



Mobile Treatment Unit for septage emptying and safe disposal in Dindigul, India

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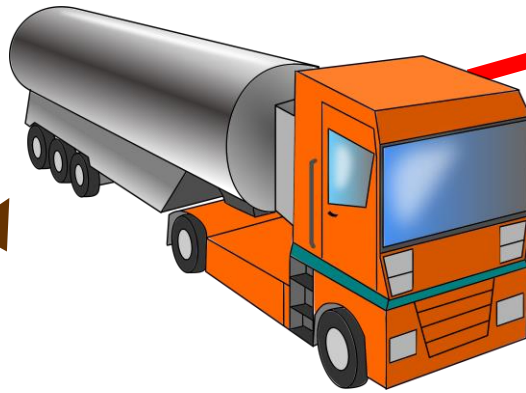
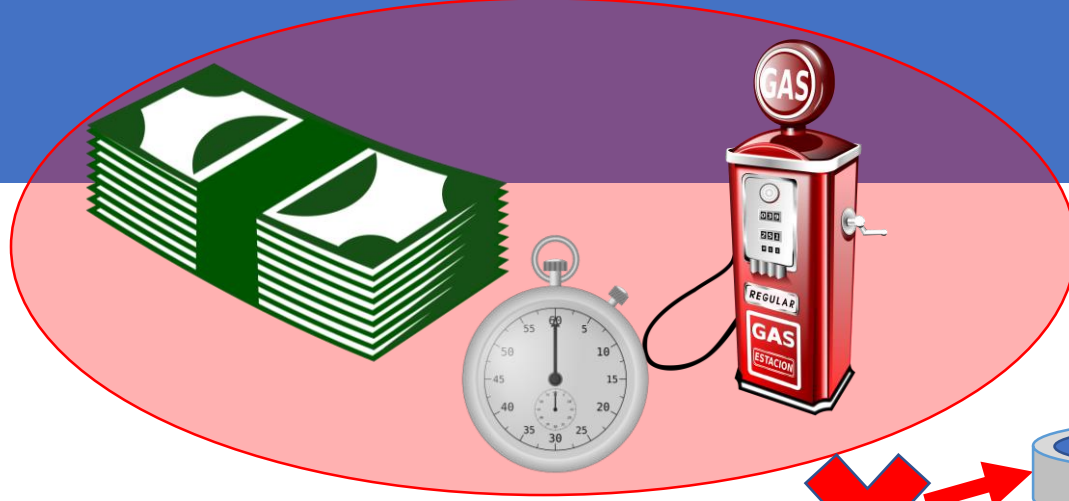
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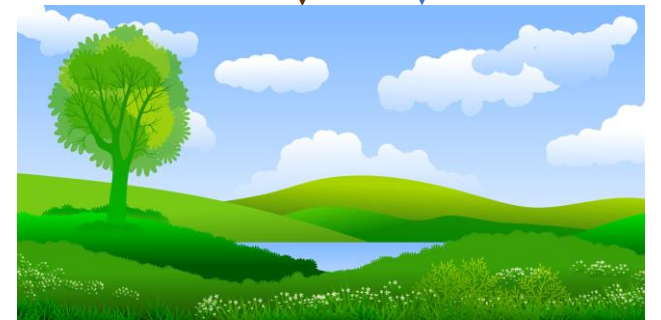
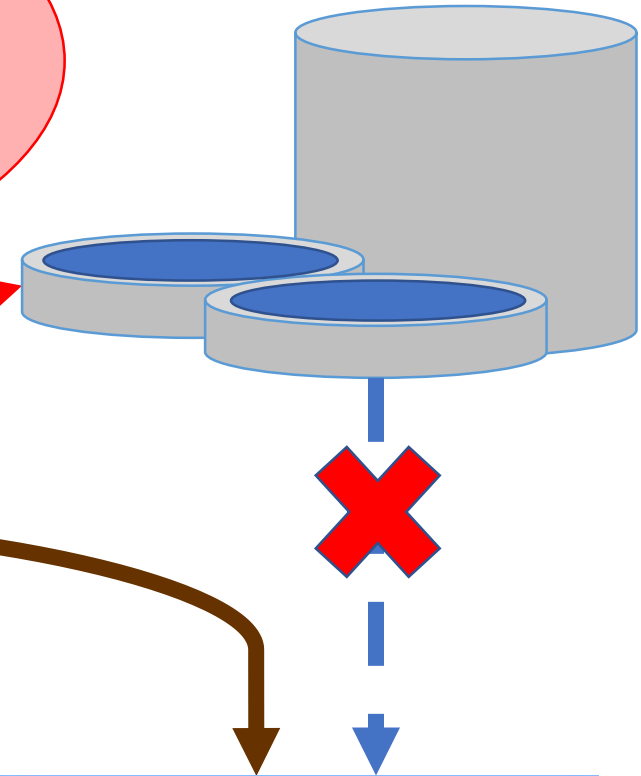
Background



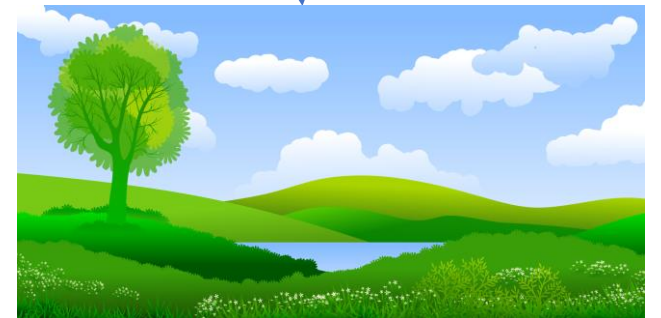
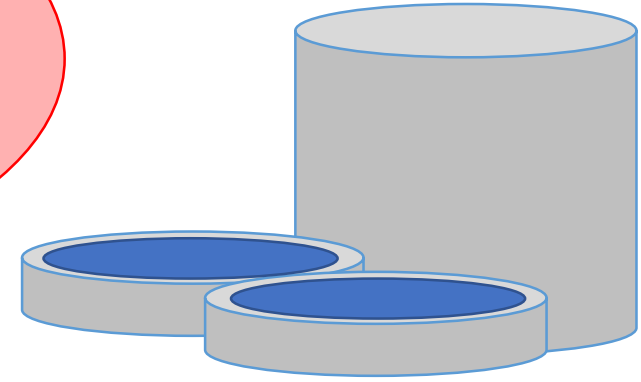
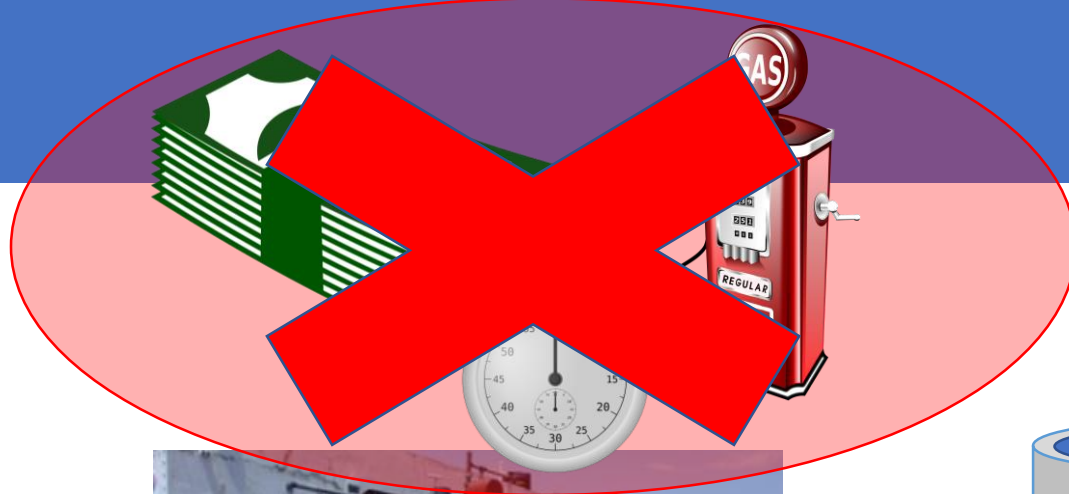
38% of urban households in India
62% of households in cities <1 million



Urban septage treatment
solutions are needed at
decentralized level

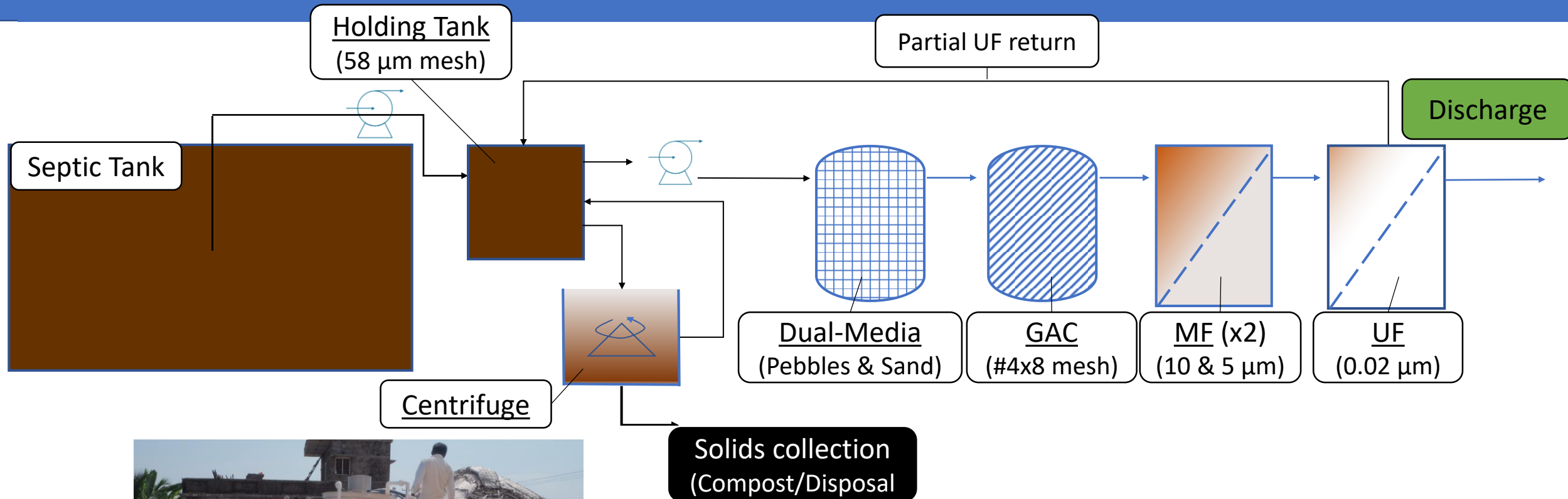


Background



Treat and discharge septage onsite.
Save time, fuel, and money.

Mobile Treatment Unit – Technology overview



MTU uses off-the-shelf separation technologies to produce a clean effluent quickly and cost-effectively

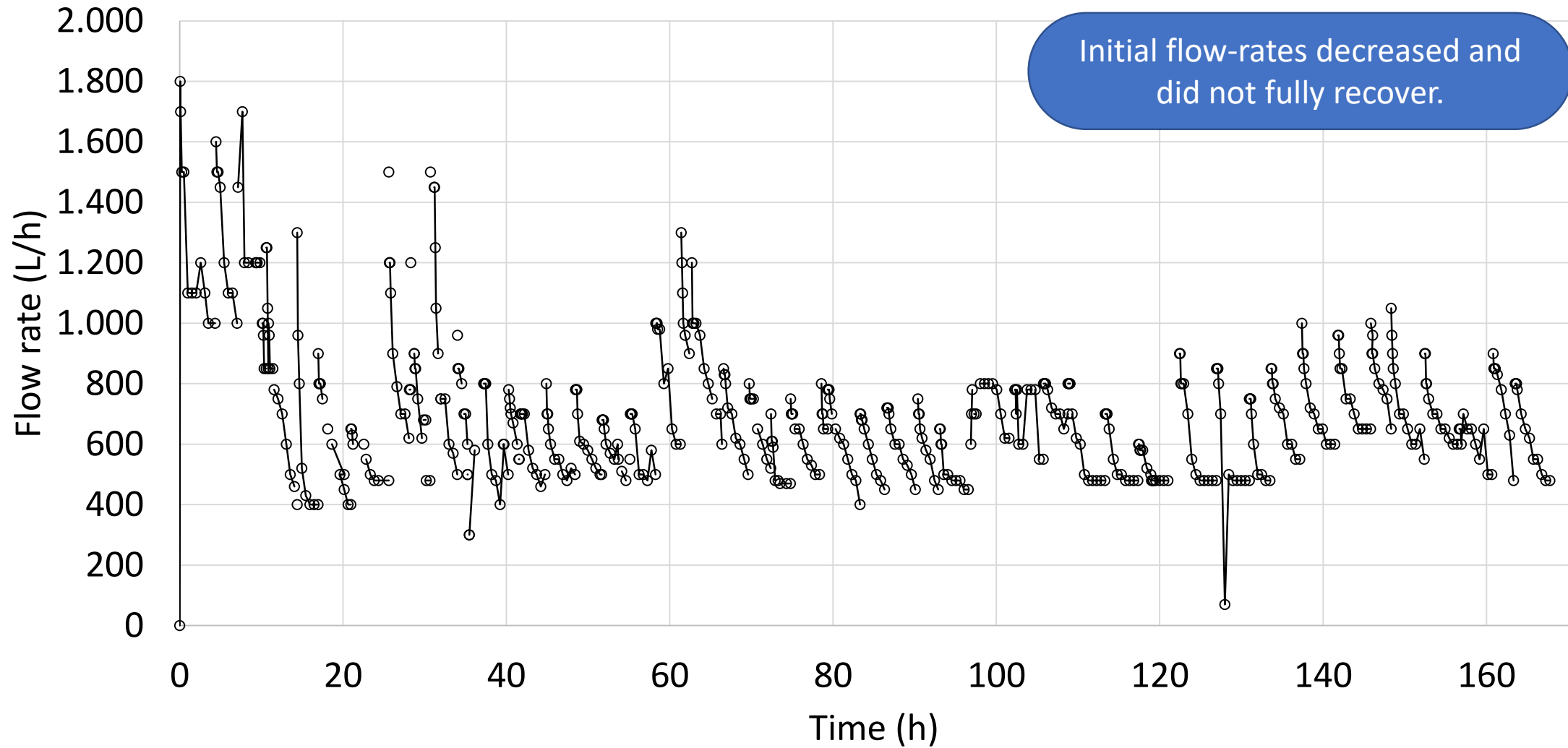
Methods

- Phase I – 1 unit
 - No backwash
 - Operational: Pressure, flow & power every 15 minutes
 - Treatment: First pass & final pass sample each location
- Phase II – 4 units (3 new)
 - Reverse flow backwash every 30 minutes
 - Operational: Pressure, flow & power every 15 minutes
 - Treatment: Final pass septage & UF effluent

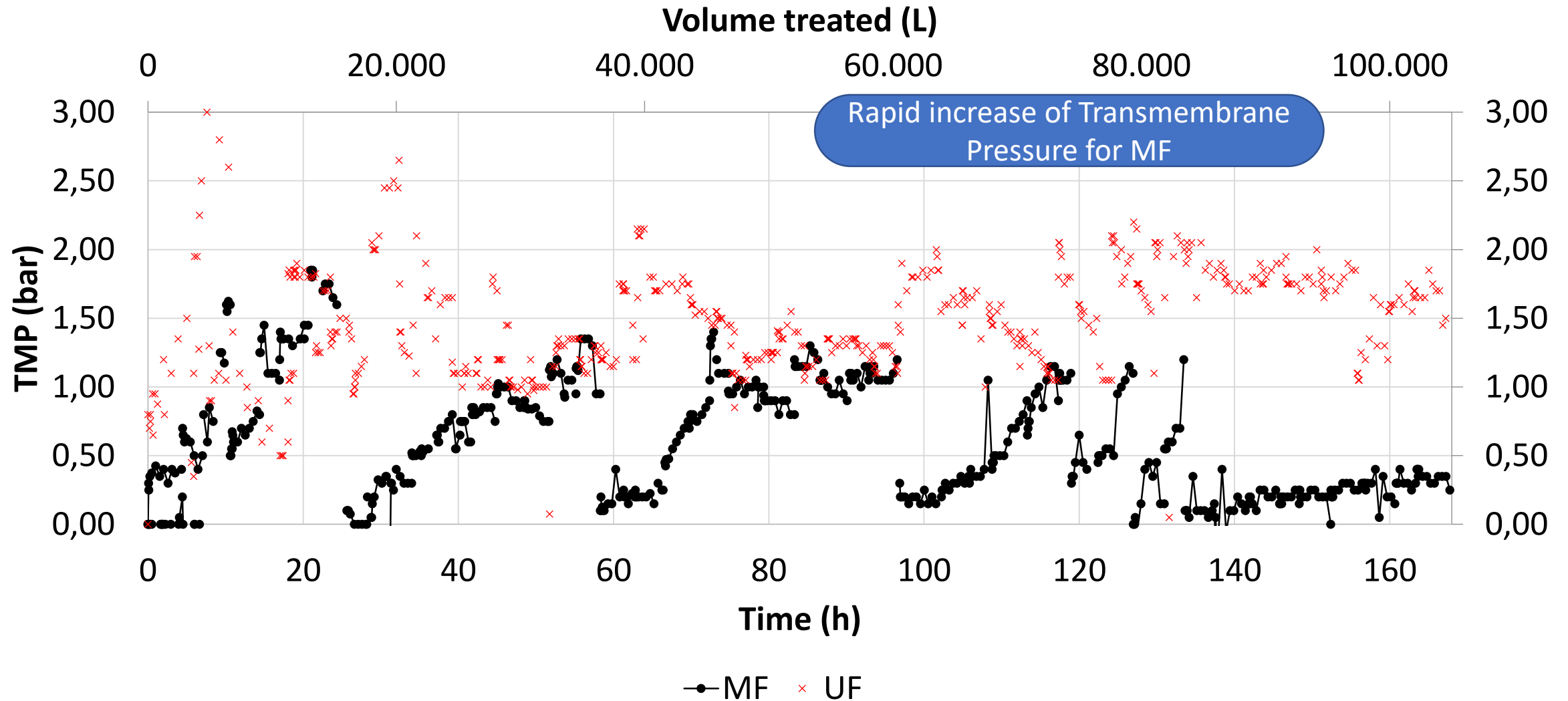


Target flow: 3,000 L/hr
Pressures: membrane life and fouling
Effluent quality: Meet Indian discharge standards

Operational performance – Phase I

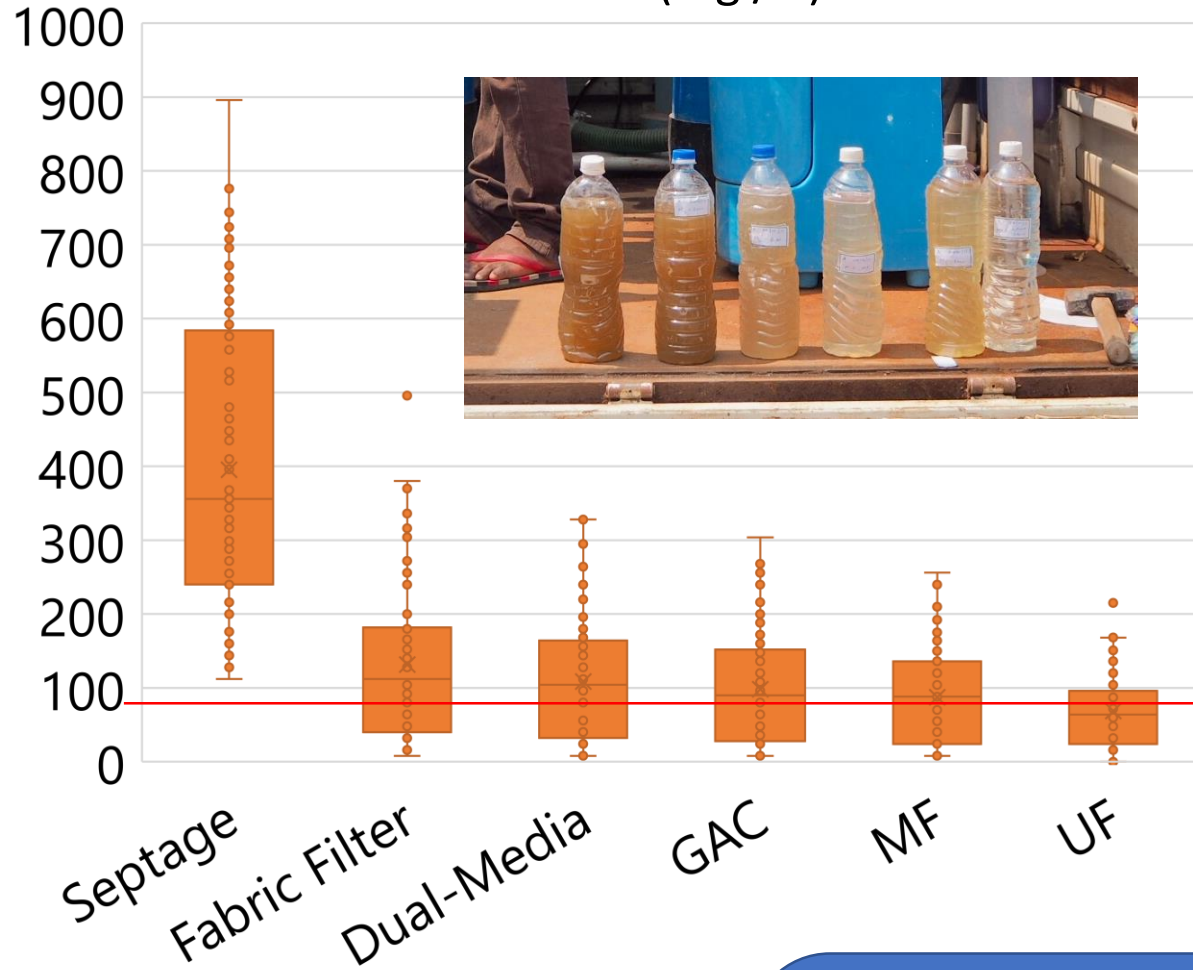


Operational performance – Phase I

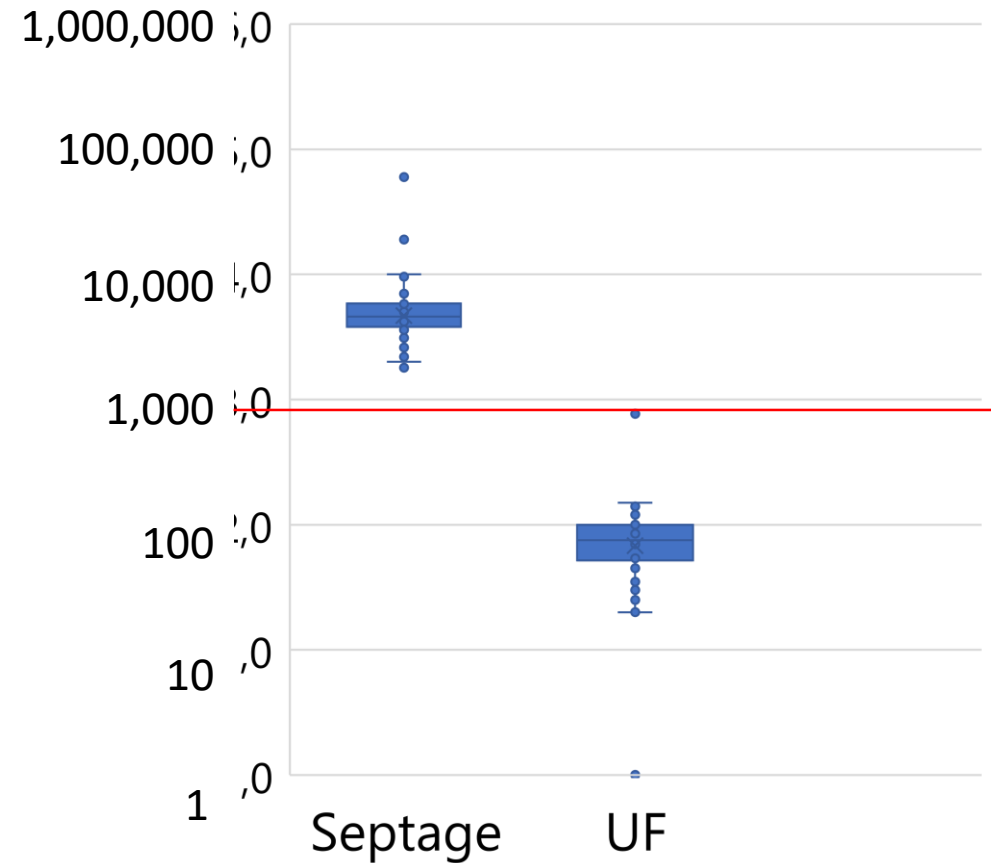


Treatment performance – Phase I

COD (mg / L)



Total Coliform (CFU / 100 mL)



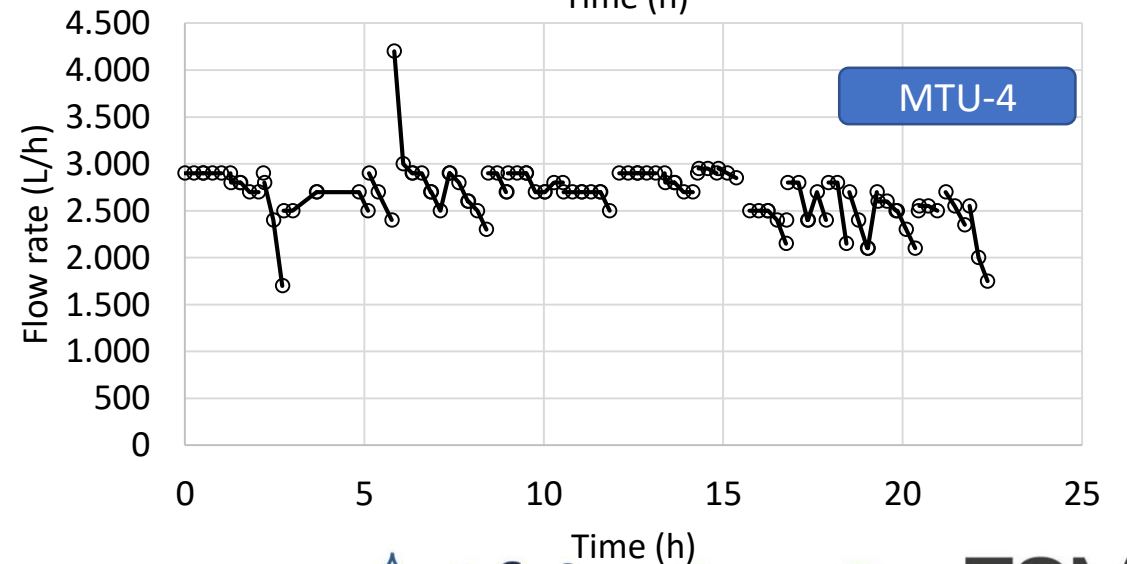
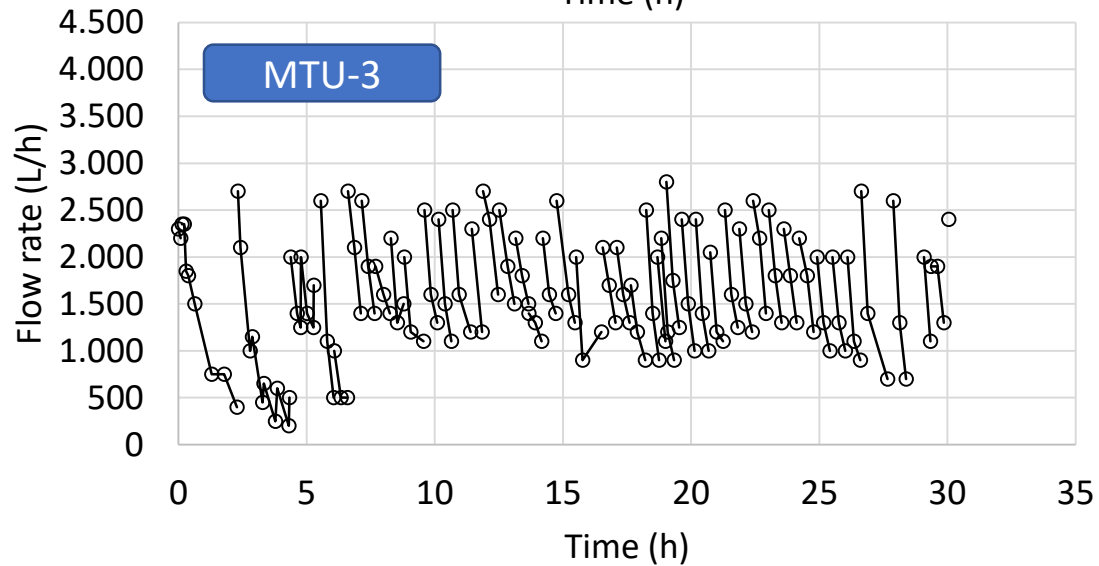
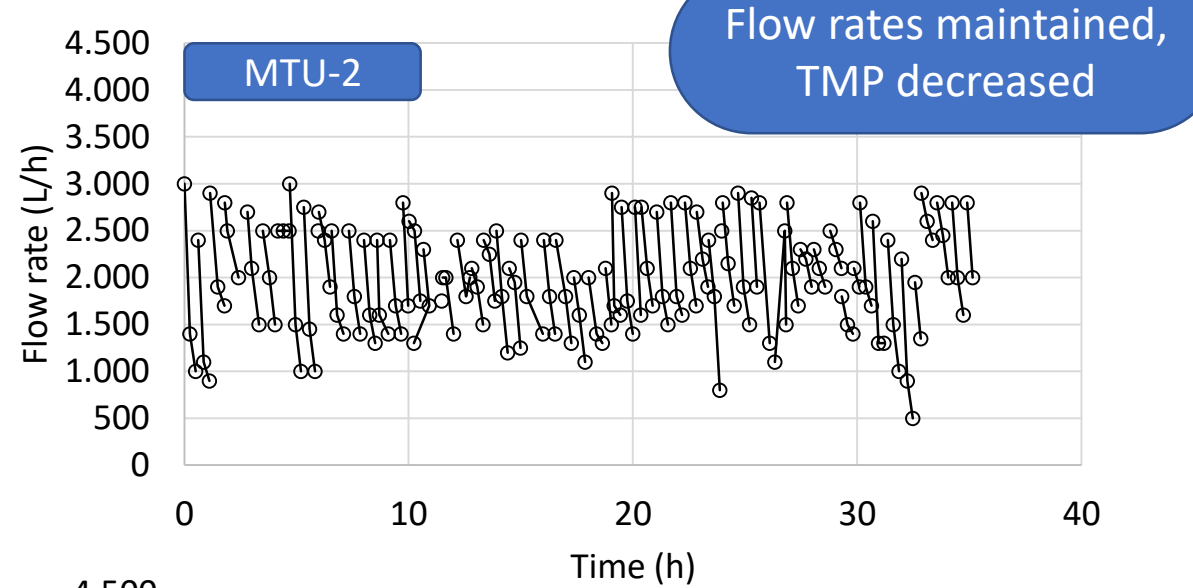
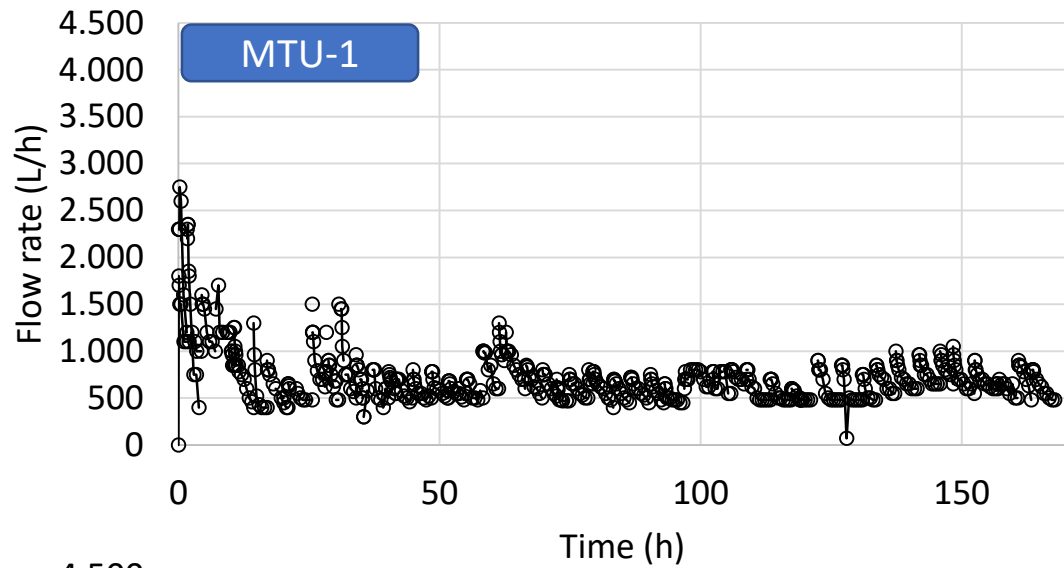
Effluent meets Indian discharge limits

Phase I Conclusions

| Phase I Challenge | Phase II Improvement |
|---------------------------------|-----------------------------------|
| Maintain high target flow rates | Routine backwashing during run |
| Rapid MF fouling | Increase MF surface area |
| Occasional high solids tanks | Additional low-cost pre-screening |

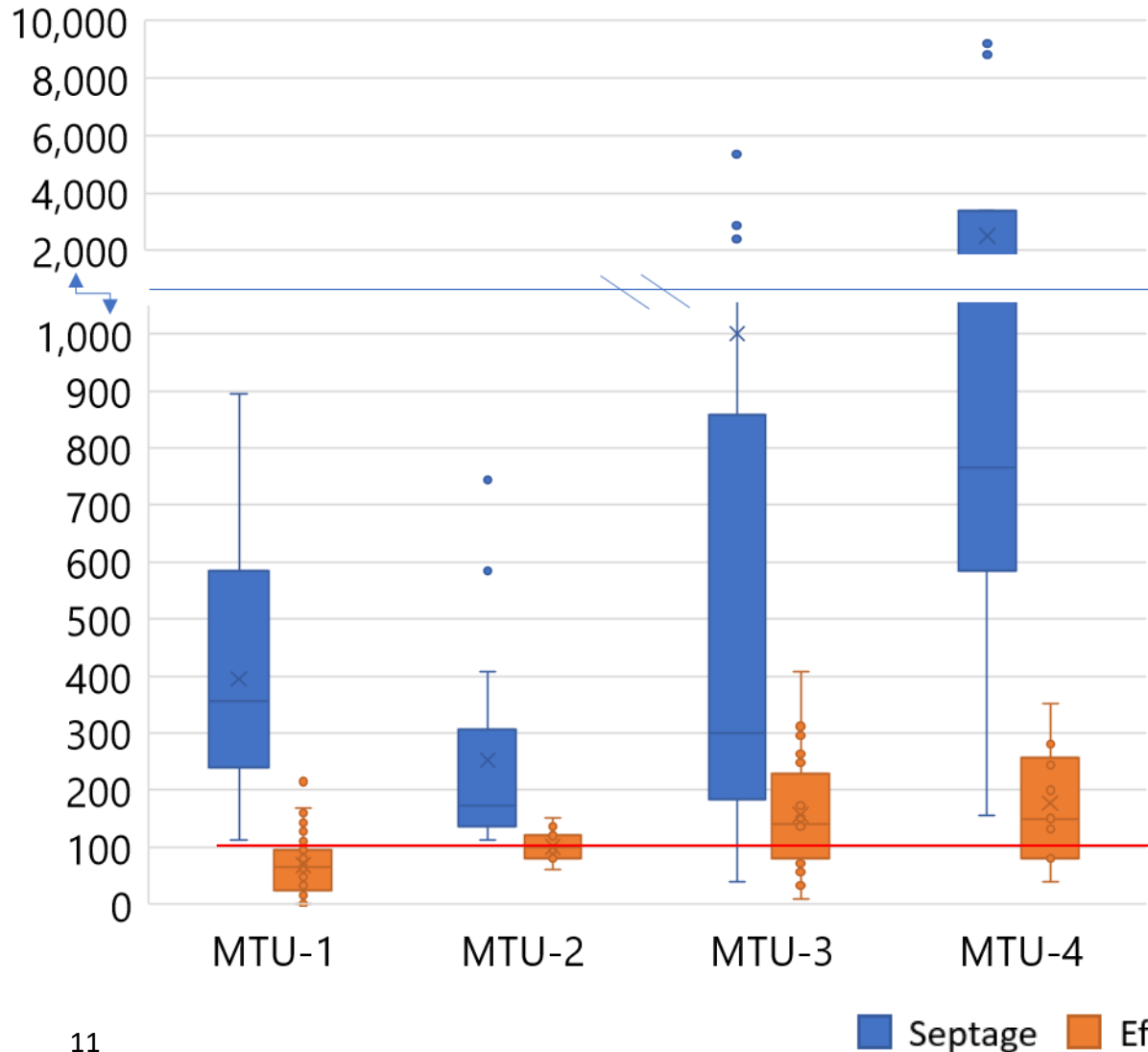
| Standard | India CPCB | WASHi Effluent | |
|------------------------------|------------|----------------|---|
| pH | 6.5-9.0 | 7.7 | ✓ |
| COD (mg/L) [old, not in new] | 100 | 66 | ✓ |
| BOD (mg/L) | 30 | 24 | ✓ |
| TSS (mg/L) | 100 | 103 | ✗ |
| Total Coliform (CFU/100 mL) | 1,000 | 83 | ✓ |

Operational performance – Phase II

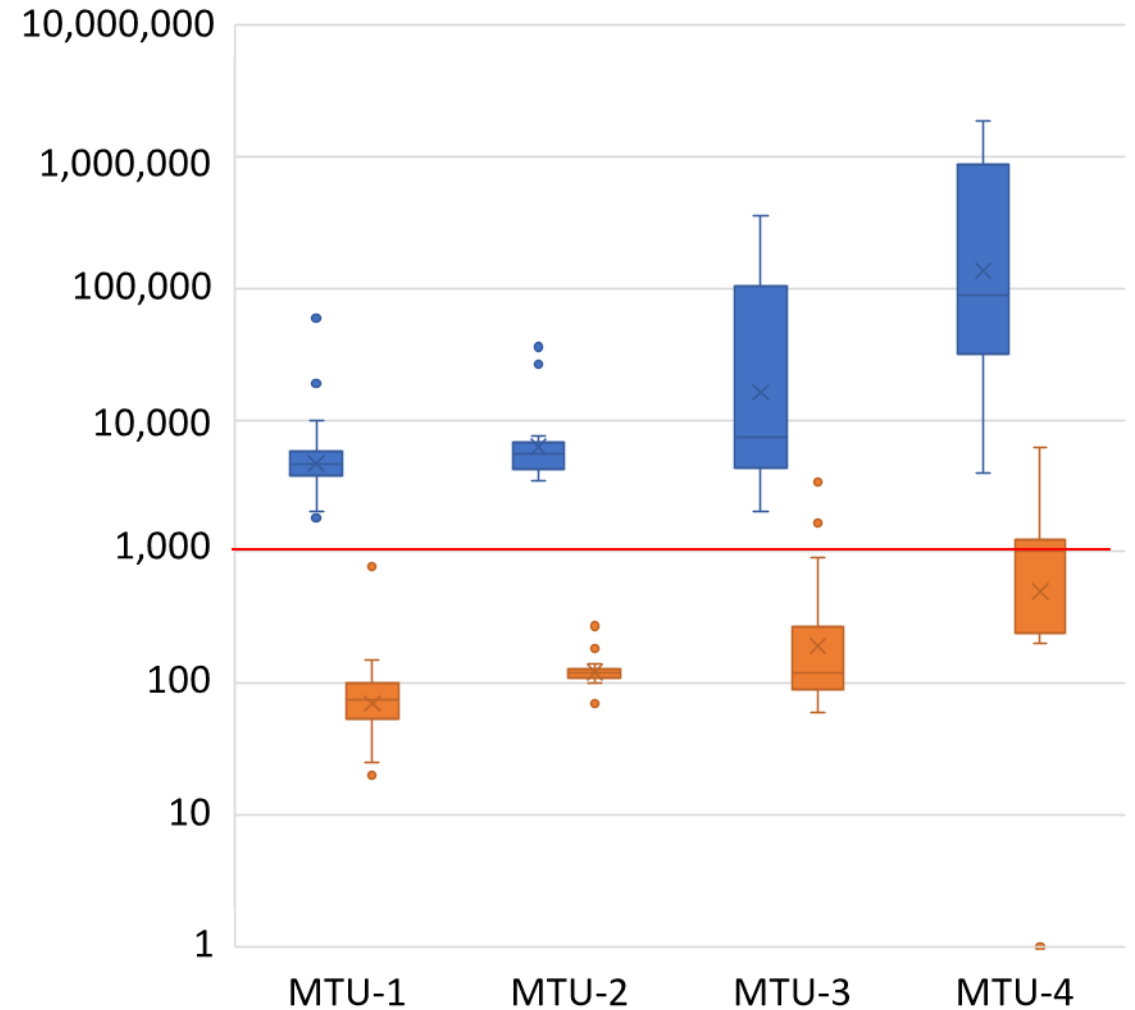


Treatment performance – Phase II

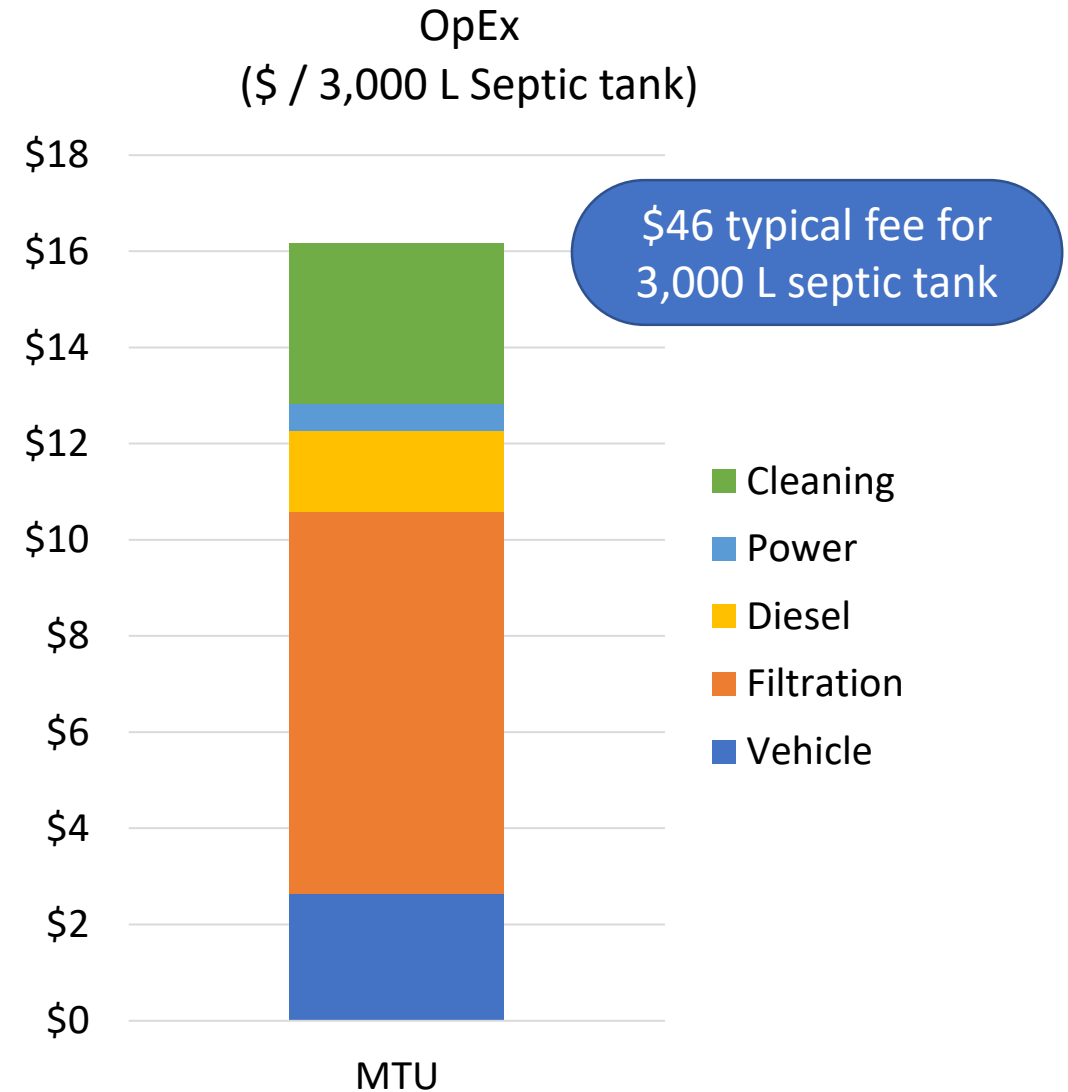
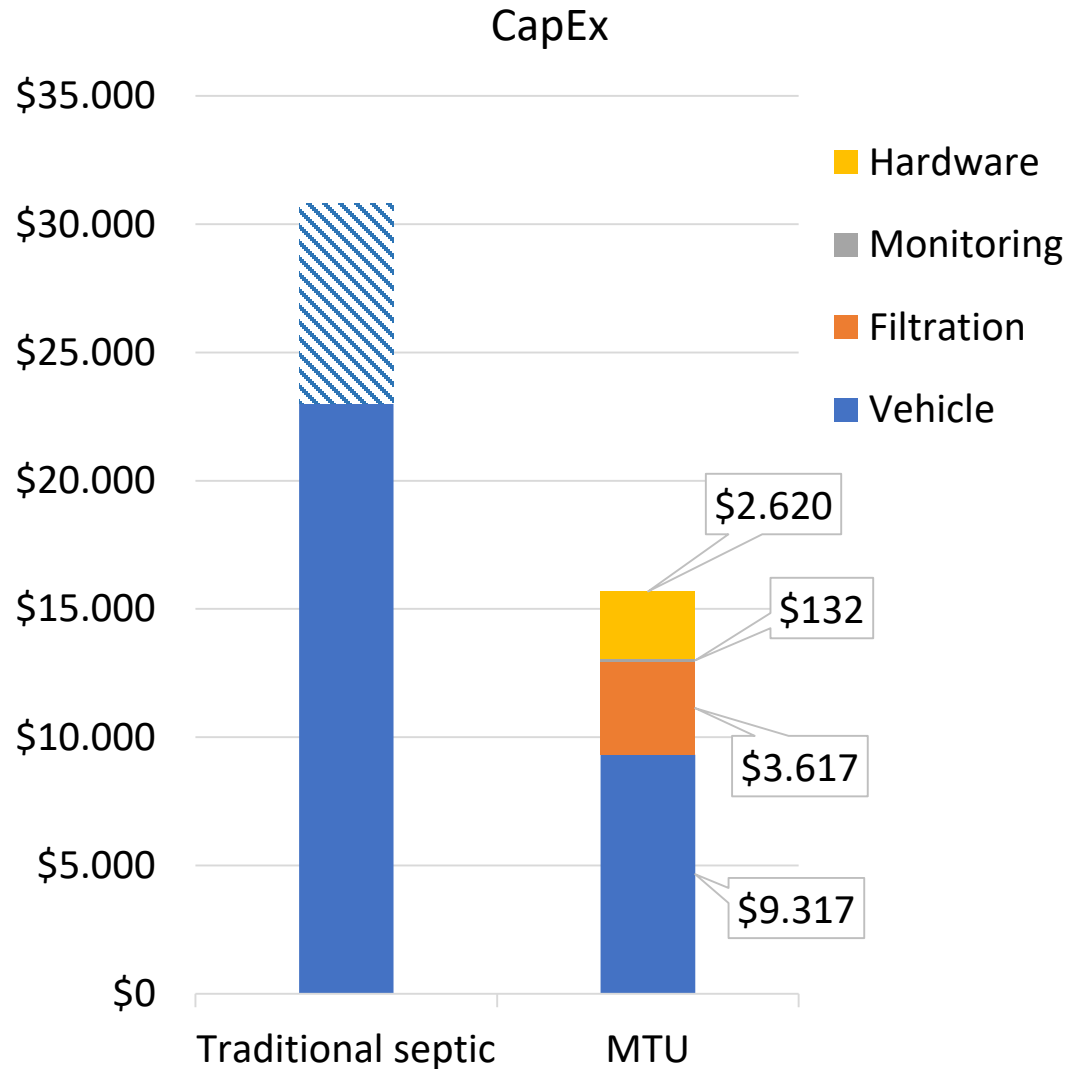
COD (mg / L)



Total Coliform (CFU / 100 mL)



Expenses



Case Study: MTU in Kerala



- 4 MTUs sent to Kerala in response to severe flooding, August 2018
- First 9 days:
 - 330,000 L septage treated
 - 34,965 beneficiaries
- Aug. 25th – Dec. 14th 2018:
 - 156 septic tanks emptied
 - 918,222 L treated
 - ~200,000 beneficiaries
 - Effluent samples met all discharge standards

Next steps

- Patent:
 - Filed and awaiting finalization
- Commercialization
 - In discussion with partners
 - Interested customers: relief agencies, small-scale entrepreneurs
- Automation:
 - Improve operation efficiency, decrease operator requirements

Thank you!



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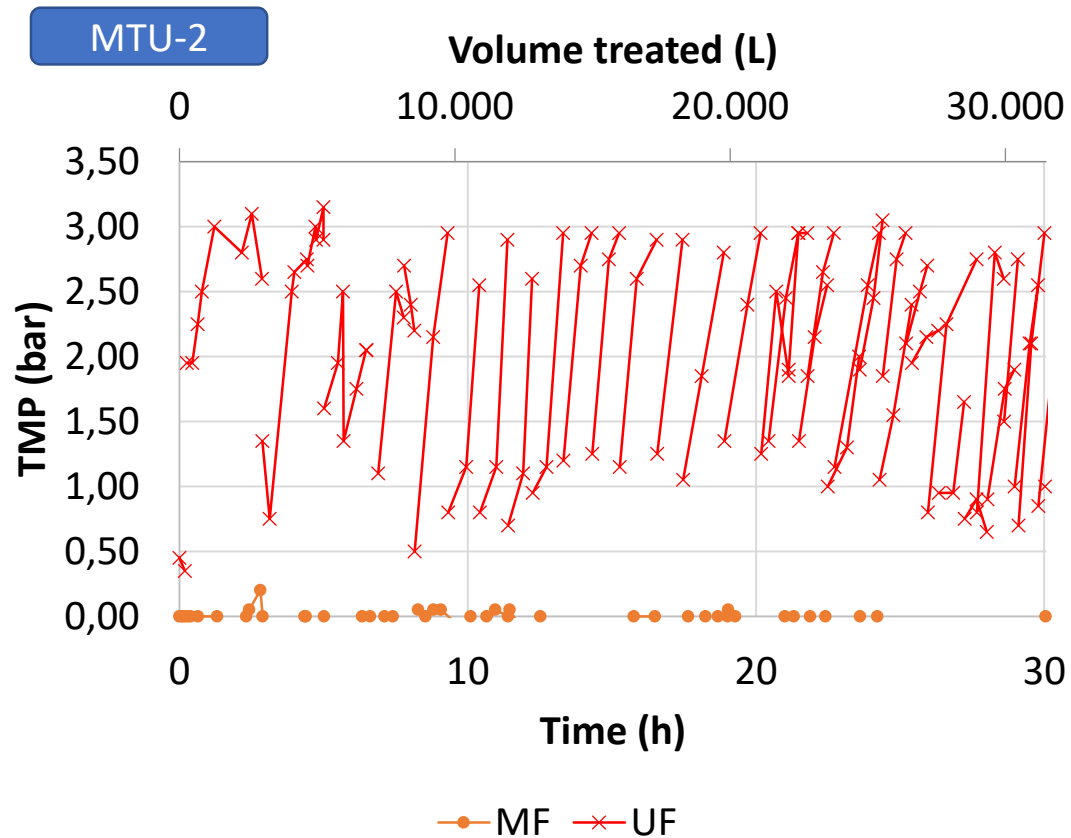
Triangle Environmental

www.triangle-environmental.com

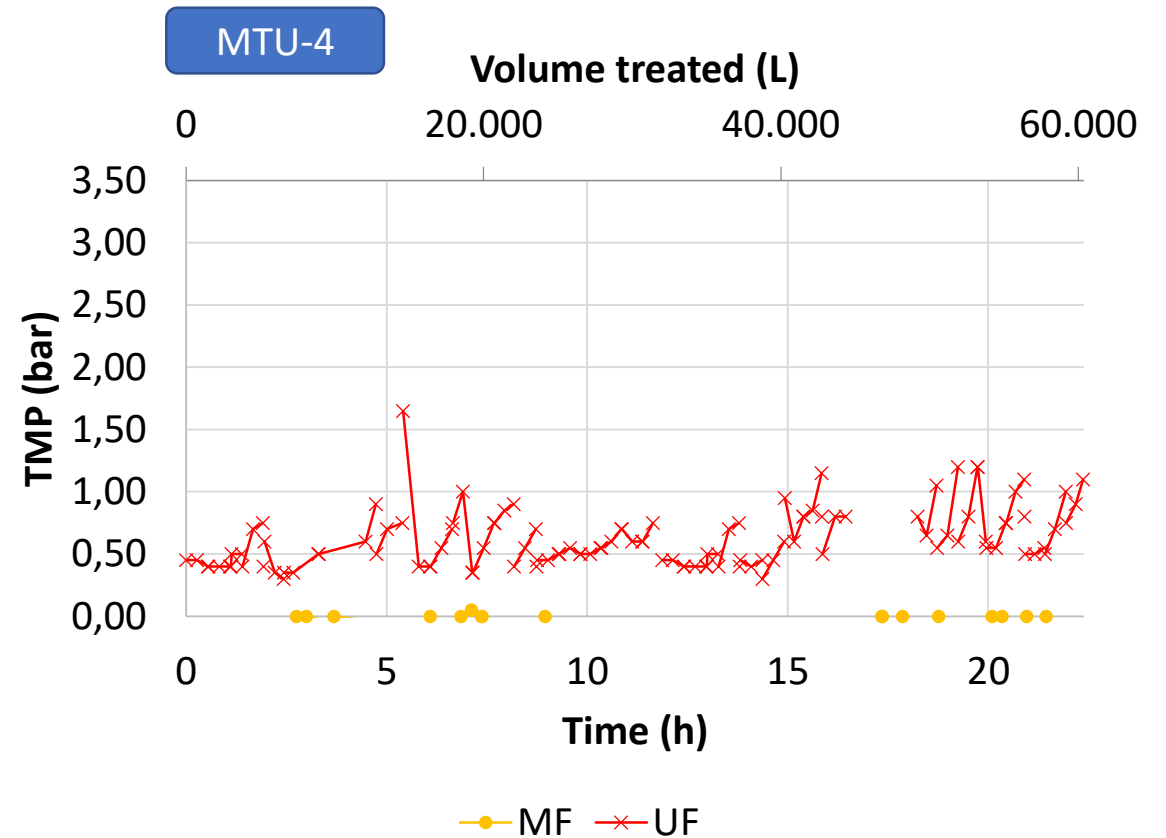
BILL & MELINDA
GATES *foundation*

Additional slides

Operational performance – Phase II



MF no longer fouling



Low TMP,
likely undersized pump