NOWRA CONFERENCE 2024

Identifying and Dealing with Biomats

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Disclaimer

The materials being presented here are the opinion of the presenter and do not reflect the opinions of NOWRA.

The mention of any specific technology in this presentation is not an endorsement by the presenter.

Identifying and Dealing with Biomats

What is a biomat?

Identifying and Dealing with Biomats

A Biomat is a layer of microorganisms, microbial debris and particles that develops at the soil infiltrative surface

Identifying and Dealing with Biomats

The Biomat slows down water infiltration and is thought to help with treatment, although excessive flow restrictions can be detrimental to the hydraulic function.

Identifying and Dealing with Biomats

What is the difference between a biomat and a bioflim?

Identifying and Dealing with Biomats

All systems develop a Biomat.

Are they good or bad for sewage treatment?

Are Biomats good or bad?

That depends on if the biomat is …..

Anaerobic

or

Aerobic

Identifying and Dealing with Biomats

How are they formed?

How Do They Form?

Lack of drying of the infiltrative surface between doses

Wastewater Quality

Wastewater Amount

Lack of System Maintenance

Lack of Oxygen diffusion to the infiltrative surface

Installation soil compaction

Biomat

What is Causing the Ponding?

Identifying and Dealing with Biomats

Research on Biomats

University of Wisconsin

Colorado School of Mines

University of Rhode Island

University of Wisconsin

Research done in the 1974

Published in JEQ

Johanna Bouma; PhD

Soil Scientist

Father of the Sand Mound

Column Studies on Biomat formation and permeability

University of Wisconsin Study

The Column Study

Columns packed with a native bioactive sandy loam soil and dosed with sewage effluent

A set of replicate columns dosed with secondary effluent of 30/30 quality

A set of replicate columns dosed with primary septic tank effluent

A set of replicate columns dosed with distilled water

University of Wisconsin Study

Results

All columns developed a biomat and ponded water

The septic tank effluent developed the fastest

The distilled water developed the slowest

The thickness of the biomat was the greatest with secondary effluent

University of Wisconsin Study

Conclusions

Biomat formation is the result of application rates and the lack of drying between doses

Wastewater quality affected the thickness of the biomat

University of Wisconsin Study

Conclusions

The hydraulic conductivity of the biomats varied. The slowest was the secondary effluent and the fasted was the distilled water. The average permeability of a septic tank biomat was .4 gal/sq. or 2.5 sq. ft./gal

The use of secondary treated effluent took longer to form the biomat than septic tank effluent but when developed was thicker, more stable and less permeable than the septic tank biomat

University of Rhode Island

Research on the genetics of biomats and their renovation of wastewater

A more robust microbial population with an aerobic biofilm

Research by Jose Amador, PhD

Soil Microbiologist

Published in the Journal of Environmental Quality (JEQ)

University of Rhode Island

The microbial population of an aerobic biomat is more robust than an anaerobic biomat

Using genetic testing they have determined the type of microorganisms that inhabit these biomats

Dealing with Biomats
Case Studies

1. Convert the primary treatment from a septic tank to an aerobic tank

2. Resting of the absorption area

3. Physical removal of the biomat and re-construction of the distribution system using pressure distribution and time dosing.

4. The Geomatrix system-Soil Air

Dealing with Biomats
Case Studies

All should require the de-watering of the absorption area to be successful

Case Study # 1

Use of an Aerobic Treatment Unit

University of Wisconsin Study

Case Study # 2

Resting of the Absorption Area

Dual Absorption Areas with a Diversion Valve

University of Wisconsin Study

Penn State Study

Case Study # 3

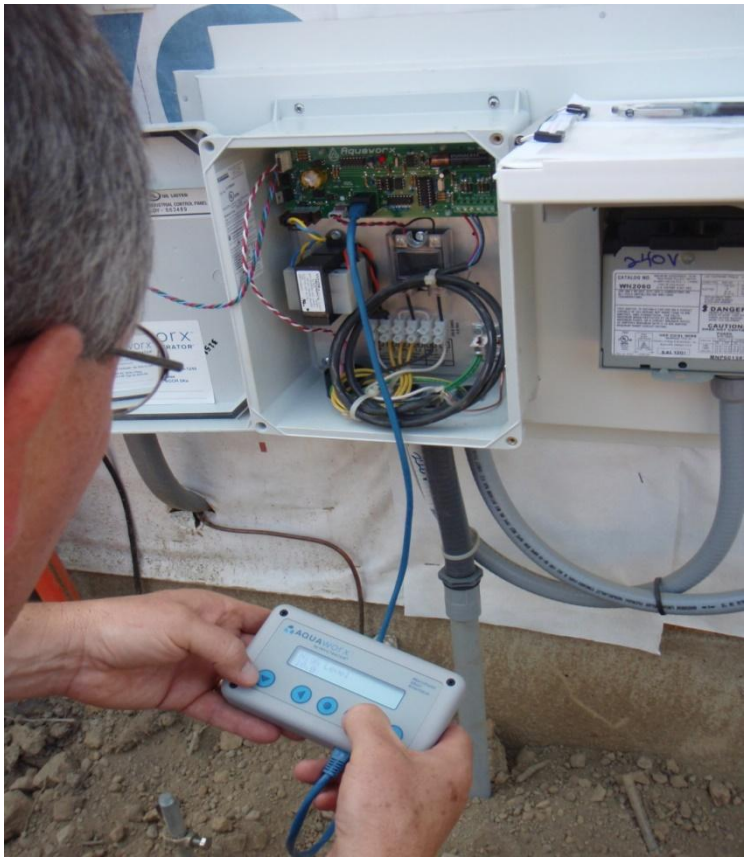
Physical removal of the biomat with dosing modifications

Time Dosing and Pressure Dosing

Conversion of gravity flow to pressure distribution

Time Dosing

Time Dosing



Case Study # 4

The Geomatrix System-Soil Air

Research at URI and DVC

Only an option if a biomat is the predominate cause for the water ponding

Will not resolve inherent soil limitations

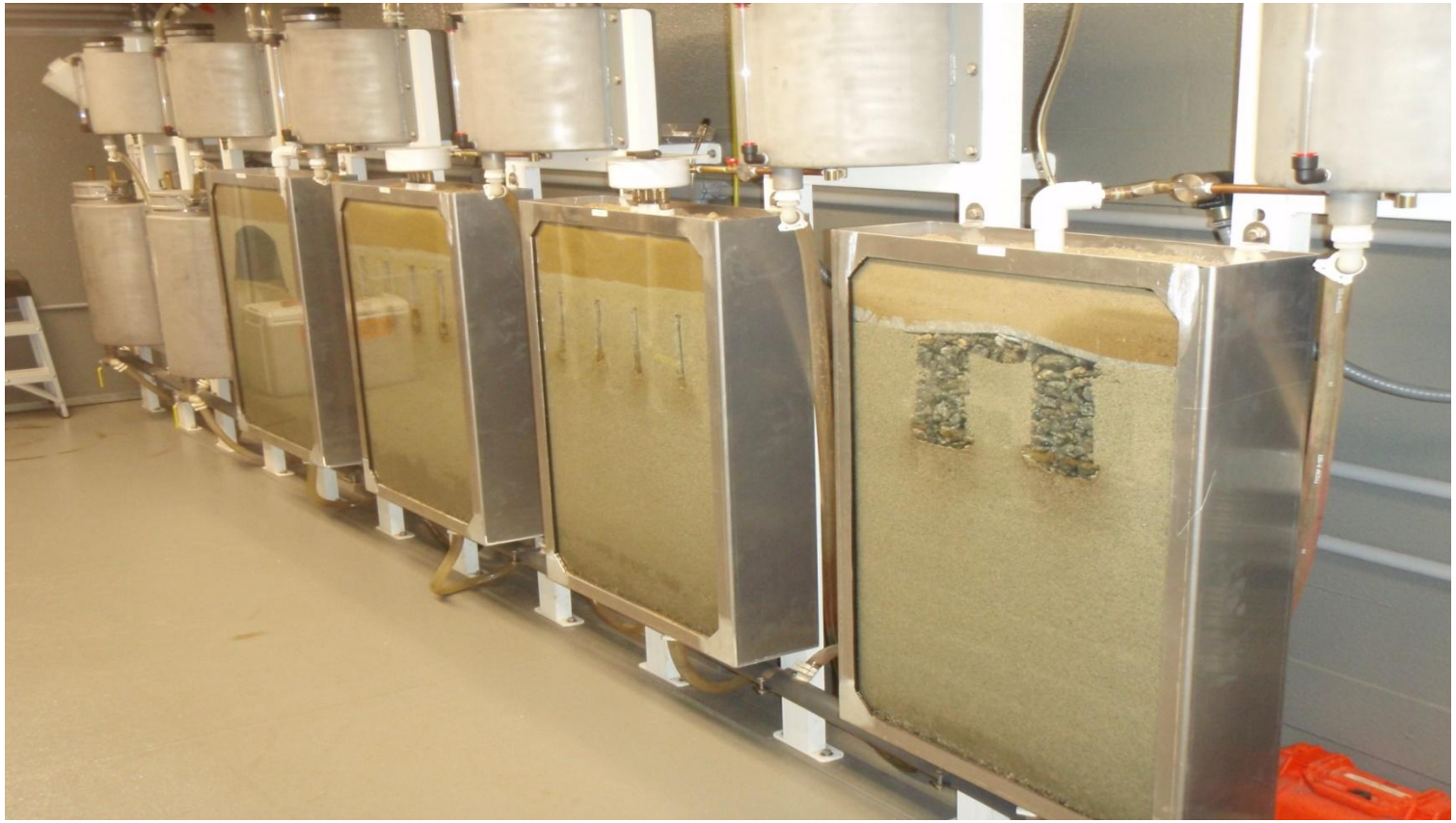
Can be used with new construction to prevent the formation of an anaerobic biomat

What is Soil Air?

A blower that supplies air directly to the infiltrative surface to satisfy the BOD demand of the wastewater

When is Soil Air an option?

Geomatrix Research



Soil Air Blower Cover

Soil Air Residential Blower

Other Treatments ?

POROX

The use of hydrogen peroxide to oxidize the biomat

Un of Wis held the patent but let the patent lapse due to the treatment's affect on soil structure

Acid Treatments

What do you know about this treatment?

What about Additives?

Do they work?

Rid-X

Septic Scrub

What Else Can Cause a Biomat?

What about soil compaction as a contribution to a biomat formation

Soil Fracturing

If soil compaction is the predominate cause for the wastewater ponding, why can we not alleviate this condition by soil fracturing ?

Terralift

Soil Reliever

SUMMARY
What Causes a Biomat

Lack of drying of the infiltrative surface between doses

Wastewater Quality

Wastewater Amount

Lack of System Maintenance

Lack of Oxygen diffusion to the infiltrative surface

Soil compaction-smearing during installation

Placement of the absorption area deeper than the bioactive zone

Acknowledgement

The information presented here today came from many sources including but not limited to:

- *Soil-Based Wastewater* Treatment

  by Amador and Loomis (2018)

- Journal of Environmental Quality peered reviewed publications of Bouma, Amador, and Potts
- Geomatrix, LLC
- PSU and UN of Wisconsin publications

Questions-Discussion

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