

Washing versus Wiping: Lessons from Field Testing an Onsite Blackwater Treatment System in India and South Africa

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MOTIVATION & SUMMARY

- Onsite sanitation facilities serve over 3 billion people worldwide.
- Treating blackwater onsite eliminates costly transport infrastructure and services.
- Field testing demonstrated the onsite treatment systems utility, functionality and maintenance requirements.
- Electrochemical disinfection reliably treated liquid effluent, bringing *E.coli* and Total coliform below detectable limits.
- ISO Category B standards were met for COD, TSS and pH.
- System design iterations were required and are currently being tested in India to improve solid-liquid separation, nutrient removal and to improve overall treatment efficiency.

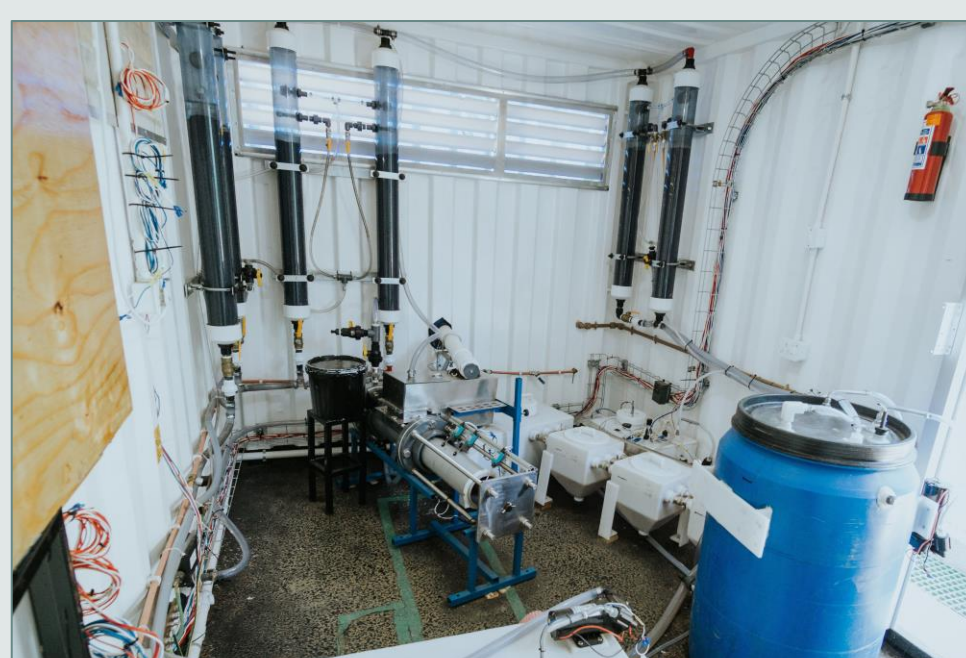
TEST SITES

India



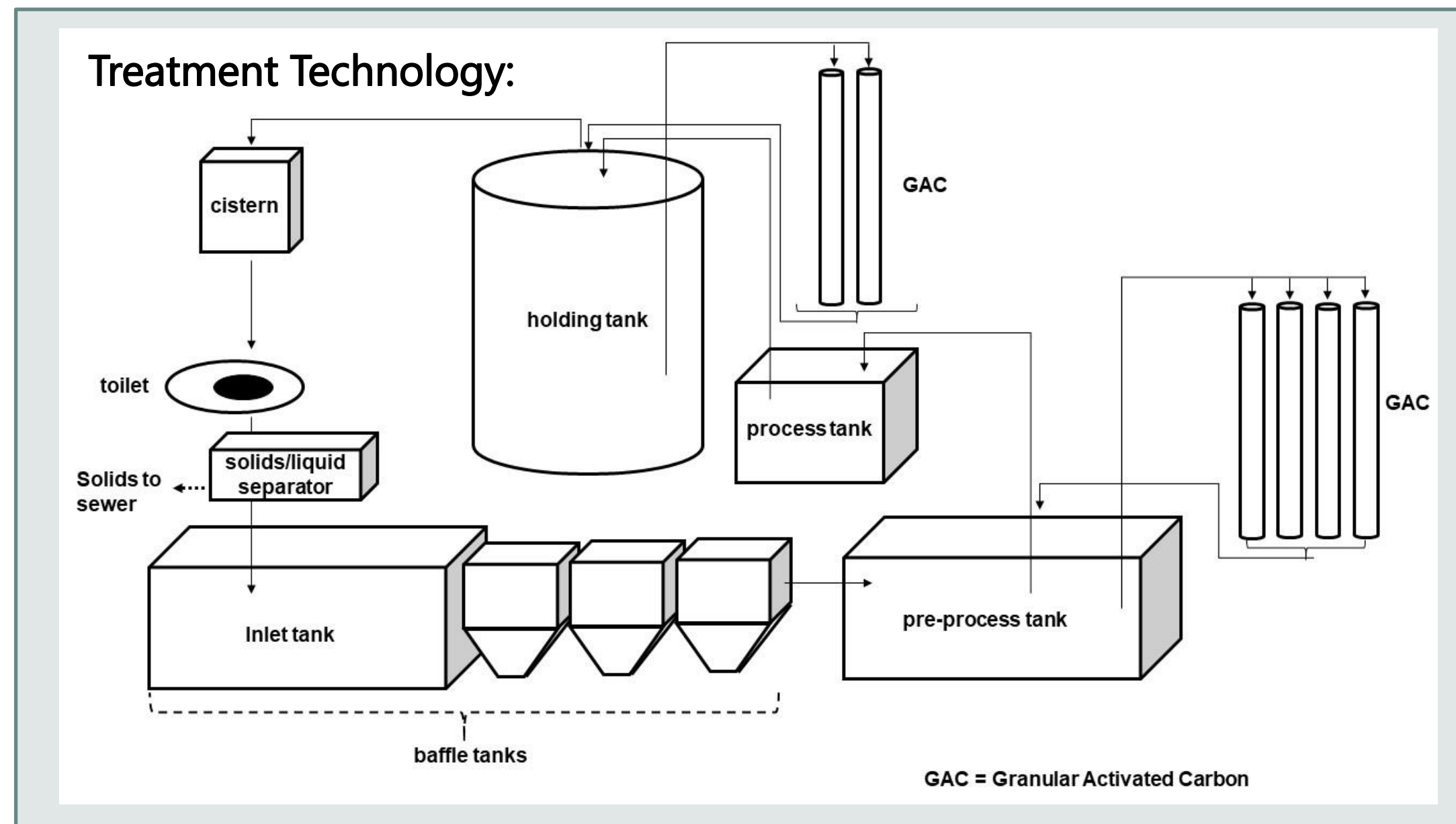
- Location:** Women's toilet block at a Textile Mill
- Users:** 70 women
 - 20 full-time residents
 - 50 daytime employees
- Technology Location:** directly beneath the toilets
- Testing Duration:** 10 months

South Africa



- Location:** Women's Community Ablution Block (CAB) in an informal settlement
- Users:** Women from 60 households
- Technology Location:** adjacent to the CAB
- Testing Duration:** 9 months

EXPERIMENTAL APPROACH



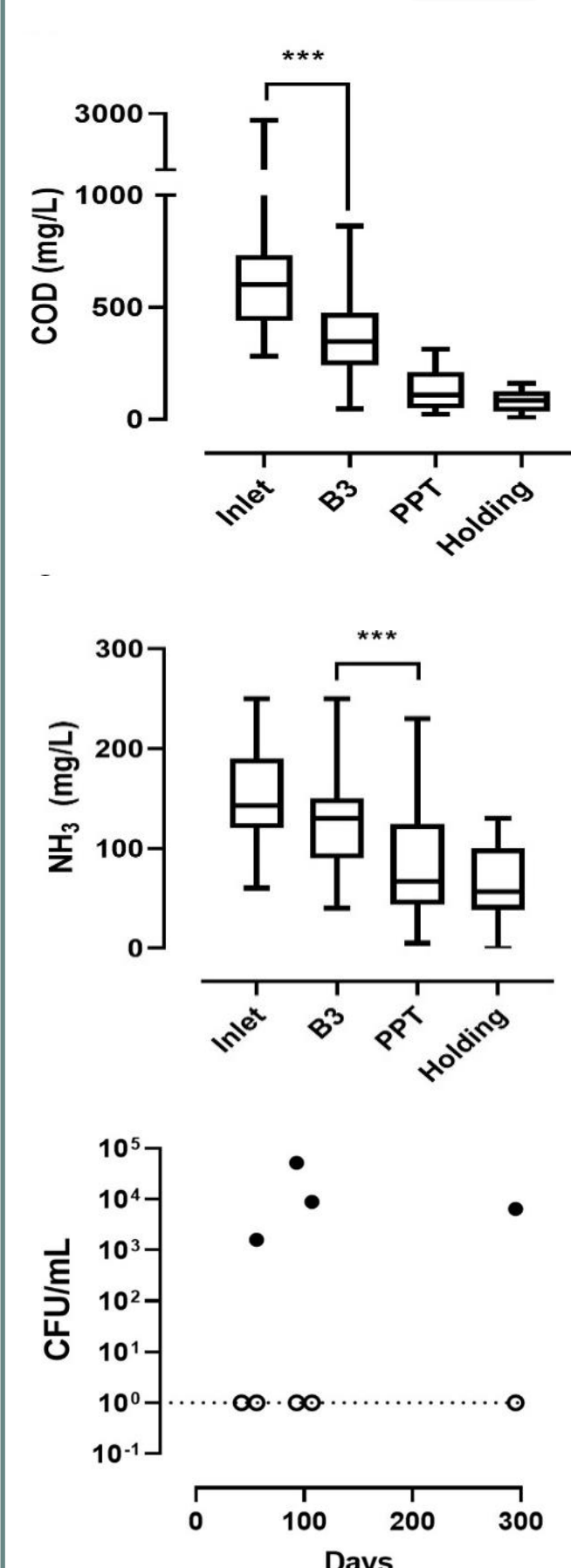
Liquid Sampling:

Sample Analysis	Sampling Frequency	Sampling Parameters
Onsite	Daily	Color, turbidity, ORP, pH, conductivity, ammonia
Onsite	Weekly	Nitrate and nitrite
Onsite	During electrochemical processing	Free and total chlorine
Offsite	Weekly	Ammonium and COD
Offsite	Monthly	Color, turbidity, ORP, pH, conductivity, nitrate, nitrite, chloride, TN, TP, <i>E.coli</i> , Total coliforms

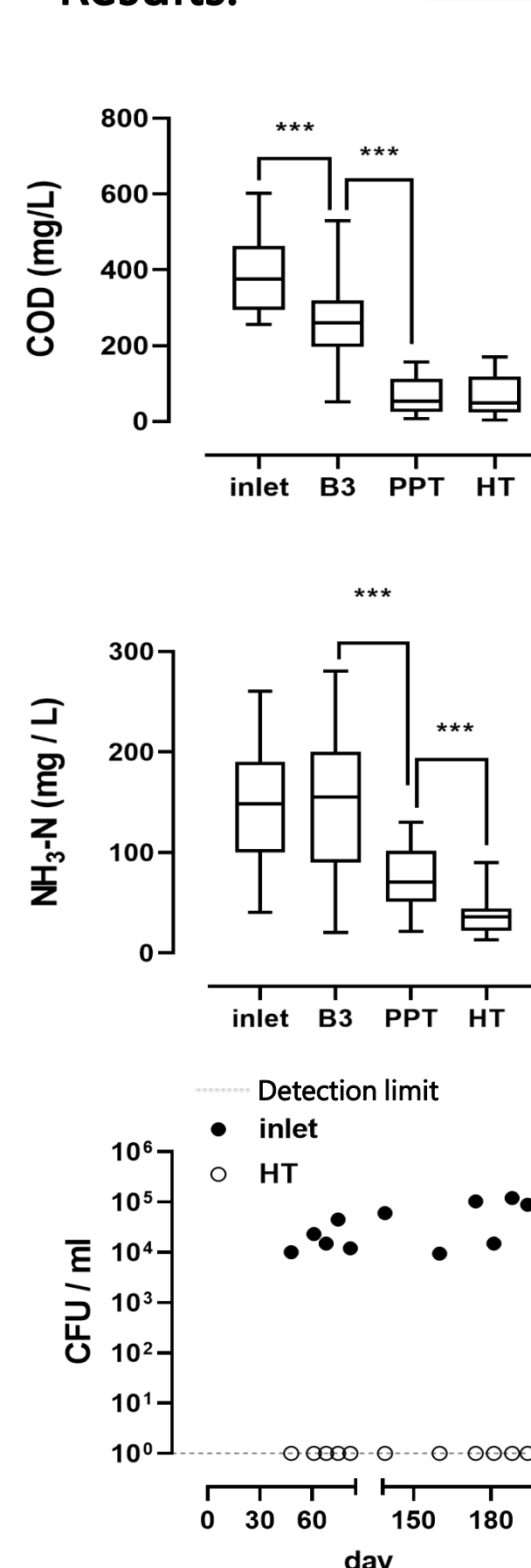
OUTCOMES

	ISO 30500a		INDIA			SOUTH AFRICA		
	Cat. A	Cat. B	Effluent	% Removal (average)	n	Effluent	% Removal (average)	n
TSS (mg/L)	≤10	≤30	11 ± 10	98	5	23 ± 13	65	8
COD (mg/L)	≤50	≤150	81 ± 48	90	33	61 ± 49	85	14
TN (mg/L)	70% removal		50 ± 6	65	5	102 ± 20	45	10
TP (mg/L)	80% removal		8 ± 4	25	5	14 ± 12	20	8
pH	6–9		7.7 ± 0.2	–	98	7.0 ± 0.6	–	80

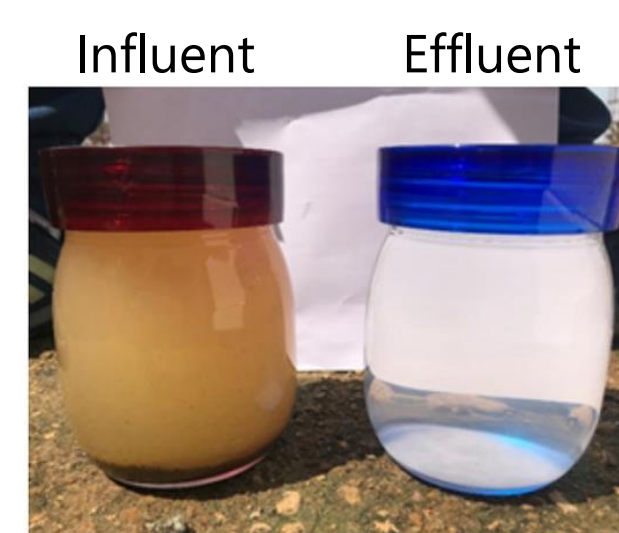
India Results:



South Africa Results:



Observations:



LESSONS LEARNED

When field-testing novel sanitation technology, be sure to:



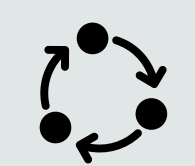
Understand local influent characteristics & user behavior:

This includes technical performance criteria, but also includes factors like trash, cleaning agents, and toilet paper.



Log maintenance activities:

Include details like frequency, duration, number of employees required, skill and costs. This helps determine components which can and should be improved.



Plan for iterative design processes:

Budget and plan for multiple rounds of technology development, to respond to unexpected challenges as they arise throughout field testing.

An updated prototype is being tested in India with a nutrient removal system and anaerobic digester for solids treatment.

REFERENCES

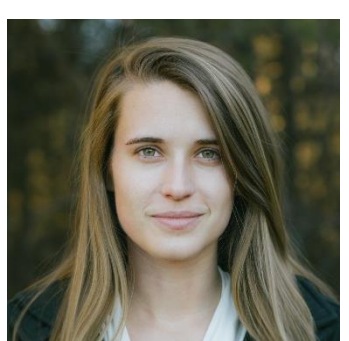
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CONTACTS

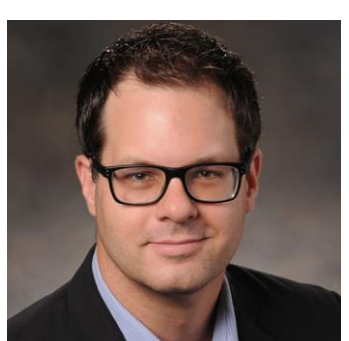
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