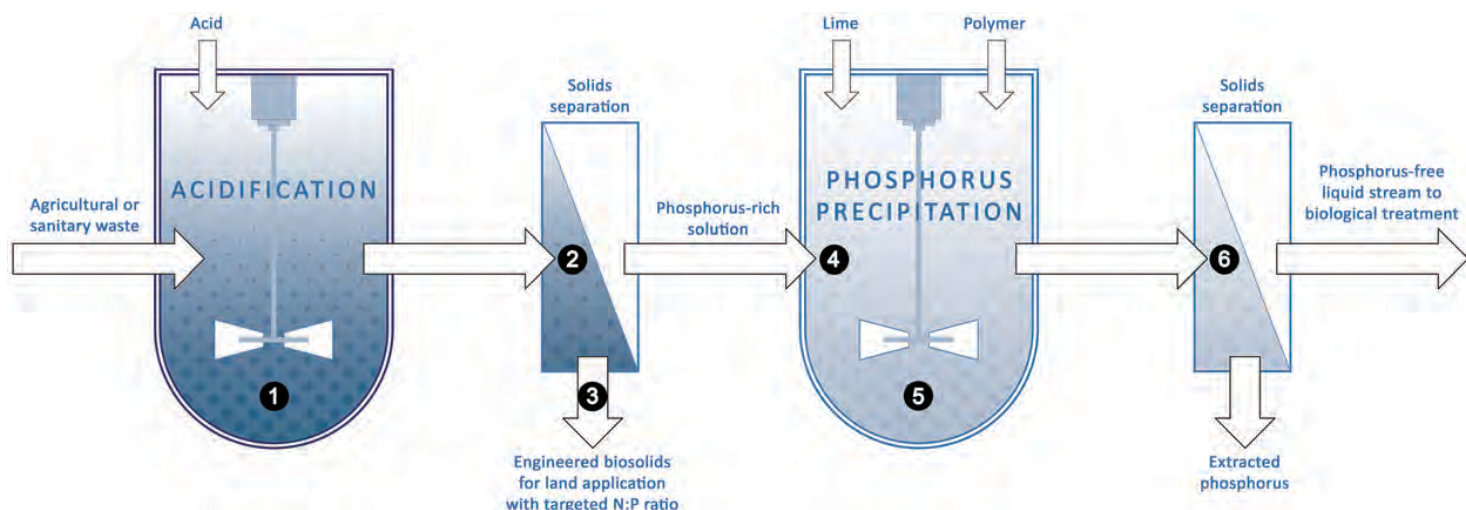
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Chuck Smithwick
District Manager
Grifton, N.C.

CMUSD

Sustainable Operations:
Low-risk biogas power

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- 1) Biosolids are pumped into Tank 1 and acidified to lower the pH, thus solubilizing the phosphorus.
- 2) Low-pH material is pumped through a ceramic membrane, allowing only liquid and solubilized materials to pass.
- 3) Low- or no-phosphorus material is pumped to dewatering.
- 4) Solubilized phosphorus solution passes through membrane and is pumped to Tank 2.
- 5) Lime is added to the phosphorus-rich solution in Tank 2 to raise the pH and precipitate the phosphorus.
- 6) A second ceramic membrane separates the precipitated phosphorus from the liquid stream, allowing phosphorus-free liquid to pass, and leaving behind extracted phosphorus.

Nutrient Solutions

AN INNOVATIVE PROCESS COMBINES CHEMICAL TREATMENT AND MEMBRANE SEPARATION TO EXTRACT AND RECOVER PHOSPHORUS FROM WASTEWATER BIOSOLIDS

By Ted J. Rulseh

Phosphorus can be a challenge not only in clean-water plant effluent but in biosolids. For facilities looking to land-apply biosolids in areas with naturally phosphorus-rich soils, high P in the material can be an obstacle.

Now, Renewable Nutrients, based in Pinehurst, North Carolina, offers a process that can remove phosphorus from the solids and capture it downstream. The results are crop- and soil-friendly biosolids and a granular calcium phosphate product that can be used as fertilizer.

The Quick Wash process chemically separates phosphorus from the biosolids in one tank, then chemically precipitates it in another tank. The company offers a mobile, trailer-mounted pilot treatment unit that can be installed at clean-water plants to test how the process could be configured to operate at a commercial scale on the site.

Jeff Dawson, CEO, and Larry Sandeen, chief engineer, talked about the process in an interview with *Treatment Plant Operator*.

tpo: What need in the marketplace drove development of this technology?

Dawson: Around the country and the world, there is an issue with the amount of phosphorus being land-applied with biosolids. Excess phosphorus can run off into waterways and cause algae blooms. On the other side, the world

has reached its peak in extraction of phosphorus, a nonrenewable resource that is also essential to growing food. Our technology creates biosolids with a more desirable nitrogen-to-phosphorus ratio while capturing the extracted phosphorus in a product that can be directed to other beneficial uses.

tpo: How is the phosphorus extracted from the biosolids stream?

Sandeen: We acidify the solids to a pH of roughly 2.5 to lyse some of the cells, dissolve the phosphorus and make it available to be carried forward in a liquid stream through a separation process. There we capture the low-phosphorus solids, which can be land-applied without affecting surface waters. The low-pH, high-phosphorus liquid moves to another tank.

tpo: How is the phosphorus recovered from that liquid stream?

Sandeen: We add lime to that liquid to a pH of about 10.5, causing calcium phosphate solids to precipitate out. After another separation process, the high-pH, relatively clean liquid stream can be returned to the treatment plant headworks or to a point in the process that requires alkalinity. The precipitated solids can then be processed further — concentrated, dewatered or dried, depending on the intended use and the specific market we would be delivering the product to.

tpo: Where in a wastewater treatment plant process would this process be deployed?

Sandeen: Most commonly, it would be installed before sludge dewatering. Our system could function as the thickening process. It could also be implemented on a phosphorus-rich sidestream. There are ample opportunities to customize it to the specific needs of a facility.

tpo: What is the typical solids content of the biosolids created from this process?

Sandeen: We typically target about 4 percent, but it depends on how we apply the technology. That's one reason we have our pilot plant — so we can look at different plants, different scenarios, different points in the process to pull the sludge from. You can work this process with digested biosolids, waste activated sludge or almost any solids stream.

“Customers don't buy a 'black box' from us. They buy the technology, and all the parts along the chain are off-the-shelf, proven technologies that have been around the waste treatment business for quite some time.”

JEFF DAWSON

tpo: How would you describe your pilot unit?

Sandeen: It's a trailer-mounted unit that we can move from location to location to demonstrate the technology. It receives flows on the order of 3 to 5 gpm. The point is to model the extraction process on site and collect data that will inform full-scale implementation. We can also collect samples of the two solids streams and send them to dewatering vendors to see how their equipment would handle the materials. For an existing facility considering a retrofit of our process, we can send samples to the manufacturers of the dewatering equipment they currently use to get an assessment of how operations would be affected by our process.

tpo: What degree of phosphorus removal can your process achieve?

Dawson: We can customize the amount of extraction depending on what the customer wants the solids to look like on the back end. So if you need a 2-to-1, 3-to-1 or 4-to-1 nitrogen-to-phosphorus ratio in your biosolids because in your region that's what you need for land application, we can do that. We have a technology that extracts more than 80 percent of phosphorus, but that can be dialed down if the customer so desires.

tpo: What does this technology look like in terms of the equipment deployed on a site?

Dawson: We're agnostic in terms of the equipment that's needed. Customers don't buy a “black box” from us. They buy the technology, and all the parts along the chain are off-the-shelf, proven technologies that have been around the waste treatment business for quite some time. We're agnostic in how we put a process together to meet the needs of a facility.

tpo: What are prospective customers saying about this technology?

Dawson: As we have conversations with consulting engineering firms and end users, there are dynamic discussions about changing how the industry deals with nutrient issues and nutrient extraction and how this could be a game-changing technology. There's a need for it because states are getting much more restrictive in the land application of phosphorus in biosolids. And the reality is that as a society we have to start reusing phosphorus as that resource becomes scarcer and prices continue to go up. **tpo**

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