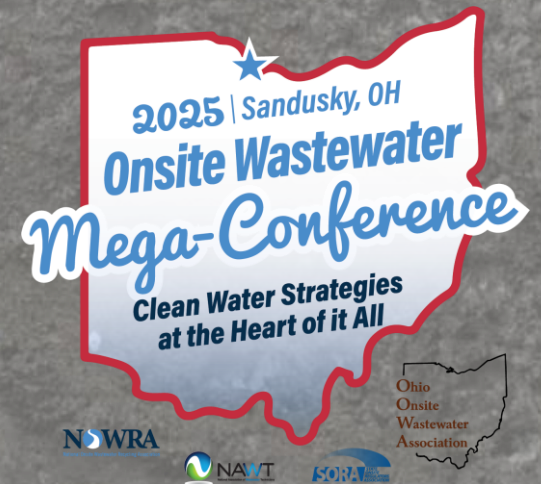


Comparison of the efficiency of recycling truck and standard double-chamber truck for sludge removal from septic tanks



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NOWRA Mega-Conference, October 2025*



Presentation represent the opinions of speakers, and do NOT reflect the opinions of NOWRA

Presented at 2025 Mega-Conference, October 19-22, 2025

Context and problem

Context : The conventional septic tank treatment method involves fully emptying the tank and hauling all biosolids—both solids and liquids—for disposal

Problem : This method is both expensive and inefficient due to the high volume of liquid in septic tanks—up to 80% of which is harmless wastewater. Disposal sites are often located far away, disposal fees continue to rise year after year, and skilled labor is increasingly scarce and costly.

Other options available :

- Double-chamber vacuum truck
- Onsite processing with filtration system



Leave the water behind

Objectives

Purpose of the Study

- Assess the **quality of sludge removals** using **OSP technology** in comparison with the double-chamber
- Based on a **rigorous experimental approach**

Evaluation Criteria

- **Physico-chemical characteristics** of supernatants returned to the septic tank
- **Efficiency of biosolid removal** from the tanks

Double-Chamber Vacuum Truck

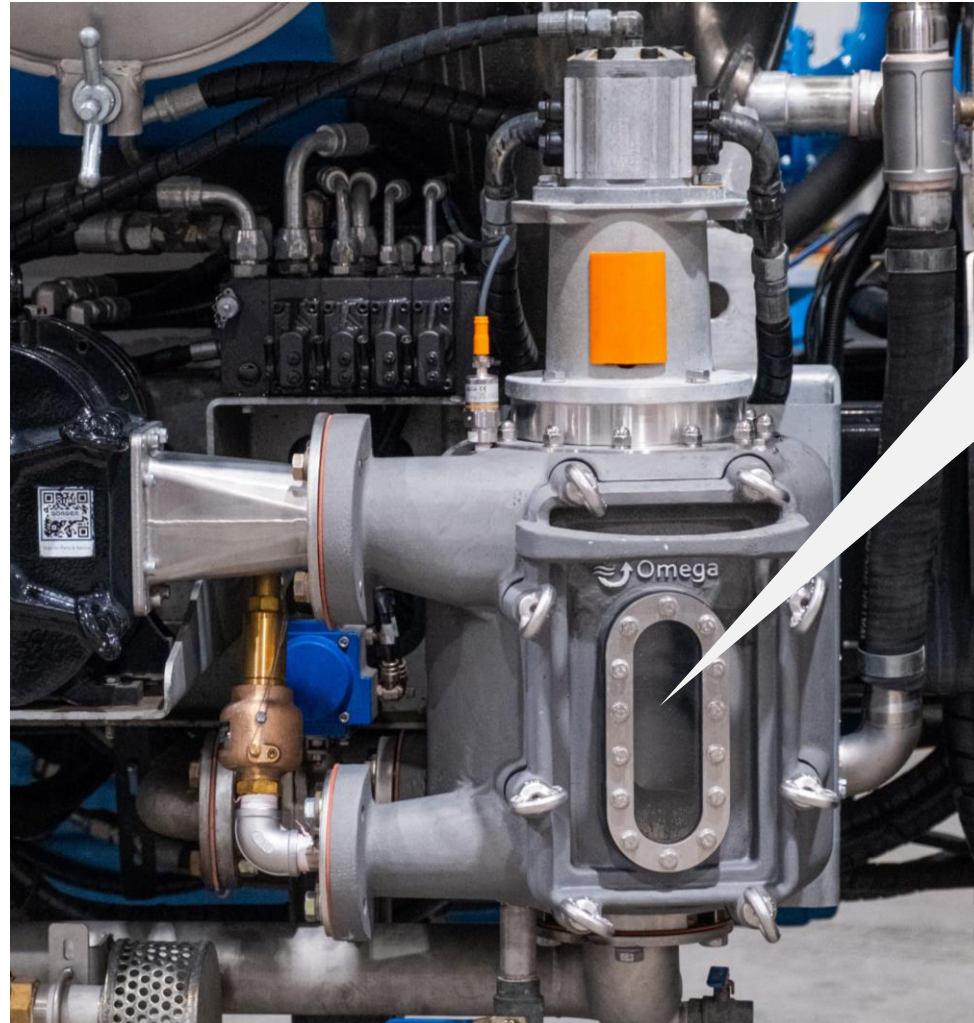


Onsite Processing Vacuum Truck

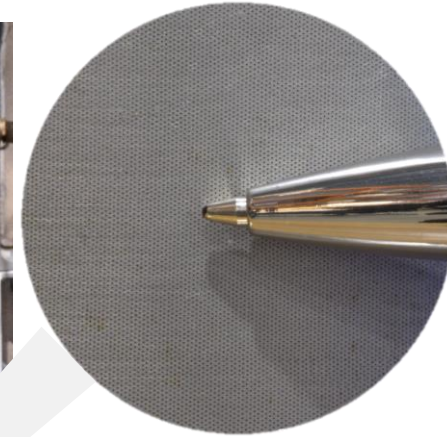


Technical Points

Self Cleaning Filtration System



**PRESERVE
BACTERIA
FLORA**



Methodology

The approach consisted of following trucks equipped with **OPS** and **double chamber** technologies

- 18 concrete tanks
- 2 years since last pump-out
- 750-gal to 850-gal tank
- Septic field for sampling

Methodology

Double chamber pumping process :

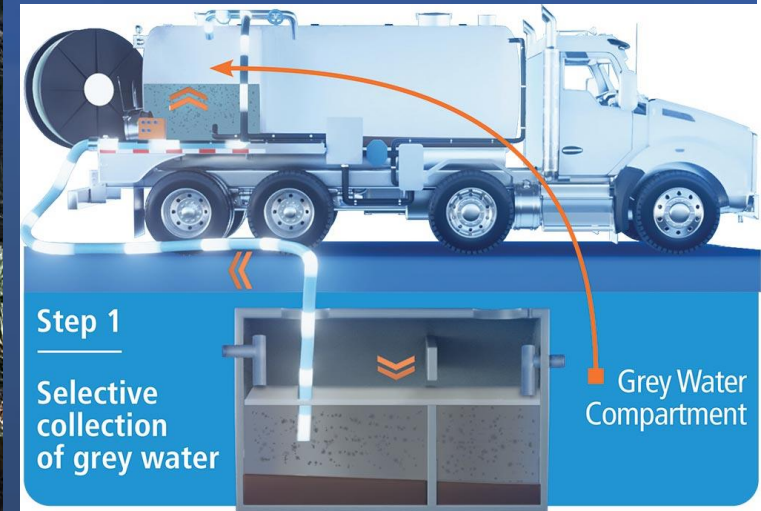
- Between 550 to 600 gal are pumped from the 2 compartments of the septic tank to the liquid compartment of the truck.
- The rest are pump to the solid compartment of the truck. Operator decide if it's liquid or solid.
- When the septic tank are empty, the liquid stored in the truck is return to the septic tank without any treatment

OSP pumping process :

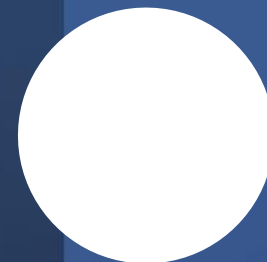
- The operator pump with a turbidity sensor and a piece of clear hose to see what he pump
- Liquid are pumped first to the liquid compartment of the truck
- When the operator reach the solid, the automatic valves on the truck switch to the solid compartment
- When the septic tank is empty, the water stored in the liquid section of the truck are filtered and return to the septic tank
- No chemical used
- The truck leave the site with the water compartment completely empty avoiding cross-contamination

STEP 1

Collection of grey water



STEP 2: Collection of solids



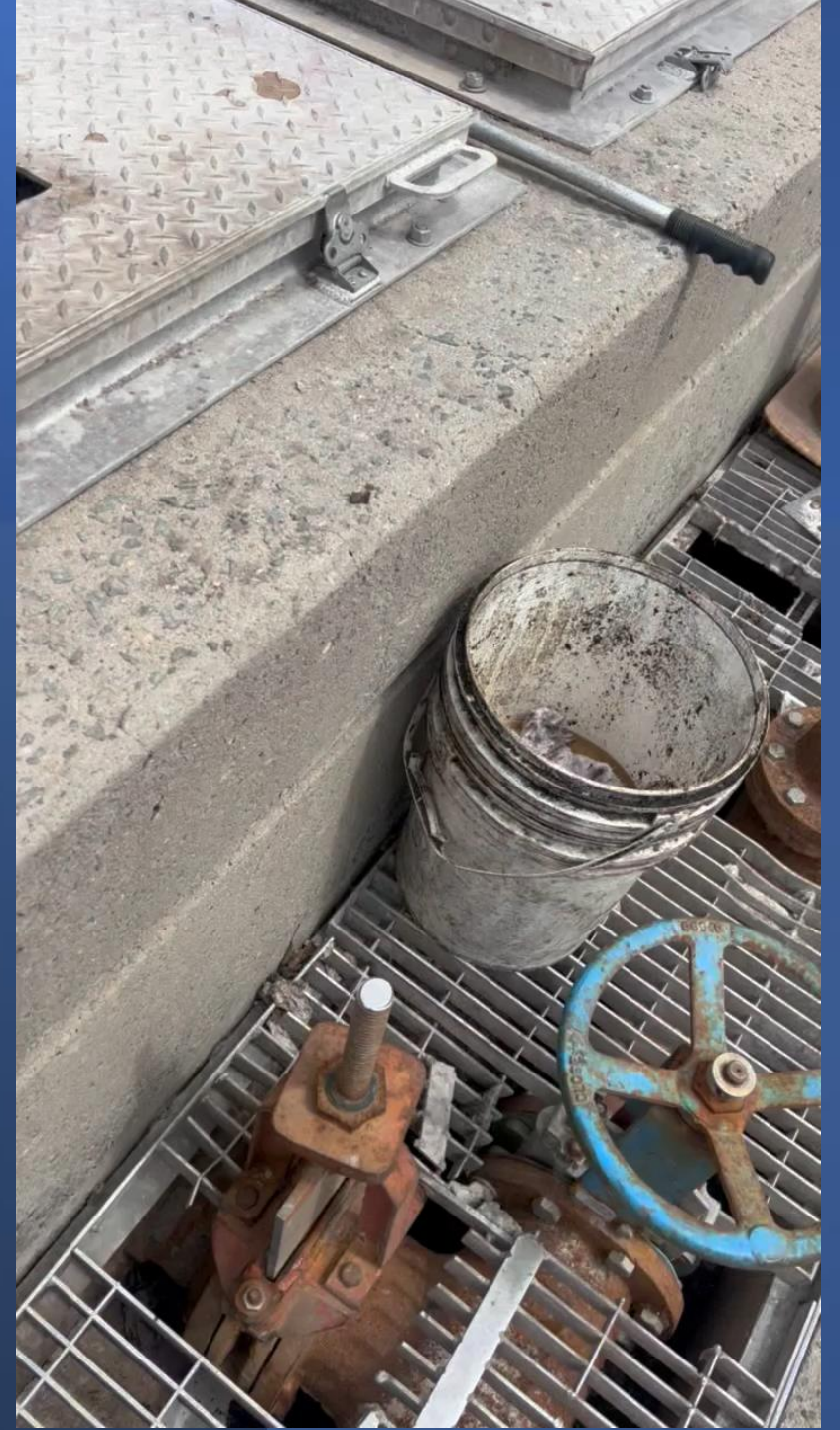
STEP 3: Return of filtered water

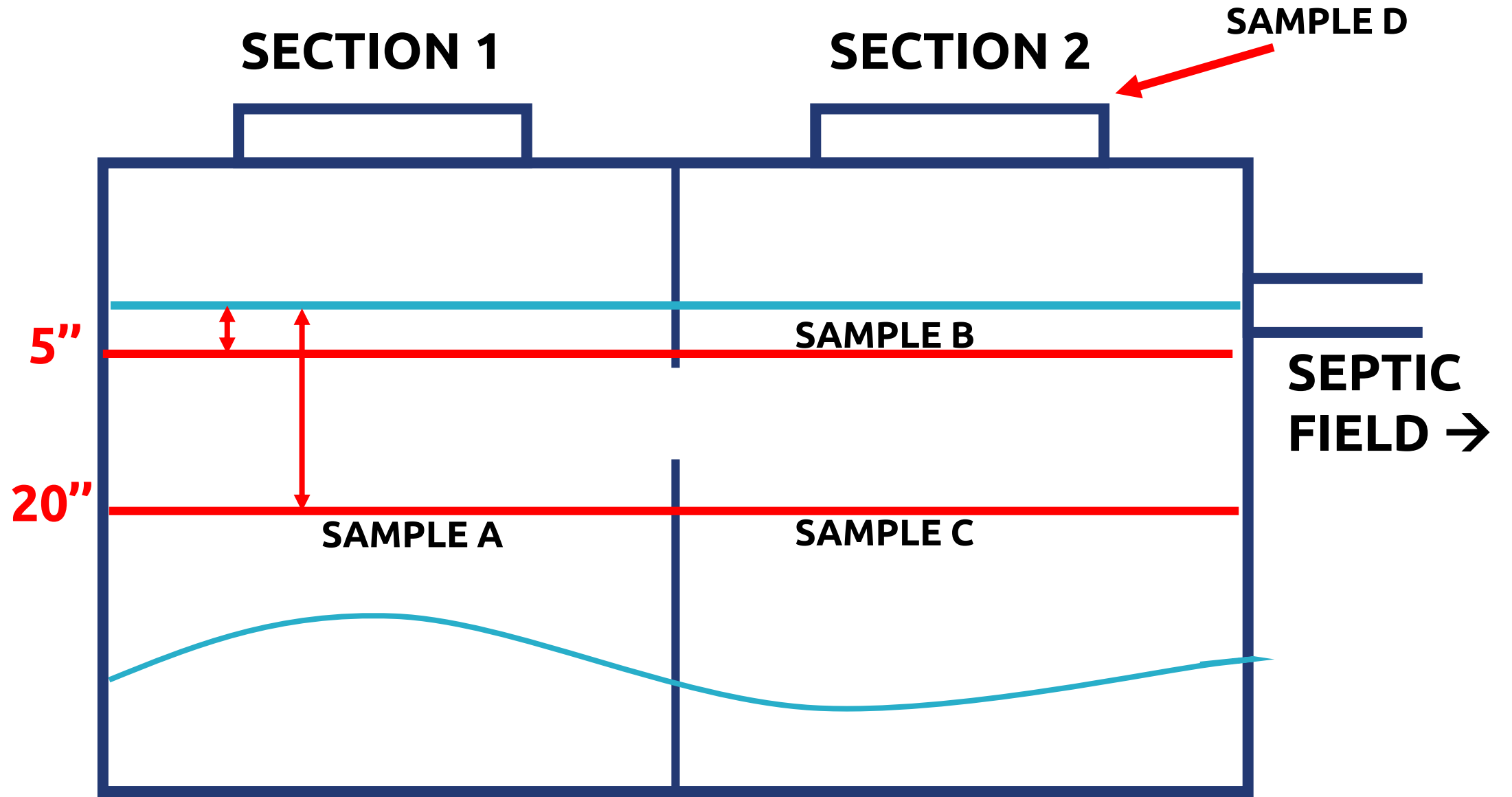


Sludge is at 3.6% to 3.8% solids

It is accepted by 95% of disposal sites

A traditional full pump-out is solid at 1%





Index 1 : Before pumping
Index 2 : 6h after pumping

Index 3 : After water return
Index 4 : 24h after pumping

Sludge Sampling



Samplings and measures

Samples and measures were taken before, during and after pumping, at different spot and depth

Before (A, B, C)

- Measure of sludge volume in the tank

During

- Sample of liquid during the return process **(D)**
- 3 samples in both sections of the tank **(A, B, C)**

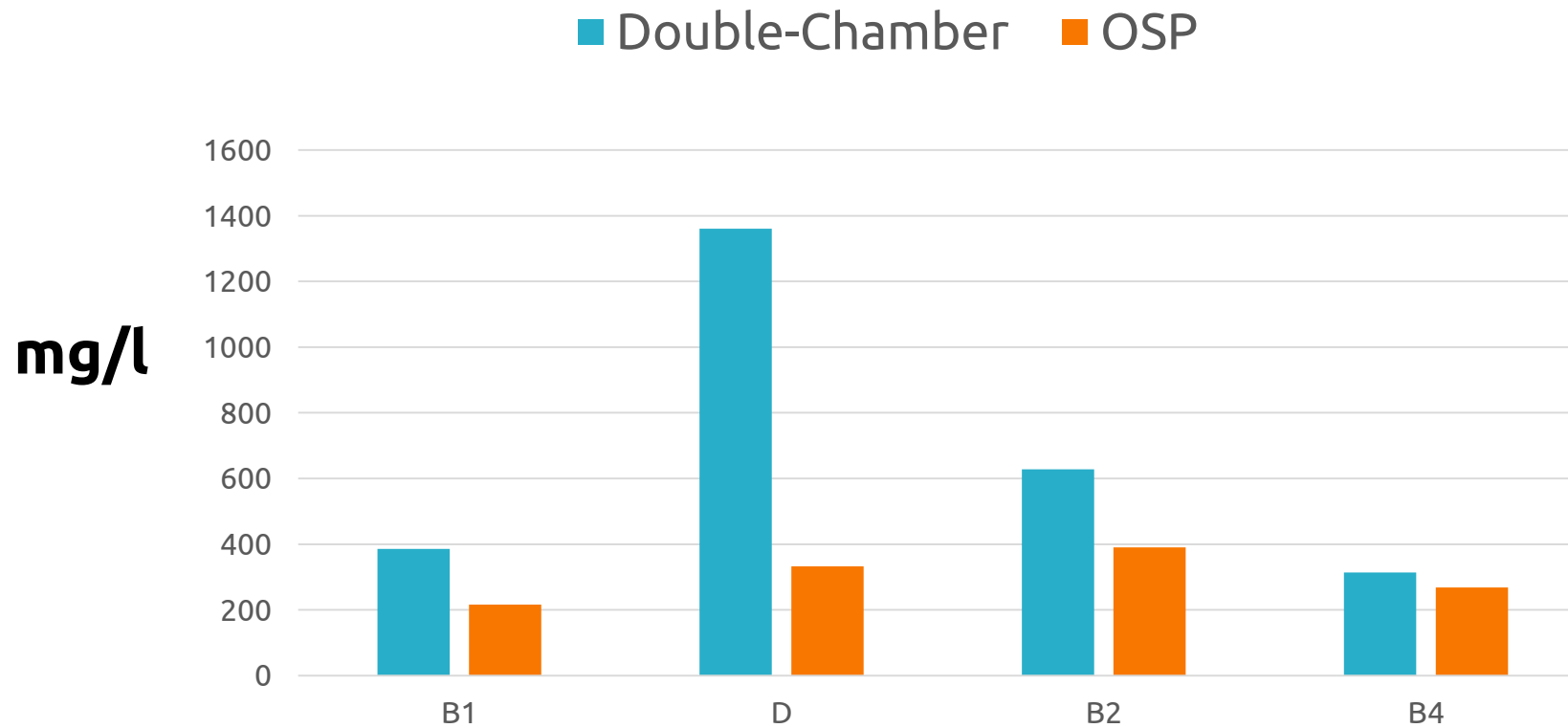
After

- 2 samples took after 6 hours and 24 hours at location B
- Sludge level was measured after 24 hours in the section 1 to determine sludge volume

Results and Findings

Biological Oxygen Demand (BOD₅)

Biochemical Oxygen Demand (BOD₅) represents the amount of oxygen used by microorganisms during the biochemical oxidation of organic matter at a standard temperature and under standard conditions.



Results and Findings

pH Measures

The **pH** is a measure of how acidic or basic (alkaline) a solution is

Measures taken in laboratory on samples D for both process

Values between 6.0 and 8.0

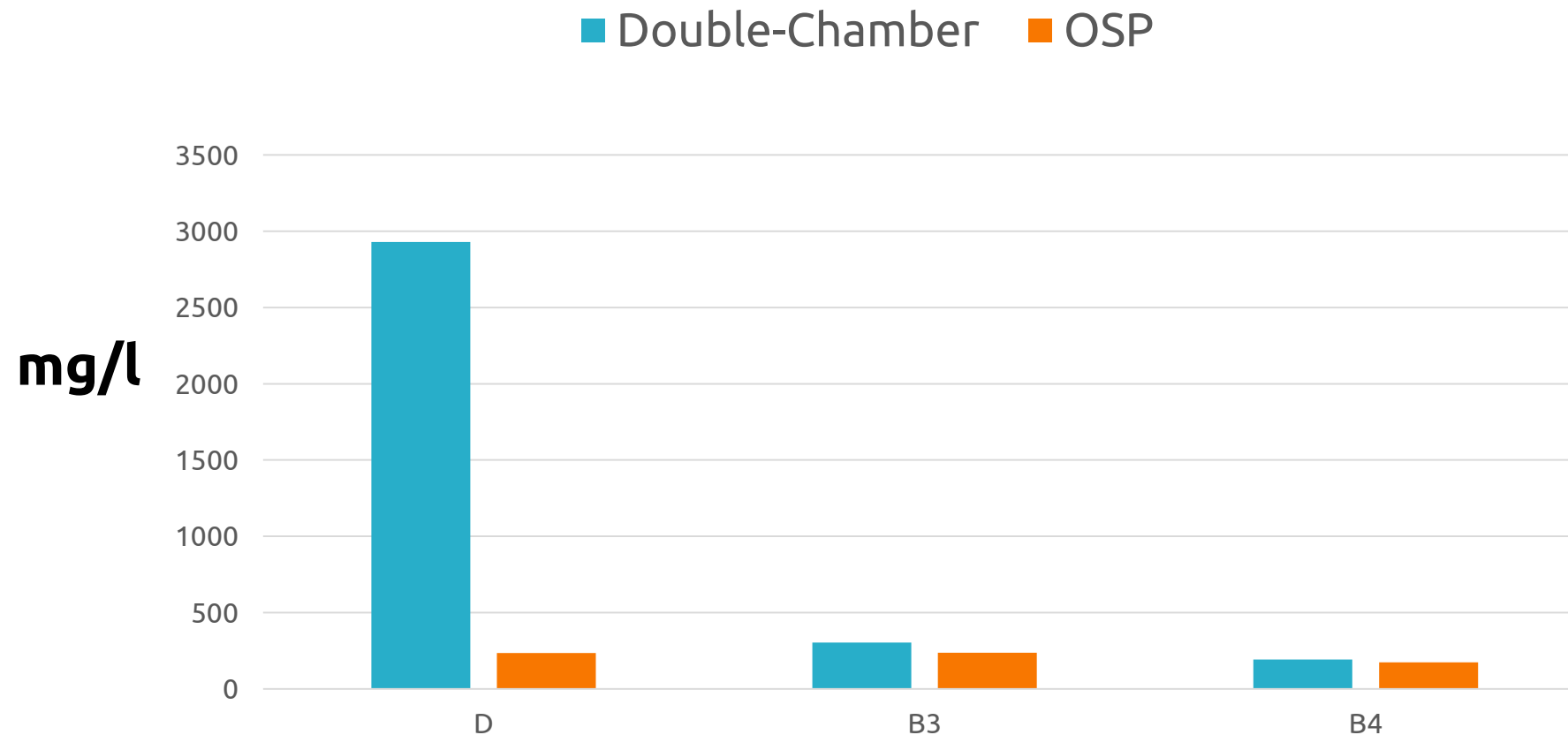
Value closer to basic → no impact on concrete

Double chamber and OSP has no negative impact on pH

Results and Findings

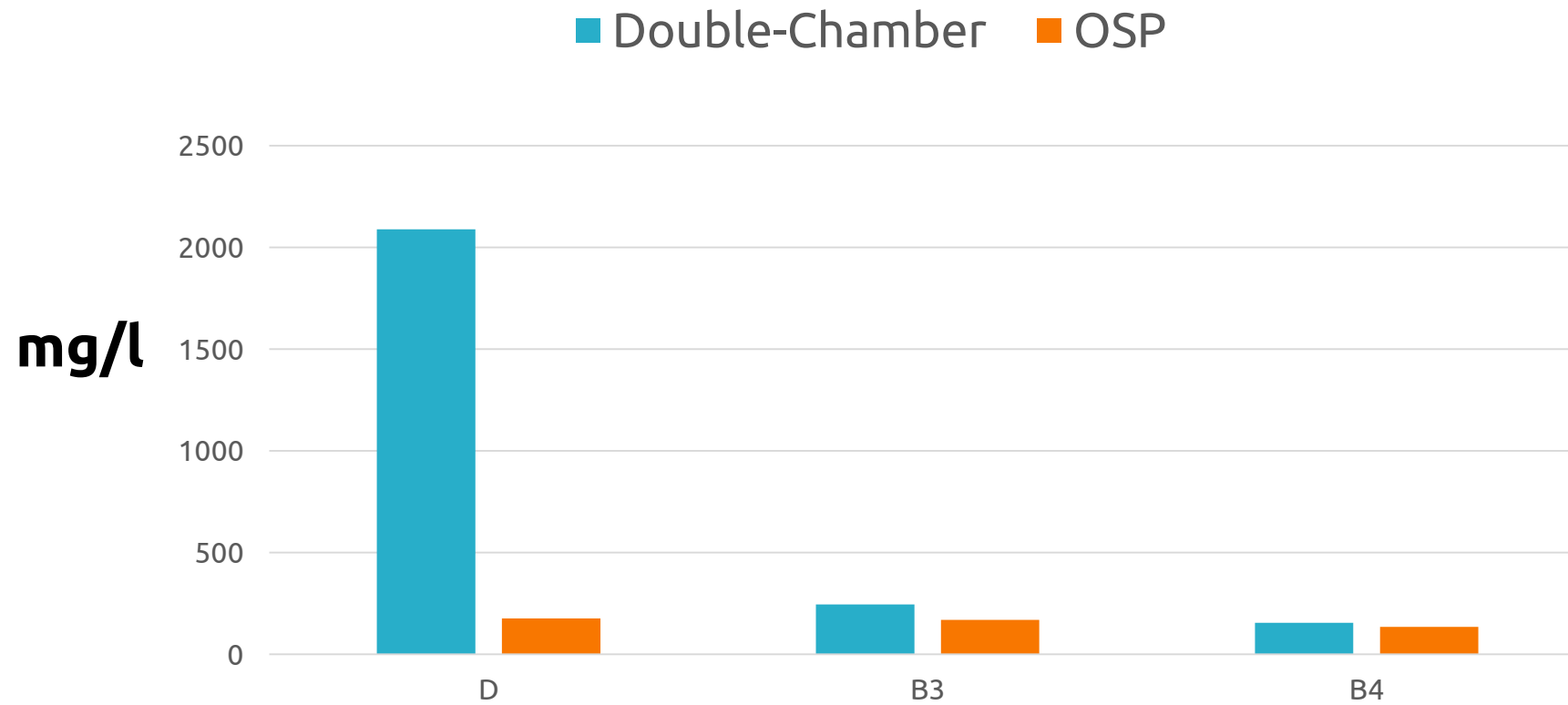
Total Suspended Solids (TSS)

TSS (Total Suspended Solids) are the concentration (mg/l) of suspended solids contain inside the wastewater, biodegradable or none.



Volatle Suspended Solids (VSS)

VSS (Volatile Suspended Solids) are the concentration (mg/l) of suspended solids that volatilize at 550°C. This parameter is commonly used to represent the organic part of solids.



Results and Findings

Total Suspended Solids (TSS) and Volatile Suspended Solids (VSS)

- **12X higher TSS/VSS concentration on water return using double chamber process than OSP**
- **VSS make up ~75% of TSS**, indicating high biodegradability of the suspended solids .
- TSS/VSS levels **gradually decrease** over 24 hours.
- **Sedimentation continues** beyond 24 hours, as liquid levels had not stabilized.
- **Fine particles dominate** suspended solids post-emptying, reducing risk of clogging.

Results and Findings

Sludge height measurements and sedimentation tests

Initial Sludge Height

- Significant variation between tanks
- **Average height: 13,4" (34 cm)** (first section)
- Consistent with **typical value of 11,8" (30 cm)** for tanks not emptied in 2 years (*Lampron & Martin, 1994*)

Post-Emptying Observations

Double chamber

- **Average of 2,4" (6,1 cm) of sludge accumulation detected after 24 hours**
- **Equivalent of 4,9 mounts of standard usage of the septic tank**

OSP

- **No sludge accumulation** detected after **24 hours**
- Indicates **high-quality effluent** returned to the septic tank / no disturbance of the installation

Discussion and Conclusion

Double chamber process

Liquid pumped

- The volume and quality of the liquid pumped by the double chamber process are based on the operator

Liquid Return

- NO filtration system are used by the double chamber process
- **Poor quality of wastewater** returned to tanks

Removal Efficiency (vs. typical sludge) (*Boulanger et al., 1988*)

- **BOD₅ / COD: 80%**
- **Suspended Solids / TSS: 79%**

Post-Emptying Observations

- **2,4" (6,1) cm sludge accumulation** after 24h
- Average of 20.3% of the solid content are returned to the septic tank

Discussion and Conclusion

OSP

Liquid Pumped

- **Turbidity sensor and piece of clear hose are used by the OSP**

Liquid returned

- Process is **fully automated**
- **500 microns self cleaning filter are used**
- **High-quality wastewater** returned to tanks
- No **operational issues** expected in leaching beds

Removal Efficiency (vs. typical sludge)

(Boulanger et al., 1988)

- **BOD₅ / COD: 95%**
- **Suspended Solids / SDS: 98%**
→ **Excellent biosolids separation**

Post-Emptying Observations

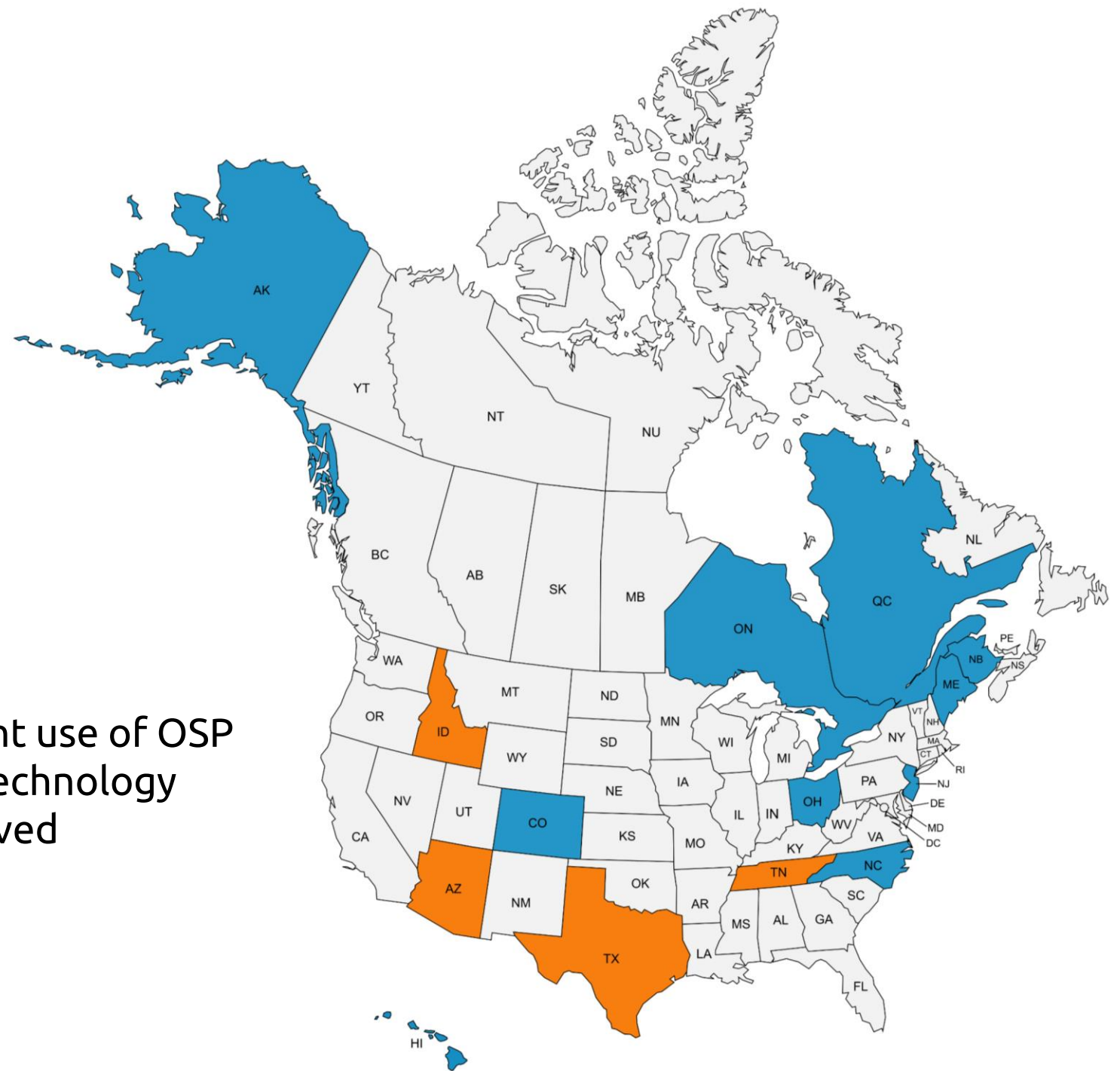
- **No sludge accumulation** after 24h
- **Efficiency of the OSP process are confirmed**

OSP Process Highlights

- **No chemicals required**
- **Fast treatment: completed in < 20 minutes**

OSP in North America

 Current use of OSP
 OSP technology approved



References

- Blais, J.-F., Leblanc, D., Durand, A., Vachon, T., & Vachon, E. (2003). Comparison of the efficiency of Juggler truck and standard double-chamber truck for sludge removal from septic tanks. *Vecteur Environnement*, 36(5), 58–67.
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- Michaud, J.-R. (2003). *Juggler™ Technology: Eco-efficient mobile unit for emptying septic tanks*. Environment Canada, Technology Innovation and Industrial Sectors. Cat. No.: EN1-17/50-2003E. ISBN: 0-662-33500-7.

THANK YOU!

