**SUMMARY OF ACTIONS AND DECISIONS**
**Open Session: Manure Treatment Technologies Expert Panel Stakeholder Forum**
**Monday, December 15, 2014, 1:00PM-5:00PM**
http://www.chesapeakebay.net/calendar/event/22245/

## Welcome and Introduction

- Jeremy Hanson (Virginia Tech, Chesapeake Bay Program; Panel Coordinator) welcomed participants and reviewed the agenda. He briefly summarized the Chesapeake Bay Program's BMP review process that the Manure Treatment Technologies expert panel will be following.

## Stakeholder Presentations

*Kristen Hughes-Evans, Sustainable Chesapeake*

- View the presentation for more information.
- She reviewed air emissions data available for 5 different projects. She noted that all have NOx data available, but only the bshl project had ammonia data.

*Patrick Thomson, EnergyWorks BioPower, LLC*

- He reviewed work EnergyWorks has done to generate energy and recover nutrients at CAFO operations. He discussed the measurement points of their process and how they account for "real-time mass and energy balance."
- View the presentation for more information.
- Robb Meinen (Penn State): what size farm?
    - Thomson: The facility we currently have can handle manure from 6.5 million birds. The technology can be scaled down, though there are benefits to scale.
- Doug Hamilton (Oklahoma State): how small can the farm be to support the on-farm heating unit?
    - Thomson: Throughput about 2 tons/day, but the systems we are trying to install in the US are not focused on the heating since the climate is warmer. The houses only need heating a few months a year. We have a 5 ton and 10 ton unit.

*Andre Dight, bhsl*

- He provided background of bhsl and their technology.
    - View the presentation for more information.
- He discussed results from an environmental study of the technology in the UK, which consider transportation, fertilizer use, and reductions in fossil fuel use, among other things. He also noted that bhsl has been collaborating with Mark Reiter (Virginia Tech) in studying ash applications to tomato field crops.
    - View the study report for additional details information.
- He mentioned in October 2014, bhsl received a State of Maryland grant for $970,000 to build a demo unit in Rhodesdale, MD.

*Sonia Nofziger-Dasgupta, Envirokure*

- She described EnviroKure's aerobic technology, which produces USDA-certified organic fertilizer from poultry manure.

- View the presentation for more information.
- Jeff Porter (USDA NRCS): Has Envirokure thought about using other manures that are already wet that do not require added water?
    - Nofziger-Dasgupta: We started with chicken manure. Felt that chicken manure offered best source of nutrients for the products we wanted to create. Given the premium for organic producers, it is still economic to pay for transport of the organic fertilizer over a long distance.
    - Porter: How does your aerobic system compare to other systems in terms of energy demand.
        - Nofziger-Dasgupta: We use ambient compressed air to fuel the digestion, not oxygen. Once we activate the bacteria they do a lot of the work.
        - In response to question from Doug Hamilton, Nofziger-Dasgupta noted they use a centrifuge to separate both pre- and post-bioreactor.
            - Nofziger-Dasgupta: It is a closed system, so very little is lost through gas releases. We'll have to be close to producers, but not likely on the farms themselves.
    - Porter asked the other presenters that for on-farm thermal systems, are farmers capable to keep the farmers up and running?
        - Dight: our systems are essentially small power systems, so we have a constant operations/maintenance of these systems with bhsl engineers.
    - John Chastain (Clemson) asked if any of the systems are paying for manure.
        - Nofziger-Dasgupta: in our business model we currently have a baseline cost of $31/ton for manure, which includes the transport to the EnviroKure facility.
        - Dight: the systems use the producer's own manure.
        - Nofziger-Dasgupta: we've been primarily in an R&D stage, and have been dealing with manure brokers, so they've maintained liability of the manure.
            - Chastain: Asked because some states still place liability on the producer even if the manure is sold and handled by a broker.
        - A participant asked what the water source is for the EnviroKure process.
            - Nofziger-Dasgupta: Recycle the water as much as we can, and we use municipal water. The Philadelphia water authority has tested the water and it is safe to flush down the drains.
                - She also noted that even though EnviroKure processes the manure, it does not have to come from organic chickens to be certified organic. To sell to Canada as organic, though, would need to get manure from organic chickens.
            - Hughes-Evans noted that ash and biochar are not currently allowable as organic amendments or fertilizers, but that may be currently under review.
        - Porter: one of the goals of these systems is to reduce the nitrogen and the phosphorus, but what kind of plans or programs are there to transport these products to areas that are not nutrient hotspots?
            - Hughes-Evans: Ideally you have someone as a broker to help make those connections and transport the products to other areas.

- Hughes-Evans noted that Delaware does not allow combustion except when it is on the farm. There have been requests to not include pyrolysis under the combustion category in Delaware.
- James Davis-Martin (VA DEQ): Manure from CAFOs is already required to be applied in accordance with NMP. If current land application is rerouted for these technologies, it is reasonable to assume that commercial fertilizer products will replace the manure, so the net benefit from the technology would need to account for that.

*Chris Haug, Triea Technologies*

- He described Triea Technologies, and the quick wash™ process that they have an exclusive sub-license for in North America. Once submitted for formal review, the low-P solids could be categorized at EPA Class A, pathogen free. Could potentially be customizable to a farmer's needs by altering aspects of the process. Phosphorus recovery has ranged from 70% to up to 98% over various types of manure and locations. He reviewed the products (manure solids, calcium phosphate, process liquid) and potential outlets.
- He noted Triea was awarded a $250,000 grant by MD DNR to implement a 3-phase commercialization plan. Hope to have on-farm, mobile, and regional systems. Also considering how the process can work with manure to energy processes such as anaerobic digestion.
- Phosphorus does not have to be in a soluble form, it can be organic or inorganic.
- View the presentation for more information.

*Peter Thomas and Mike McGolden, Coaltec Energy USA, Inc.*

- Mike McGolden presented Coaltec's gasification systems. He explained gasification is oxygen-starved, pyrolysis is oxygen free. There are large-scale systems currently in operation. Gasification can be applied to a variety of manures, from layers, broilers, horses, swine, or turkey, etc. For wetter manures, requires solids separation before drying and gasification. There is an on-farm system operating in Ohio, with 4,500 cows on site. He mentioned the operation previously paid about $1 million for bedding, but last year they paid closer to $8,000. It is a cattle sexing operation that was ideal for using the biochar as bedding material. Biggest challenge is developing a full scale market for biochar. Most work so far has been at pilot or small scale.
- View the presentation for more information.

*Clint Church, USDA-ARS*

- Church noted that two USDA-ARS researchers (Vanotti and Szogi) developed the process that was described by Chris Haug. That process depends on pH manipulation. ARS has also developed a similar process that does not depend on pH manipulation. Church described the latter process and the performance they have been measuring, with up to 96-99% phosphorus removal and a 99% solids removal. Removed solids are about 70% moisture so they are stackable and easily used for composting. Currently constructing a full scale mobile system. Also constructing a full scale on-farm system on a site where they currently have two lagoons, the second of which can effectively serve as

the chemical treatment tank. Still in early discussions with that producer. Average carbon content is 20-25% from manure, most manure biochar will be in that range.

- View the presentation for more information.
- Jactone Ogejo (Virginia Tech): what are the characteristics of the input?
    - Church: We tested on typical dairies that were about 7% solids, and this newest location has about 1% solids.
- Keri Cantrell (NC DENR): What size facility, especially for gasification and combustion, do we need to be concerned with regarding EPA or other air quality regulations?
    - Hughes-Evans: Most facilities would fall under boiler rules. Maryland also has biomass regulations. VA and WV have different permitting process that have thresholds. If the system does not heat water it is not considered a boiler under federal regulations.
    - Mike McGolden noted that each state has different requirements.
    - Peter Thomas noted that EPA sent a letter to Max West in FL that mentions when boiler regulations would provide. Will provide a copy for the panel.

**Discussion**

- Porter: of these technologies, how many are beyond the R&D and ready for production? What are the timeframes to be in full production?
    - Dight: for combustion we've made lots of iterations and are identifying manufacturers. With combined heat and power we are still commercializing. The technology is moving quite rapidly.
    - Nofziger-Dasgupta: we're looking at 10 months-15 months.
- Dominic Bassani (Bion): One of the things, there's a lot of discussion of phosphorus and ammonia. When you start looking at trading or regulatory side, need to consider what the liability or policy issues might be.
- There was discussion of the possibility of presenters or others sharing confidential or other sensitive data sources with the Panel. Hanson noted that the Panel's deliberations are closed and they have access to password-protected platforms for safely sharing such data if it is provided for the Panel's consideration. The Panel's analysis would place greater weight on peer-reviewed, published data, but any available information could prove beneficial.
    - Cantrell: would prefer they provide whatever they are comfortable providing.
    - Brian Benham (Virginia Tech): Any such data would preferably be shared in a summarized form.
- Hughes-Evans: nitrogen emissions are relatively low, but can't assume ammonia emissions are negligible until there is data to back that up. For smaller scale projects or facilities it may not be practical to have real-time monitoring. Larger scale projects could more reasonably afford extensive or real-time monitoring.
- **Post-meeting note:** Dominic Bassani (Bion) shared slides for the meeting participants.

**Wrap up and next steps**

- Hanson asked each Panel member to share their biggest take-away messages or lessons learned from the day.

- Hamilton: Presentations reiterated that the Panel has a number of specific technologies to consider. Panel will need to nail down where the specific technologies fit into the categories.
- Porter: There were several presentation of farm-based and community- or regional-based systems. Will need to grapple with that issue and determine how to approach that as we form recommendations.
- Andrea Ludwig (University of Tennessee): This has been very useful information and it is great to see actual removal rates or performance, but it definitely raises practical questions related to implementation, management, etc., which will need to be considered.
- Chastain: Feel encouraged by the participation from entrepreneurs in the room. We're still learning more about our charge and we will see where the Panel goes from here.
    - Hamilton reiterated that the Panel is not recommending specific technologies, but nutrient and sediment reductions. Not a recommendation of one technology versus another, but what the benefits are for each of them as a broader category.
- David Wood (Chesapeake Research Consortium): from the CBP perspective it is good to know the range of technologies and capabilities.
- Ogejo: Great presentations and glad to hear of all the work and research currently being done.
- Cantrell: Excited to see so much progress by these technologies over the past seven years.
- Meinen: Still questions about the transport of the manure or end-product, whether it is out of the watershed or not. Receiving data from stakeholders would help the panel in its recommendations. Think some of these technologies and their odor benefits would be well applied in Pennsylvania. He mentioned the North American Manure Expo is located in the Chesapeake Bay Watershed in 2015.
- Chris Brosch (Virginia Tech, VA DCR): this panel will have a unique job in interpreting these BMPs into something the states can track and report for their annual progress runs.
- Hanson echoed that he was also encouraged by the participation from the private sector, and he was excited to work with the Panel following the productive stakeholder session.
- Patrick Thomson asked for clarification of what the process is once the Panel's report is released to the Agriculture Workgroup (AgWG).
    - Hanson explained the process as it is described in the latest version (July 2014) BMP Review Protocol. The report is released to the AgWG and other relevant CBP groups, including the Watershed Technical Workgroup and Water Quality Goal Implementation Team. Time is allowed for all those entities to review and provide comments and ask questions on the report. The Panel Chair and Coordinator work with the Panel to address comments and make necessary revisions or clarification. Then the report goes through the approval process. Hanson noted the process can take multiple months, depending on the BMP and the report.
- Hanson thanked everyone for their time and participation.

**Adjourned**

## Participants

| Name | Affiliation |
|---|---|
| *Panel members and support staff* | |
| Doug Hamilton (Chair) | Oklahoma State |
| Keri Cantrell | NC Dept. of Environment and Natural Resources |
| John Chastain | Clemson University |
| Andrea Ludwig | University of Tennessee |
| Robert Meinen | Penn State |
| Jactone Ogejo | Virginia Tech |
| Jeff Porter | USDA-NRCS, East National Technology Support Center |
| David Wood (CBPO Modeling Team Rep) | Chesapeake Research Consortium, CBPO |
| Chris Brosch (WTWG Rep) | Virginia Tech, VA Dept. of Conservation and Recreation |
| Jeremy Hanson (VT Project and Panel Coordinator) | Virginia Tech, CBPO |
| Brian Benham (VT Project Lead) | Virginia Tech |
| Mark Dubin (AgWG Coordinator) | University of Maryland |
| Ashley Toy (Regulatory Support), via phone | EPA Region 3 |
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| *Attendees and presenters* | |
| Ann Baldwin | NRCS-DE |
| Dominic Bassani | Bion Environmental |
| Clinton Church | USDA- Agricultural Research Service |
| Andre Dight | bhsl |
| Chris Haug | Triea Technologies |
| Devon Hooper | EnviroKure |
| Kristen Hughes-Evans | Sustainable Chesapeake |
| Dan Johannes | Chesapeake Bay Foundation |
| Spiros Mantzavinos | The Mantzavinos Group-Public Affairs |
| Mike McGolden | Coaltec Energy USA, Inc. |
| Sonia Nofziger Dasgupta | EnviroKure |
| Lucinda Power | USEPA |
| David Size | Poultry Litter Solutions, LLC |
| Peter Thomas | Coaltec Energy USA, Inc. |
| Patrick Thompson | EnergyWorks BioPower, LLC |
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| *Remote participants* | |
| Mark Zolandz | EPA Region III |
| Robin Pellicano | MD Dept of Environment |
| Louise Lawrence | MD Dept of Agriculture |
| Jarrod Miller | |
| Mike Phillips | Perdue Agribusiness |
| Jack Meisinger | USDA Agriculture Research Service |
| Quirine Ketterings | Cornell University |
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| Michael McCaskey | EnergyWorks BioPower, LLC |
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| Gary Flory | VA Dept. Environmental Quality |
| Lindsay Dodd | DE-MD Agribusiness Association |
| Ann-Marie Adams | EnviroKure |