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PATHOGEN EQUIVALENCY COMMITTEE (PEC)

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LTG 4 Poster 04

Science Questions

MYP Science Question:

What is the current state of management practices for biosolids production and application, and how can those be made more effective?

Research Questions:

- Are there innovative or alternative sludge disinfection processes that are capable of significantly reducing pathogens (PSRP - Class B, Alternative 3) or further reducing pathogens (PSRP - Class A, Alternative 6) and thus meeting the requirements of 40CFR503?
- What must the developer of an innovative or alternative sludge disinfection process do to demonstrate the capability of his/her process? In other words, what pathogens or indicator organisms must it be capable of reducing?
- Is the Pathogen Equivalency Committee (PEC) using the best criteria to evaluate innovative or alternative processes? Are the best standardized and validated analytical methods being used for quantifying fecal coliform, Salmonella sp., enteric viruses, and Ascaris sp; and are pathogens emerging that Class B or A processes may not be able to disinfect?

How Research Addresses the Water Quality MYP Goals

The PEC, with members from OW, EPA Regional Offices, various ORD laboratories, and CDC, is entrusted by OW to critically evaluate innovative and alternative sludge disinfection processes and make recommendations about their PSRP or PFRP equivalency. Their evaluation procedures require development of a quality assurance project plan including use of the latest optimized sampling and analytical techniques to ensure validity of all scientific data produced and maximum protection of public health. The evaluation procedures are regularly updated with state of the art knowledge. Plans are underway to make them readily available to applicants via the Worldwide Web and streamlined to encourage development of new technologies and modification of old ones for testing and cost reduction. The public's increasing desire for well disinfecting sludge being applied will be more and more met by utilities as the cost for Class A - PFRP treatment is reduced. The PEC's strategy is working. Essentially all the technologies currently under evaluation and the new ones being proposed for evaluation are for reduction of pathogens below the analytical detection limit and many of their costs are less than the prevailing ones.

Research Objectives

- Evaluate the effectiveness of innovative or alternative sludge disinfection processes
- Evaluate the level of pathogen reduction provided by the current criteria used to evaluate sludge technologies
- Create an assemblage having a vast body of knowledge in the issues surrounding 40CFR503D to provide general guidance and expertise to local, state, and regional regulators, as well as the public in how best to eliminate infectious disease concerns through treatment

Research Methods & Collaboration

The PEC was created by OW in 1985 to advise EPA and State managers on the equivalency of innovative and alternative sludge disinfection technologies to either a PSRP or a PFRP under the 40CFR-Part 257 and later the 40CFR-Part 503 Regulations. The PEC accomplishes its mission through a rigid evaluation program that includes:

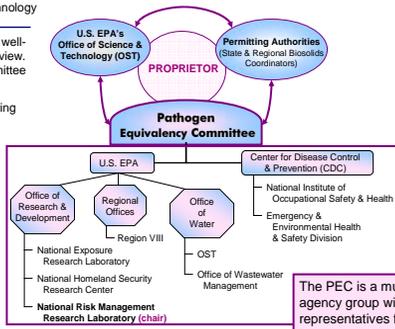
- Working closely with the permitting authority and the applicant to develop a quality assurance project plan - When followed, such a plan ensures that the results submitted in support of a process are statistically significant
- Providing oversight of the demonstration
- Providing rigid review of the data
- Helping with preparation of an operation and maintenance manual detailing conditions of the equivalency
- Disseminating information on the new technology

The PEC consists of 11 members with a well-rounded expertise and diverse point of view. Areas of expertise represented on the committee include:

- ✓ Microbiology ✓ Environmental engineering
- ✓ Virology ✓ Wastewater treatment
- ✓ Parasitology ✓ Industrial hygiene
- ✓ Medicine ✓ Sludge regulations
- ✓ Veterinary science

Its members also provide guidance to permitting authorities and members of the regulated community on issues related to meeting the pathogen and vector attraction reduction requirements of Part 503. Numerous health issues are brought to the attention of the committee for addressing.

In addition to equivalency application reviews, the PEC holds workshops with invited international experts on a regular basis to maintain an awareness of emerging pathogen, analytical method, disinfection, and risk analysis issues. These workshops also serve to educate the committee on ways to improve its process evaluation criteria as well as produce proceedings useful to the field.



The PEC is a multi-agency group with representatives from these organizations.

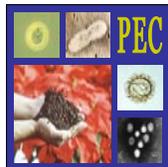
Research Results

Examples of innovative processes currently under evaluation:

- **Vermicomposting** as marketed by Vermitech and OregonSoil is a variation on traditional composting that uses worms to assist in disinfection as well as the biological breakdown of organic materials at mesophilic temperatures.
- **New thermophilic anaerobic digestion processes** using staged operation designs are being evaluated by the DC Water and Sewer Authority and the Los Angeles Hyperion Plant. DC's design involves a number of continuous flow stirred tank reactors (CFSTRs) in series which approaches plug flow, while Los Angeles's design has only two stages, one CFSTR and one fill, hold, withdrawal stage.
- **The MagnaGro Process** is being investigated by Magna-Flow Environmental and Evergreen Organics, Inc. The main disinfectant is liquid metam sodium, a registered pesticide (*Trademark: Rid-A-VecTM*) which reacts immediately upon mixing with the moisture content of the sludge & converts to methyl isothiocyanate (MITC). MITC is a poisonous gas which preliminary data suggests can achieve the required levels of disinfection in a batch process with four hours of contact time in a closed vessel.
- **The NeutralizerTM Process** developed by BioChem Resources uses chlorine dioxide as the primary disinfectant in an acid-oxidative process similar to the PFRP equivalent process Synox, just substituting chlorine dioxide for ozone.

Examples of equivalencies recently recommended by the PEC include:

- **Conditional National PFRP Equivalency for ONDEO Degremont's Two-Phase Thermo-Meso Fed Sequencing Anaerobic Digestion Process.** A thermophilic digester in which acidogenic bacteria predominate is combined with a mesophilic digester in which methanogenic bacteria predominate. The system is fed intermittently (once every 6 hours) and the temperature in the thermophilic reactor must remain between 49 - 55°C including a minimum of 3 hours at or above 55°C, and the temperature in the mesophilic reactor must be at least 37°C. The overall sludge residence time in each reactor is 2.1 and 10.5 days, respectively.
- **Conditional Site-Specific PFRP Equivalency of the South Columbia, Georgia Water Resource Facility's (SCWRF's) Biosolids Flow-Through Thermophilic Treatment (CBFTTM) Process.** The CBFTTM Process is a four stage, entirely anaerobic process. It consists of a pre-heat tank to increase the temperature of the sludge to 53°C, a continuously fed, mixed digester (CFMD) operated at a minimum temperature of 53°C and a minimum residence time of 6.0 d, a plug-flow reactor that provides a contact time of at least 30 minutes at a minimum temperature of 60°C, and finally a mesophilic digester. Conditionally was placed on characteristics of sludge, such as solids concentration and ammonia-nitrogen content, for which the efficiency of the CBFTTM process can be reasonably assured. Recommendation of equivalency for this process is significant because it is the first process to use a CFMD.
- **Site Specific PFRP Equivalency of the BIOSET Process at Kingwood, Texas.** In this process, lime and sulfanilic acid are added to dewatered sludge with a solids content between 6 and 35% solids. The mixture then moves through a plug flow reactor with a minimum residence time of 25 minutes and a temperature of 55°C. In the reactor, the sludge is subjected to internal pressures of approximately 30 psi and high ammonia concentrations produced by the lime addition. Thus, disinfection in the process results from both contact with ammonia and elevated temperatures and pressures. Following BIOSET's success at Kingwood, four pilot installations have been installed, one in Louisiana and three in Florida, and an application for national equivalency is under review.



Research Conclusions & Future Directions

- The PEC has evaluated numerous sludge disinfection technologies/processes and recommended 13 for equivalency.
- New ideas for innovative and alternative processes are brought to the PEC's attention at a steady pace.
- The PEC routinely provides technical assistance and advice to utilities, and local, state, and federal regulators on interpreting the disinfection and vector attraction requirements of 40CFR503.
- The PEC website will facilitate applications for equivalency and provide general information regarding disinfection and vector attraction reduction.
- Based on their September, 2005 Retreat, the PEC is updating its evaluation procedure to consider multiple stressors: physical, chemical, and biological; and to look at alternative bacteria, virus, and parasite indicators for disinfection effectiveness.
- Specific products produced:
 - Smith, J.E. Jr., P. Millner, W. Jakubowski, N. Goldstein and R. Rynk, Eds. 2005. *Contemporary Perspectives On Infectious Disease Agents in Sewage Sludge and Manure*. ISBN 0932424-28-7. Compost Science and Utilization / The JG Press, Inc. Emmaus, Pennsylvania
 - USEPA, 2003. *Environmental Regulations and Technology: Control of Pathogens and Vector Attraction in Sewage Sludge*, EPA/625/R-92/013-2003 edition (were several editions, 1989, 1992, 1999, 2003), National Risk Management Research Laboratory, Cincinnati, Ohio. This is a primary reference for regional, state, and local regulatory authorities and their constituents.

Interactions with Customers

The principal customers of the PEC include:

- OW,
- Regional biosolids coordinators,
- State biosolids coordinators,
- Local regulatory authorities,
- Regulated community, and
- Concerned citizens.

They are all formally involved with the PEC's equivalency recommendation process. Both the regulatory authority and OW (in particular the Office of Science and Technology), act as a checks and balance system by reviewing and concerning in the committee's equivalency recommendation before the equivalency is considered legally-binding. OW also uses the PEC's findings, not only from their equivalency reviews but from their workshops as well, in updating biosolids guidance and regulations. The applicants play the largest role by performing the actual sampling and analysis in support of their process with the PEC's guidance. Besides the equivalency reviews, the PEC disseminates information through the publication of guidance manuals and workshop proceedings.

How Research Contributes to Outcomes

The principal users of the PEC's work include:

- OW,
- Regional biosolids coordinators,
- State biosolids coordinators,
- Local regulatory authorities,
- Regulated community, and
- Concerned citizens.

The PEC's work benefits the users in the following ways:

- Minimal risk to the public's health is assured by knowing that technologies being utilized were successfully demonstrated.
- Utilities have more alternatives to disinfect sludges at a range of costs.
- The information regarding public health is made readily available (proof is in the pudding) at all levels of government and to utilities and the public.
- A body of experts is on hand to answer questions on emerging pathogens, analytical methodologies, disinfection technologies, and health concerns.