Report on leachate treatment session at the 2nd ICLRS in Asheville

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After a short introduction highlighting the large variety in leachate concentrations and the wide span of possible periods of time for leachate treatment, the presentations four focused on different aspects of leachate treatment. In the following, the title and presenter of the four contributions are listed as well as some of the questions/answers that were object of the short discussions after each presentation.

- Long term nitrogen management in bioreactor landfills (Morton Barlaz)
  - ✓ nitrogen mass balance; resorption of ammonium-N (not much produced by DNRA); no ex-situ treatment applied
- Constructed wetlands treatment system for landfill leachate in cold climates (Drew Bender)
  - ✓ Accumulation of salts in the prairie (not observed due to lots of rain); lining of the wetlands with a gravel and soil based hydrophobic system (high metal removal)
- Microbial populations in biological leachate treatment at low temperatures (Markku Pelkonen)
  - ✓ No questions
- Leachate treatment by direct capillary nanofiltration (Anton van der Boom)
  - ✓ Costs; regeneration of the filters (constantly); biofilm on the filters (yes, removal with peroxide or acid detergents as usual); energy consumption less than for conventional methods due to less pressure (6-3 kWh/m^3, see abstract); problems regarding chemical precipitates ($CaCO_3$, bacteria, humic acids)

The ensuing overall discussion focused on the following questions:

- ❖ Treatment goals for leachate treatment?
- ❖ Treatment – regulatory or risk based?
- ❖ Factors important for design and operation of leachate treatment facilities?
- ❖ Useful techniques with regard to low concentrations of leachate constituents?
- ❖ Robustness of leachate treatment techniques?
- ❖ What is a stable landfill?
- ❖ Accumulation of salts and heavy metals in wetlands or by land irrigation?
- ❖ Can distribution be an alternative?

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The conclusions can be summarized as follows:

1. Try to avoid problems with the leachate by going back to the waste itself – separation, waste treatment, etc.
2. Leachate treatment should be:
   - site specific
   - economical
   - reliable.
3. Treatment goals → different approaches during the active and the passive phase of the landfill: first, the design is primarily dictated by regulation and costs and there are higher demands on the leachate quality; later/in the long term, durable and robust methods will be most advisable.
   → Treatment goals should be site specific.
4. Time for leachate treatment is a function of the leachate quality and the receiving body.
5. Leachate quantity often appears to be a bigger problem than quality
   → Control the leachate quantity; a volume of not more than about 2 m^3 (500 gallons) per day was mentioned as a reasonable amount.
6. Even though leachate treatment in practice most often is regulatory based we should try to contribute to get regulations that are based on risk assessment.
7. A stable landfill means:
   - no threat of polluting the environment
   - no more concentration gradient between the landfill and its environment
   - in practice: stable according to legislation (counter question: when will we get a stable landfill legislation?)
8. Robustness was defined as that attendance would not be necessary more often than once a month (or, more jocular, as reliable in a way that the EPA will not come after you).

R & D needs:

- **?** Site specific treatment goals and treatment technology
- **?** Long-term fate of heavy metals, salts, recalcitrant organic compounds
- **?** Treatment technologies adapted to low concentrations in the leachate
- **?** Supplement and type of C-sources for long-term nitrogen reduction
- **?** Sustainable and robust systems

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