ISO 9509 Nitrification Inhibition Study

Presenters

Geoff Hinshelwood
Universal Laboratories
geoff@universallaboratories.net

Duane Wilding

Maryland Environmental Service

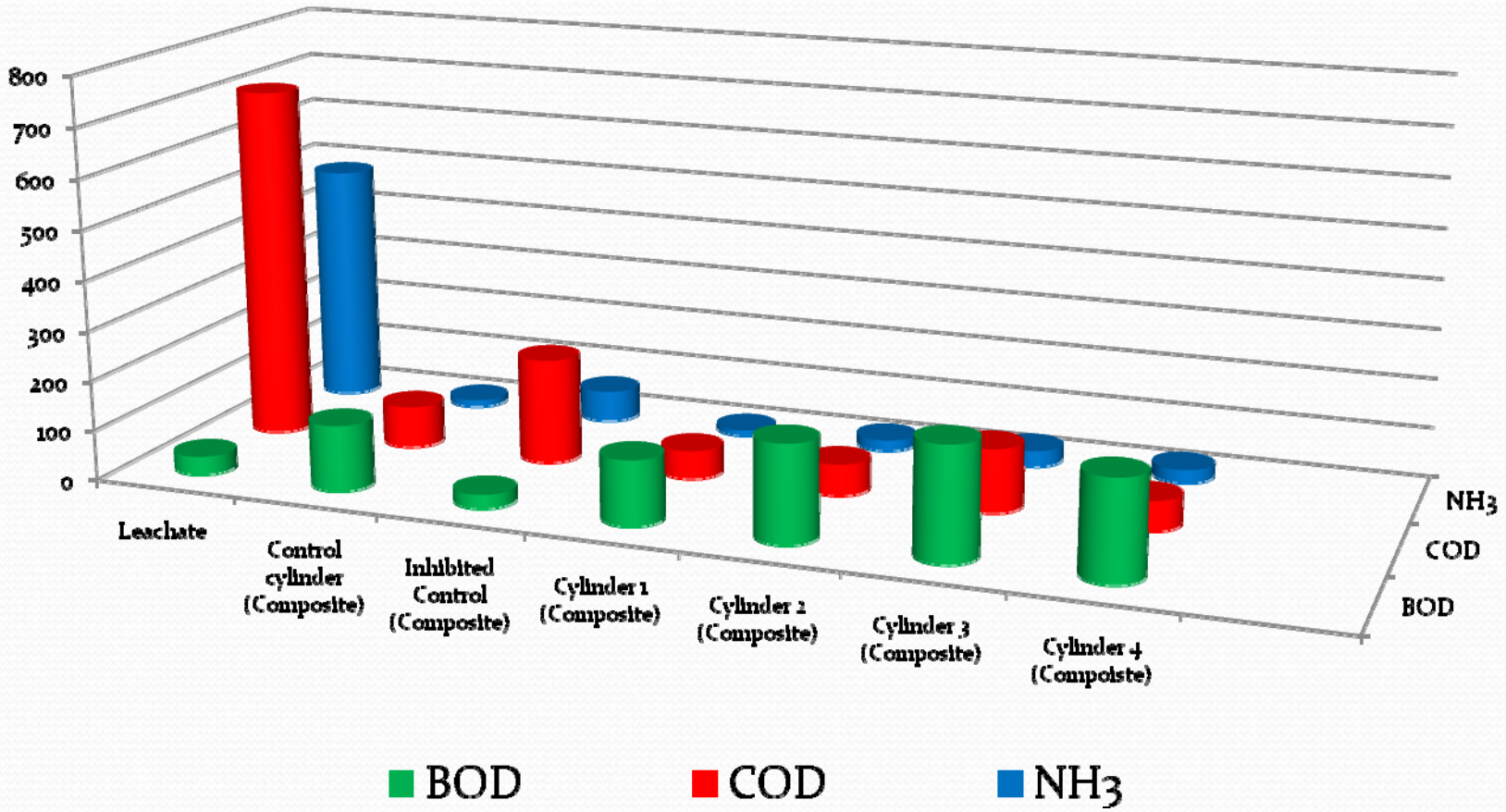
Background

Midshore Regional Landfill discharged leachate to Easton wastewater lagoon system

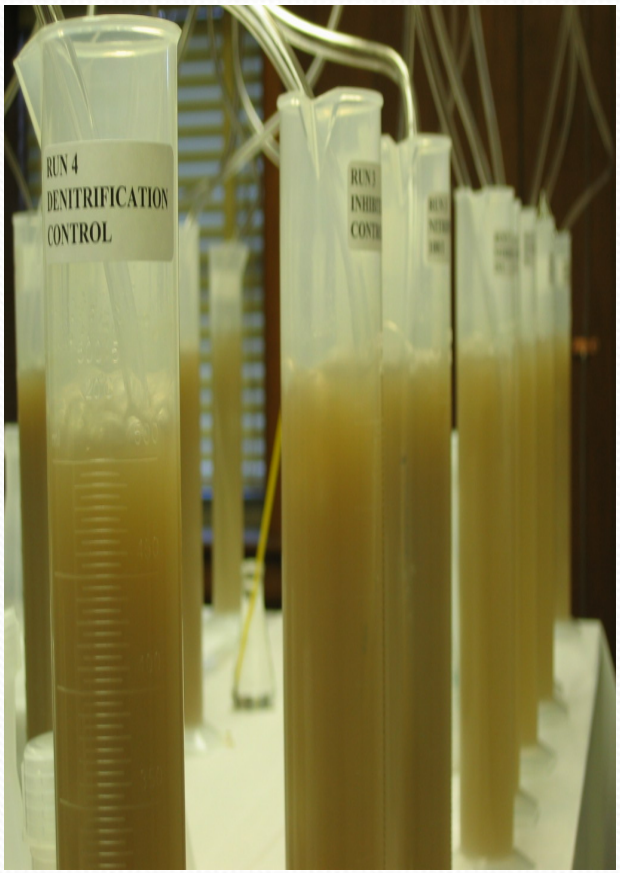
Easton's new ENR WWTP – concerns with treating leachate due to potential toxicity or inhibition with sensitive nitrification processes

MES requested to demonstrate "no toxicity or inhibition" of leachate

Composite Data



Principal Concerns



- High NH3 in Leachate representing 5 - 15 % of Influent
- Heavy metals, e.g., zinc – High spikes with generally low values
- Sufficient storage during wet weather flow

Nitrification/ DeNitrification

$NH_4^+ + 1.5\ O_2 \rightarrow NO_2^- + H_2O + 2\ H^+$

NH_4^+ - oxidizing bacteria oxidize NH_4^+ to NO_2^-

$NO_2^- + 0.5\ O_2 \rightarrow NO_3^-$

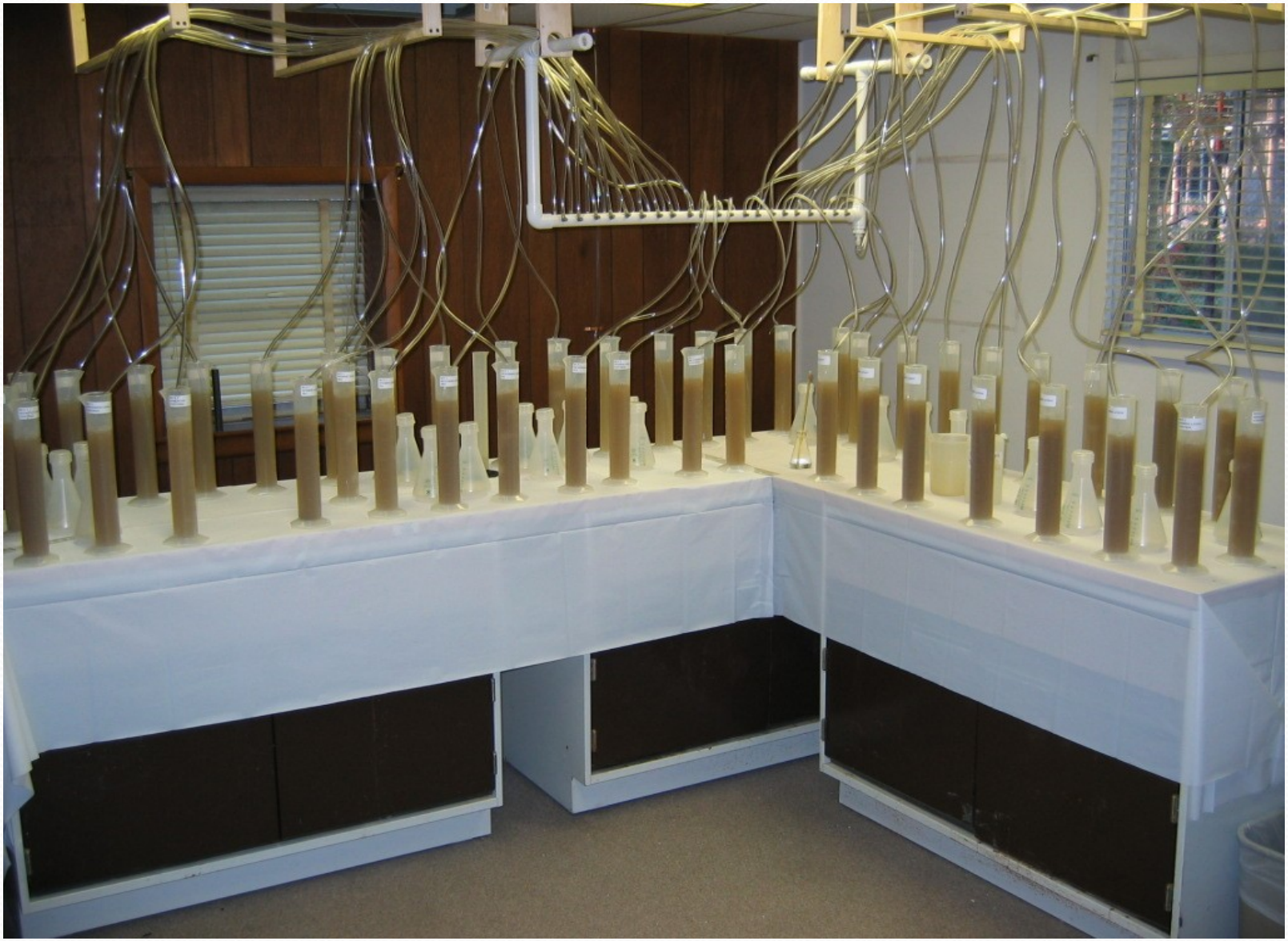
NO_3^- -oxidizing bacteria oxidize NO_2^- to NO_3^-

ISO 9509

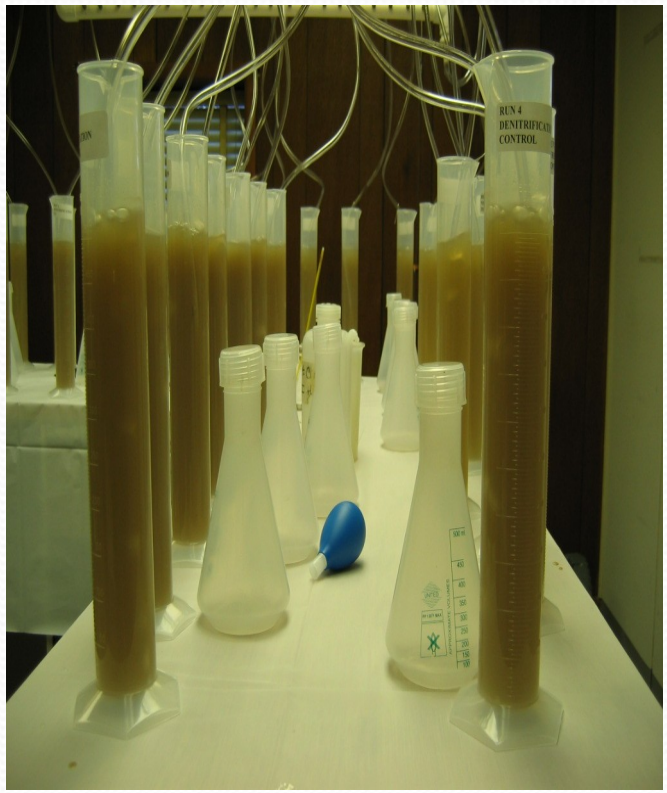
- ISO 9509 second edition 2006-07-01

- Toxicity test for assessing the inhibition of nitrification of activated sludge microorganisms

- ISO Method expanded to include testing for “denitrification”



Lessons Learned



Easton Wet Bench

Easton aeration set-up

Test Results

Total of 30 test vessels for nitrification

Total of 20 test vessels for denitrification

No inhibition was observed

Summary Data Table 3

Summary Nitrate Table (mg/L of NO3)					
	run 1	run 2	run 3	run 4	run 5
Control	48.88	32.02	27.80	49.05	43.85
Inhibited Control	4.30	2.28	3.32	2.28	5.62
cylinder 4	39.55	58.20	25.45	36.15	49.20
cylinder 3	48.40	34.70	37.65	28.60	10.70
cylinder 2	37.60	49.10	35.52	32.60	48.50
cylinder 1	95.80	54.00	15.60	14.60	20.60

ANOVA Data Table 4

Groups	*Count*	*Sum*	*Average*	*Variance*
Control	**5**	**201.6**	**40.32**	**96.89**
Cylinder 4	**5**	**208.55**	**41.71**	**156.99**
Cylinder 3	**5**	**160.05**	**32.01**	**193.35**
Cylinder 2	**5**	**203.32**	**40.664**	**58.36**
Cylinder 1	**5**	**200.6**	**40.12**	**1231.6**

Lessons Learned

1. This type of testing is needed due to new ENR processes being used
2. Only nitrification testing can determine inhibition to ENR processes.
3. Need to have “fresh” mixed liquor
4. Recommend regular “nitrification rate” testing to regularly monitor process performance.

Outcome of Testing

- Results presented to MDE and Easton Utilities on Jan. 16, 2007
- EU to allow discharge of untreated leachate for a trial period of 3 months
- Presently discharging with no impact
- 20 gal/min from 6 am to 12 midnight and 10 gal/min from midnight to 6 am

Conclusions / Summary

- Testing allowed receiving approval to discharge untreated leachate for a trial period
- Will save several millions dollars
- MES will pay Easton Utilities a surcharge for treating the high strength wastes.

Acknowledgements:

- Easton Utilities Staff
- Maryland Department of the Environment
- Stearns & Wheler Staff
- Landfill staff
- Universal Laboratories Staff