ESAA Remediation Technologies Symposium

Glycol-Impacted Water Management - Bioremediation

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R&D Performed by: ***SAIC Canada***

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SAIC Canada

Environmental Technologies - Business Focus

Remediation Technology Development and Demonstration

Treatability Studies

Spill Response Equipment Testing and Standards Development

Bench and Pilot-scale System Fabrication and Technology Scale-up

ISO 9001 Certified

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Deicing Runoff – Glycol Impacted Water

High BOD for municipal waste water treatment plant.

Discharge limit 100 mg/l to surface water (property boundary or natural waterbody within property line).

Irregular flow volume and glycol concentration:

-depend on ambient temperature and

-weather conditions.

Potential for high flow at lower concentrations or low flow at very high concentration.

Solution Development:

A number of options were considered.
Site hydrogeological study was conducted.
Sandy soil on airport property.
Airport operation constraints.
Literature reports rapid biodegradation of glycol.
Underground infiltration bed was chosen.

Objective:

Confirm biodegradation of glycol in the laboratory before full-scale implementation.

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Simple Flask Test

Actual soil at proposed site for infiltration bed was used as biodegradation medium and source of microorganisms.

Spiked glycol at an initial concentration of approx. 50 mg/l.

Both aerobic and anaerobic tests.

No nutrients added

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After 28 days:

	Initial (For all flasks)	Flask A (aerobic)	Flask B (aerobic)	Flack C (anaerobic)	Flask D (anaerobic)
Glycol Concentration	52 mg/L	53 mg/L	53 mg/L	53 mg/L	22 mg/L

Soil at selected site not likely to support sustained biological degradation of glycol if glycol impacted water is released into the infiltration bed as is.

Bioreactor Test

Using Indigenous Microbes from Airport Storm water sump.

Exposure to glycol during deicing season.
Layer of sediment – possible anaerobic culture.

Sediment sample + Nutrients (Mineral salts)
→ Microbes capable of glycol degradation ?

Custom-made bioreactor –
aerobic and anaerobic operation,
process parameter control,
large reactor volume.

Bioreactor Test results:

Reactor is anaerobic after 5 days.

Glycol concentration dropped below detection limit between 7 to 14 days.

Visible active bacteria culture growth.

Shows lag phase before glycol degrading anaerobic microbes become active.

Strengthening indigenous bacteria culture for field application.

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Pilot-scale Test

Mimic field groundwater flow and conditions.

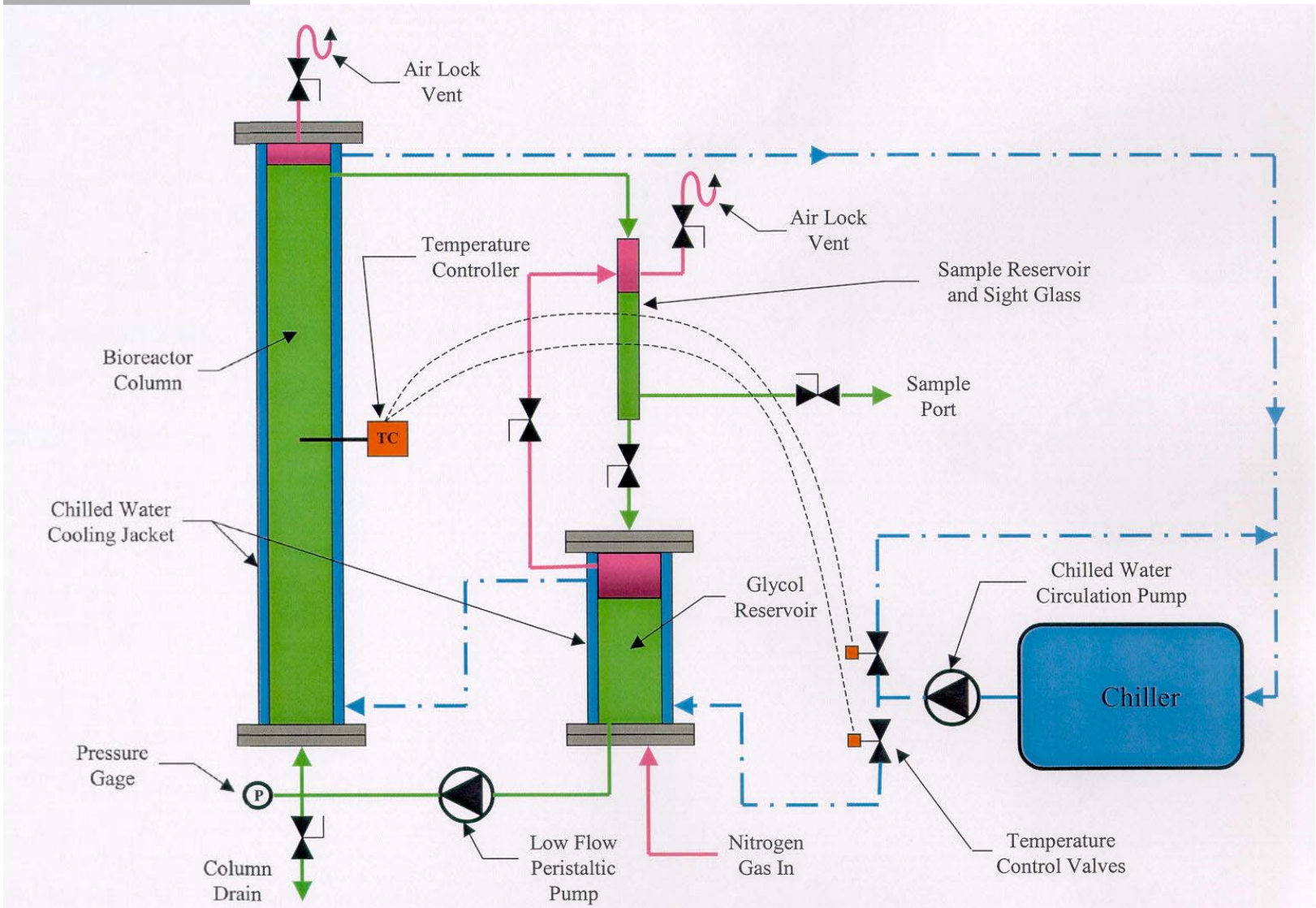
Flow velocity: 15 mm / minute.

Temperature: between 8 and 12 C.

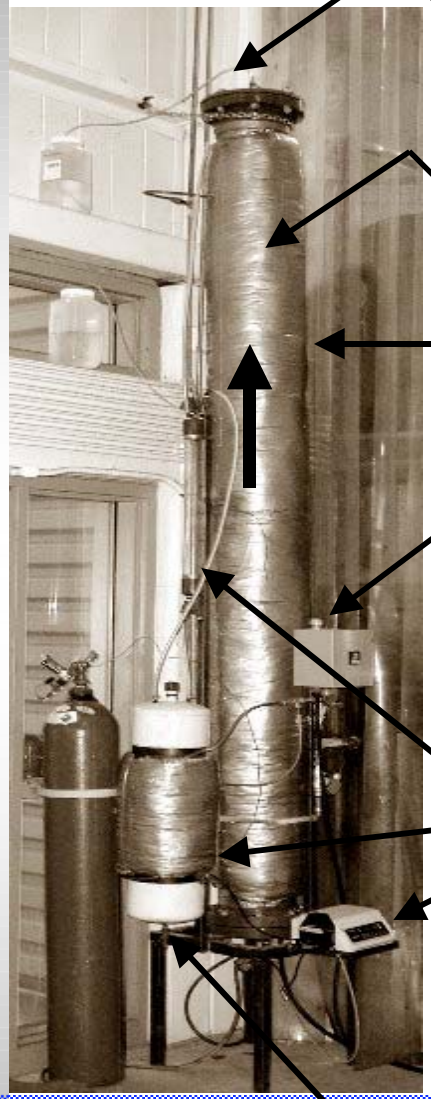
Air tight system with special sampling reservoir.

Nitrogen purge.

Actual sand from proposed infiltration bed site.



Pilot-scale Column Test System



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Pilot-scale Column Test Results:

4 weeks system conditioning.

Injection of nutrients and strengthened microbes.

Between 10-21 days, glycol concentration dropped to below detection limit.

Conclusion:

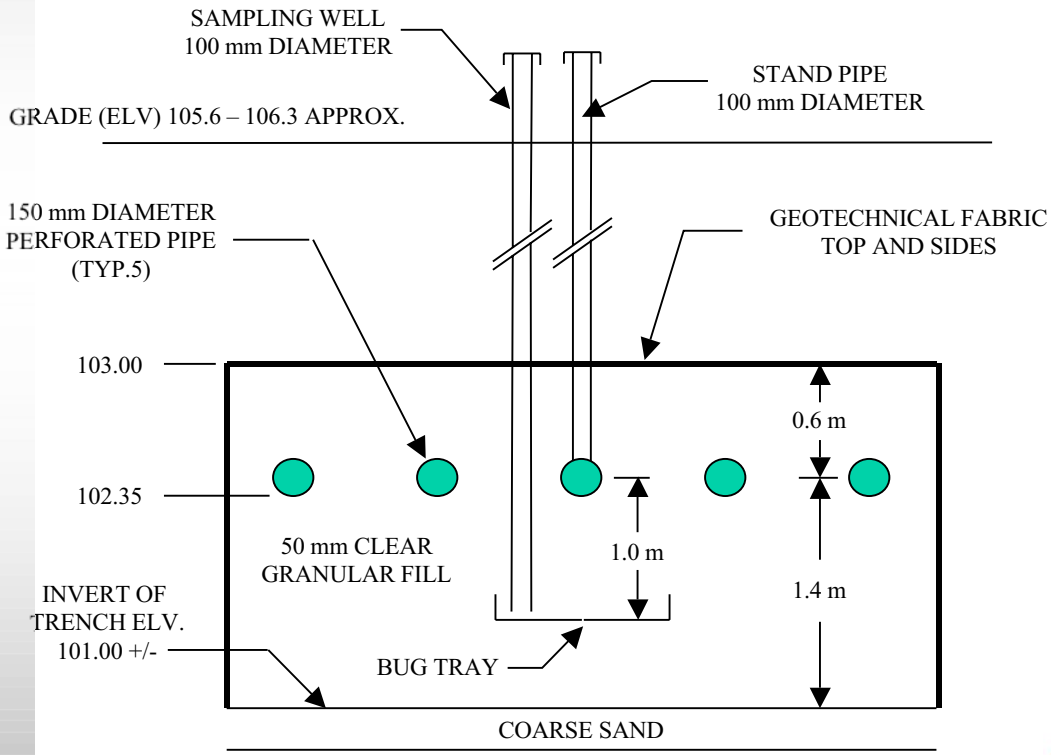
Able to biodegrade glycol in an anaerobic environment using indigenous microbes.

Soil at selected site not likely to sustain biological degradation of glycol if glycol is released into the infiltration bed.

Infiltration bed system should include nutrient and bacteria injection.

Field Implementation:

Implementation scheduled for November 2003.



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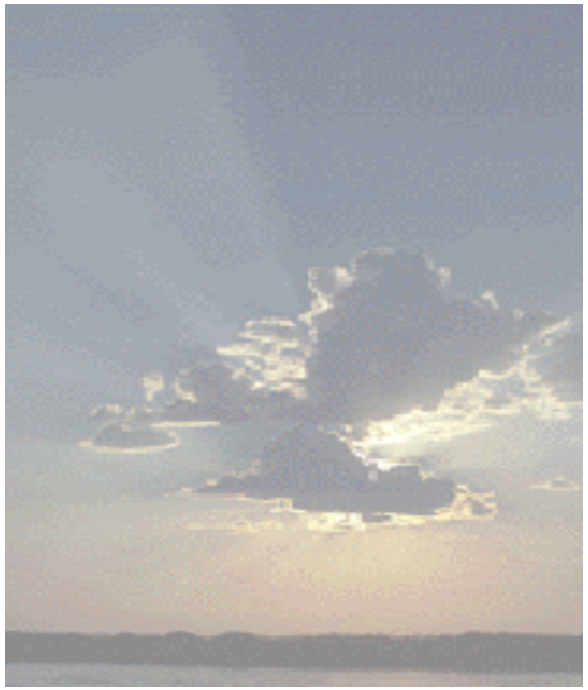

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