

**Today's Webcast:**

**August 21<sup>st</sup>, 2009**

**"Evaluating Innovative Technologies Based on the Collective Experiences of Farm Pilot Project Coordination, Inc."**

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**Webcast participants**

- **Lawrence Clark**, served as Deputy Chief for Science and Technology for USDA's Natural Resources Conservation Service
- **William Boyd**, Leader – NRCS Manure Management Technology Development Team in Greensboro, North Carolina
- **Robert Monley**, General Manager Farm Pilot Project Coordination Inc. Tampa, Florida

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**Background**

- Farm Pilot Project Coordination, Inc. (FPPC) is a non-profit organization
- Chartered by Congress in 2002
  - Find innovative and economically viable technology while promoting wise use of land and water, and value for manure resources
  - Farm-scale demonstration at swine, poultry, dairy & feedlots
  - Reduce 75% of N,P,K nutrients from waste stream of animal feed operations
- Collaborate with other stakeholders – state and local
- Cooperative agreement with USDA-NRCS to administer grant program

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**Thermo-chemical** reactions can convert waste into ash, char, heating oils and syngas and still provide thermal benefits

Torrefaction

Pyrolysis

Combustion

Gasification



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**Composting** of poultry manure and mortality mix with recycled off-gases layer facility in Lake Mills, Wisconsin

Mixed manure and mortalities

Static bin

Forced aeration

Rotary drum

Windrow



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**Drying** can remove moisture to very low levels while maintaining BTU value of solids portable unit in Eldora, Iowa

Evaporative

Solar assist

Cyclone

Fluidized bed

Waste heat & biodrying



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**Solid separators** are effective dewatering processes for wet waste  
farm in Bell, Florida

- belt press
- geo-textile bag
- centrifuge
- tangential flow
- vacuum dewatering bed
- screw press
- inclined screen
- rotary drum
- weeping wall



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After solids separation, **effluent can be further treated** to remove more nutrients  
Dairy farm in Trenton, FL

- biological: mixing zones in lagoons
- clarifiers
- reverse osmosis
- eration & microbial addition: Nitrification and deNitrification
- wetlands and buffer strips
- micro filtration
- vibrating membranes



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**Chemical reactions** can augment separation processes and nutrient capture removing swine lagoon solids - New Douglas, IL

- Metal salts  
Alum  
 $FeCl_3$   
 $FeSO_4$
- Polymers
- electro-coagulation
- Struvite formation techniques



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**Waste-to-energy products** extends the conversion process but enhances value add  
Weise Dairy at Greenleaf, WI

- methane
- liquid fuels
- combustible solids
- thermal - heat / cooling
- electricity on/off grid

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- liquid fuels
- electricity on/off grid

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**Building the technology toolbox - developed by combining processes & borrowing from others**

**Processes**

- Biological
- Mechanical
- Chemical
- Thermo-chemical

**Industry crossover**

- Mining
- Municipal waste
- Pulp & paper
- Food waste
- Petrochemical

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**Reality on the farm .....**

**Challenges**

- Agriculture is not uniform
- Agriculture is complex

**Best Solutions**

- Simple, robust, integrated, flexible & cost effective
- Very best will convert waste problems into resource management opportunities

**Learning**

- Education in the classroom
- Learn by doing
- Learn from what others are doing

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**Is the project objective reasonable ? Treat effluent or add additional storage capacity ?**



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**Will this innovative technology work for me ?**

Consider:

- Identify your business objectives
- Waste stream characteristics
- Technology ? how does it work ?
- Identify the risk involved
- What can I learn from others?

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**Does the technology help the farmer achieve his business objectives ?**

- Avoid neighbor's complaints about odor
- Regulatory issue ?
- Expand size of operation (but without land base to use nutrients coming from his operation)
- Reduce hauling costs
- Implement a waste treatment system to avoid dredging an already filled lagoon
- Are captured solids destined for energy or composting operation?

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### Before getting starting ... due diligence

- During the site visit ..... Farmer needs to consider  
**change at his farm**
- Technology provider understand my operation ?
  - Is operation realistic match for this technology ?
  - What is your experience; what is the experience in agriculture ?
  - Construction & operating permits ?
  - Has the technology provider considered my total resource requirements (ie. manpower, energy, water, land) at the farm ?
- Can this be routinely operated and maintained by me ?
  - What can I afford ? (short term & long term)

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### Waste stream suited for the technology ?

**Characterize the waste stream :**

- Influence of the animal feed ?
- Does waste change with season ?
- Is waste homogenous ?
- Can foreign material/debris introduced ?
- Does mix have bedding material ingredient ?
- Special material handling to pump or transfer ?
- Waste chemistry - pH, alkalinity, composition ?
- Surges, interrupted flows or changes - promoting settling and/or non uniform mixing ?
- Storage ? (time/temp & exposure to the elements)

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### Is the material transfer method reliable for conveying the waste ?



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**Foreign material can interfere with operation of mechanical equipment**



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**How does this technology work ?**



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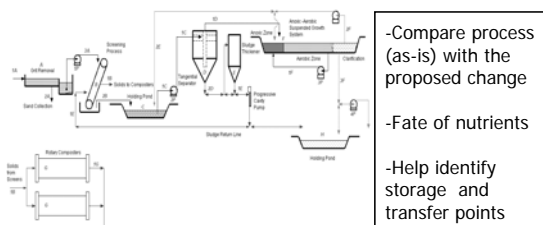
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**A flow diagram can illustrate how the technology pieces fit and how the process works together as a complete system**



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**Does it matter which separation method is selected & how solids are captured ?**



Double inclined screen

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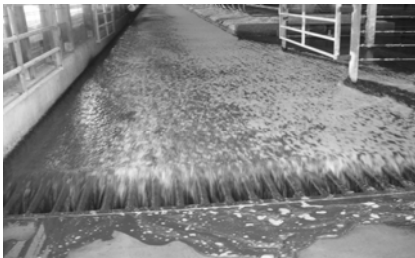
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**Knowing flow rate and how it varies is a system design requirement**



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**Bench testing with polymers - recommended; allows honing the chemical recipe on site**



Raw manure waste



Separation with polymer



Dried cake solids

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What is the moisture requirement entering this rotary composter? Not sure - works in Texas.



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Where is the risk and what can I do about it?

- Is there a critical technical issue? *1. Use independent consultant*
- Within my capability to manage and maintain? Is service available? *2. Have a contingency plan*
- Economic assumptions met? *3. Know critical breakpoint*
- 4. Have stakeholder interest in outcome*

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Construction risk with large concrete structures



- Complex pour geometries require experienced contractors
- Consider more supervision and a performance bond
- Karst regions may require a geo-technical evaluation before finalizing a site

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**Risk can be managed during the project if enough interest and time committed**

<b>Stay involved</b>	<b>Performance real ?</b>
<ul style="list-style-type: none"><li>■ Installation</li><li>■ Debugging</li><li>■ Seasonal change (hot/cold; rainy/dry)</li><li>■ Document O&amp;M costs</li><li>■ Evaluating results</li></ul>	<ul style="list-style-type: none"><li>■ Based on data</li><li>■ Obtained objectively</li><li>■ Identify process conditions (works – what doesn't)</li></ul>

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**After the project ....**

- You will know more and where to improve
- Expect that it may take 6 months to stabilize system and improve performance

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**Collective experience across many diverse projects indicates common avoidable problems:**

- Poorly defined engineering requirements
- Miscalculated solids loading and flow rates
- Not fully characterized the waste stream
- Unclear responsibility for management at site
- Installation of large concrete structures
- Systems – poorly integrated
- Under estimated operation & maintenance

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**Next threshold for innovative technology ?  
Economical viable**

- Optimize unit process and better integrate as complete system
- Realize more value in the marketplace for resource recovery
- Generate reasonable return on investment
- Build acceptance within agricultural community of technology providers, farmers and bankers

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**Summary – take away points**

- Make sure that waste stream and technology are match
- Don't underestimate material handling issues
- Consider having a trusted consultant
- Understand how technology works and what benefits will result
- Alignment between business objectives and technology
- Observe steady state and upset conditions; don't rely solely on the claims of the technology provider; insist on objective data
- Innovative technology has risk – understand it and be prepared to manage it
- Recognize there is a learning curve and be ready to share lessons learned

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**Thank you for your attention**

[www.fppcinc.org](http://www.fppcinc.org)

*Time for questions*

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