Onsite Wastewater Treatment Systems for the Future

Nordic Conference
Onsite Wastewater Treatment

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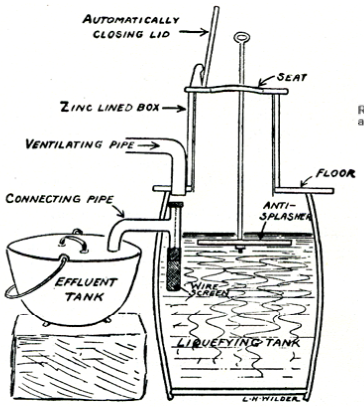
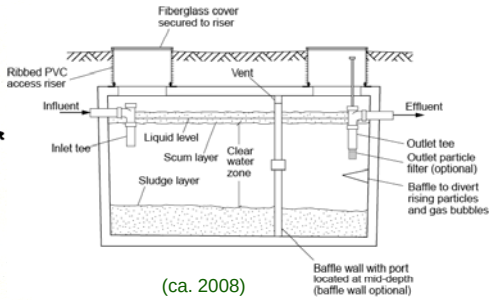
Discussion Topics

- Historical Perspective on Onsite Systems
- Technological Advancements in Wastewater Treatment
- Effective Use of Soil Manlte
- Onsite Systems in the Urban Fringe
- Research Needs
- What to Expect in the Future

Evolution of Septic Tank?



(ca. 1900-1910)



(ca. 2008)

No new developments in 100 years

Pictorial and Plan View: Imhoff Tank and Sand Filter for Five Persons (ca. 1920)

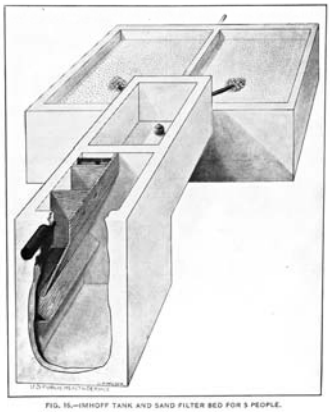
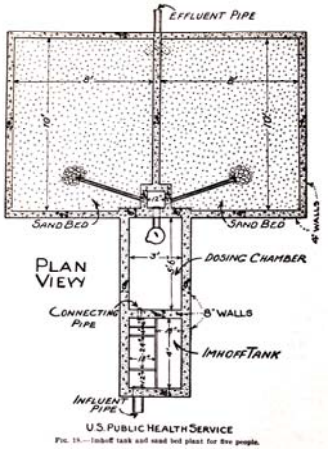


FIG. 18.—IMHOFF TANK AND SAND FILTER BED FOR 5 PEOPLE.



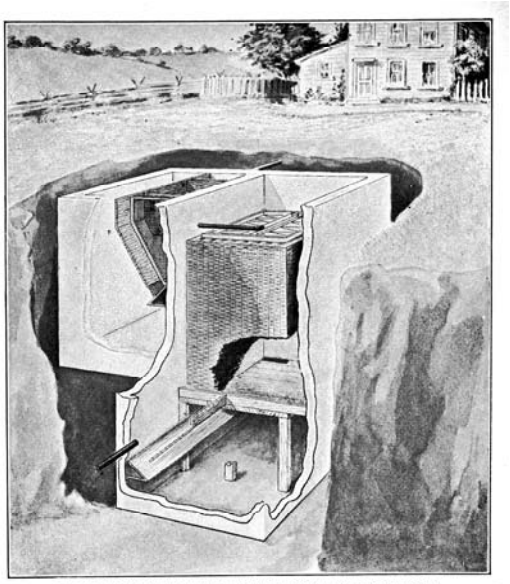


FIG. 19.—IMHOFF TANK AND LATH FILTER PLANT FOR 6 PEOPLE.

Imhoff Tank and Lath Filter for Six Persons (ca. 1920)

Dosing (e.g., Distribution) Arrangements (ca. 1920)

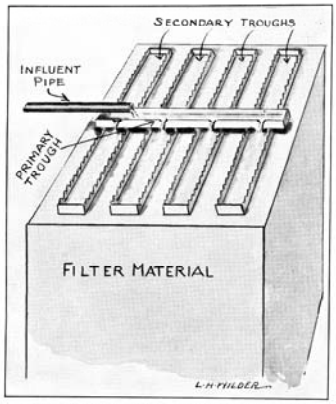


FIG. 8.—SEWAGE DISTRIBUTOR; SERRATED TROUGH TYPE.

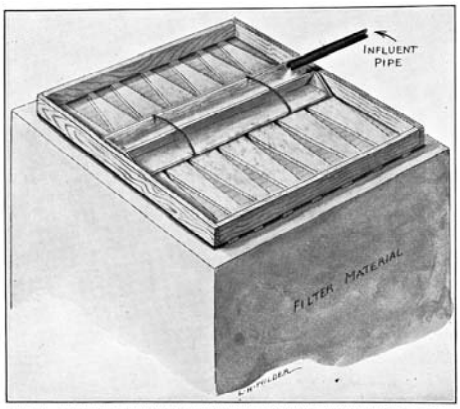
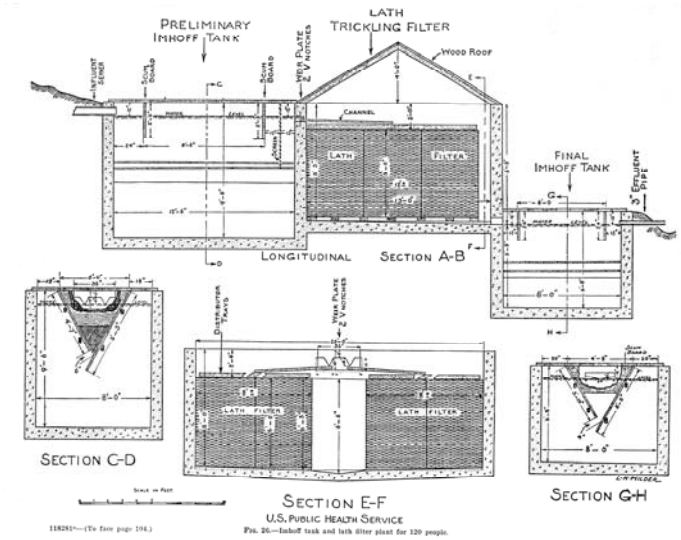


FIG. 12.—SEWAGE DISTRIBUTOR; TIPPER AND TRAY TYPE, CONVERGING BOARDS.

Views of Imhoff Tank and Lath Filter for 120 Persons (ca. 1920)



Dosing Siphon and Subsurface Dispersal

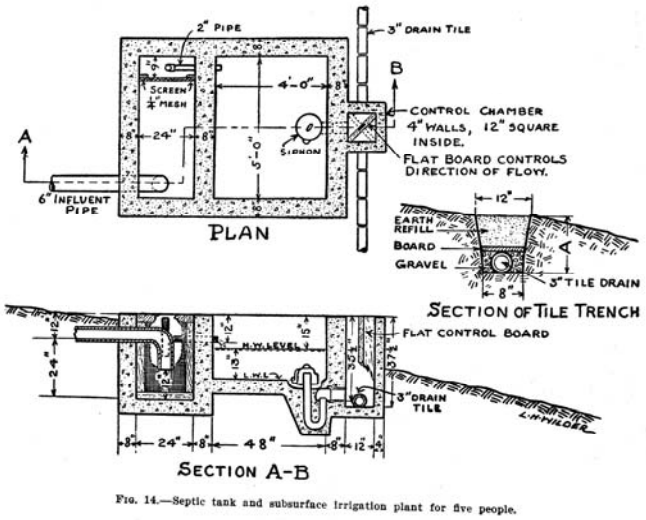
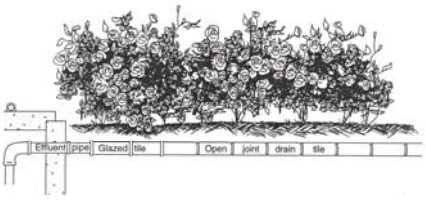


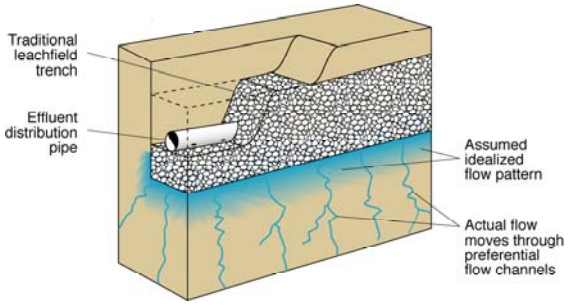
Fig. 14.—Septic tank and subsurface irrigation plant for five people.

Effluent Dispersal Trenches



Recommended shallow (30 mm) dispersal trench for maximum utilization of nutrients in septic tank effluent circa 1900.

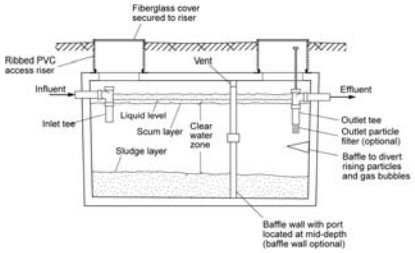
Conventional dispersal trench utilizing mechanical excavation techniques. Effluent discharged below active soil horizon, often leading to groundwater contamination.

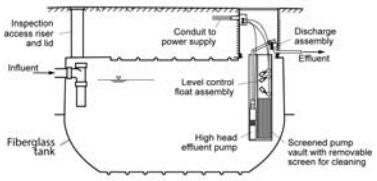


Technological Advancements

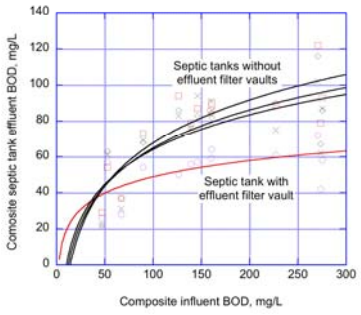
- Enhanced Pretreatment
- Aerobic, Anaerobic, and Active/Passive Biological Treatment Processes
- Membrane Treatment
- Urine Separation
- Use of Existing Collection System for the Transport of Source Separated Wastes

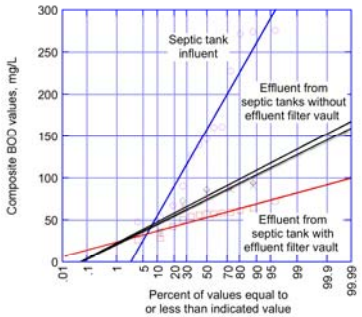
Conventional Pretreatment



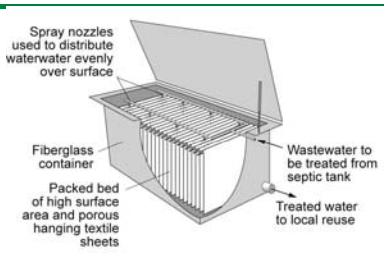


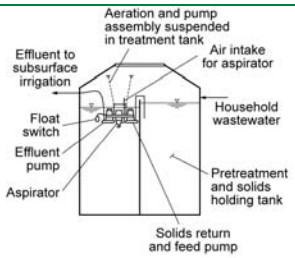
Reduced Variability in Effluent Quality in Septic Tanks with Effluent Filter

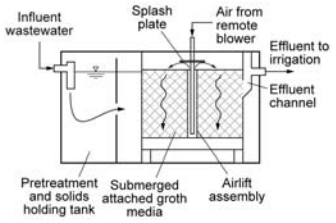


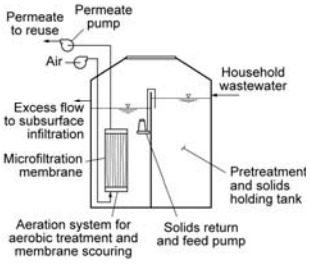


Aerobic Biological Treatment

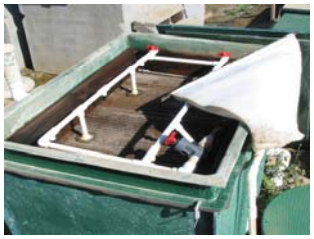


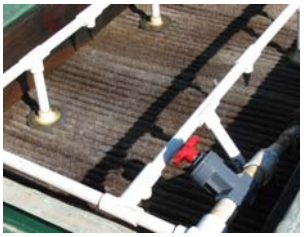




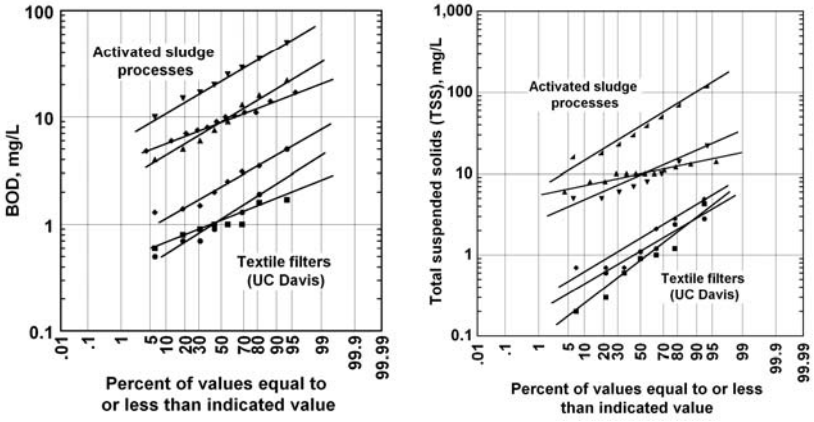


Views: Textile Filter Evaluated at University of California at Davis

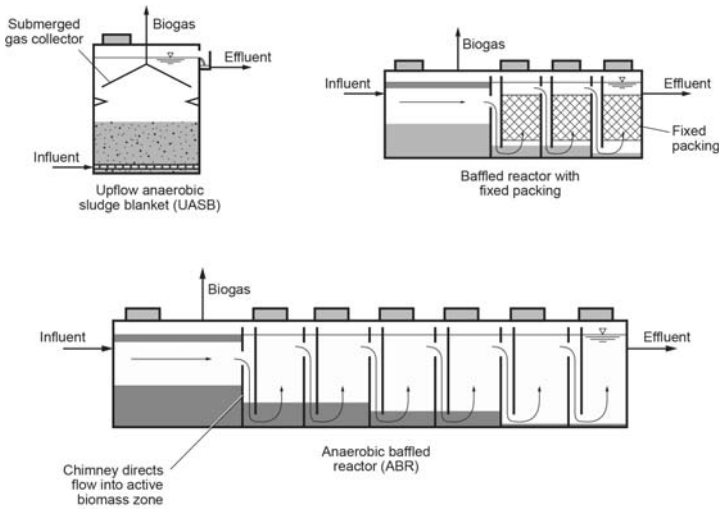




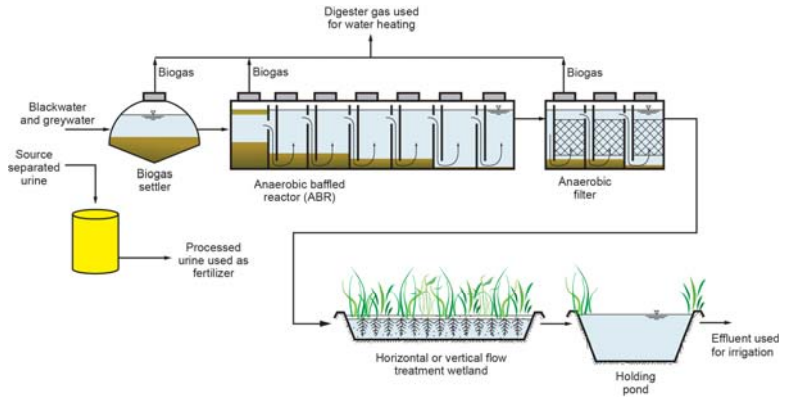
Performance of Textile Filter



Anaerobic Biological Treatment

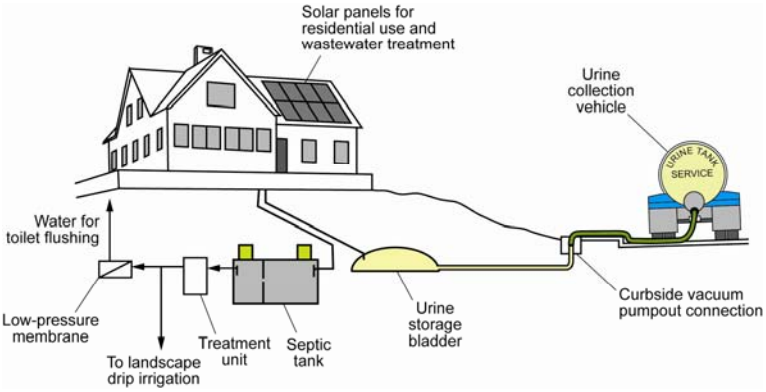


Passive System for Treatment and Resource Recovery



Complete Membrane Treatment Solids Drying with Heat from Wastewater

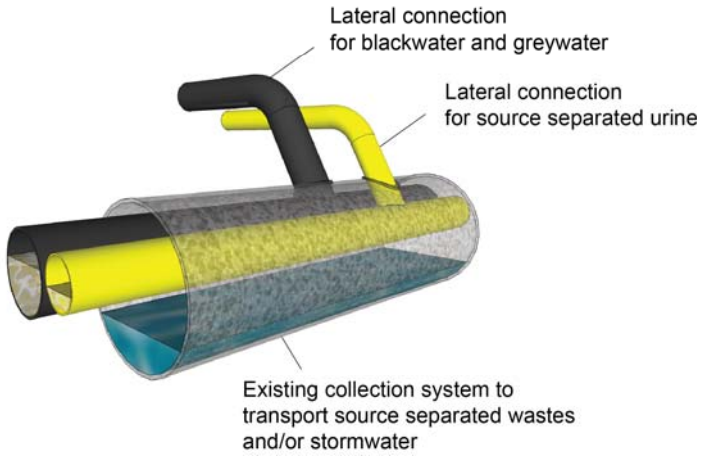
Onsite Wastewater Management with Full or Partial Resource Recovery



Potential Impacts of Urine Separation On Biological Wastewater Treatment Consider Partial Separation

Constituent	With US, mg/L	After primary, mg/L	Cell yield, mg/L
BOD_5	~450	292	190
COD	~1050	525	-
TSS	~500	150	-
NH_4-N	3	~3	Req. N for cell growth 23.5
Organic N	13	~9	
TKN	16	~12	
P (biogenic)	3.3	2.3	Req. P 4.7
P (other)	2.6	1.8	

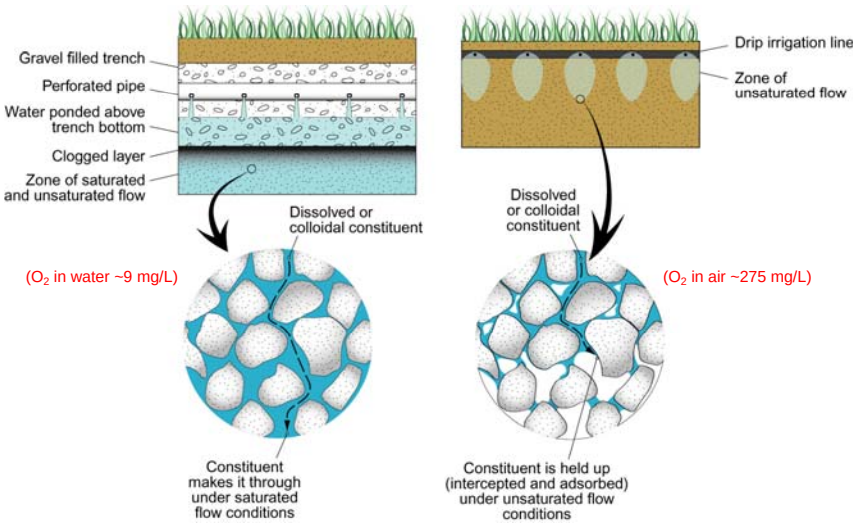
Use of Existing Collection System For Source Separated Resource Streams



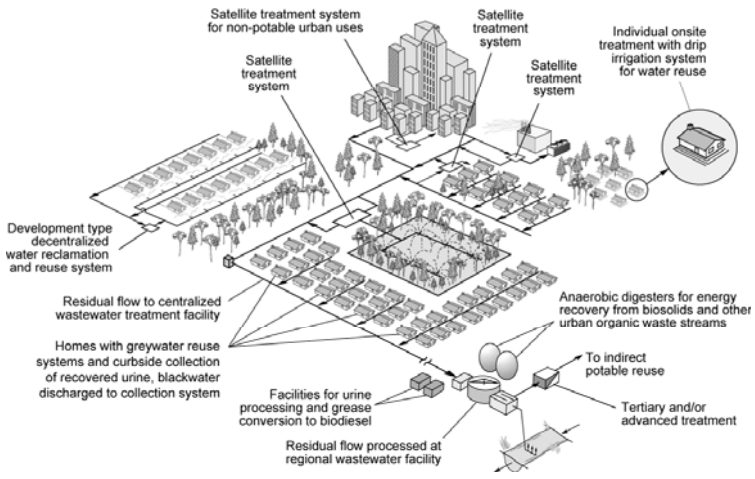
A Strategy for Utilizing the Soil Mantle More Effectively

- Develop a policy for the use of the soil mantel for the treatment of constituents of concern in the 21st century (e.g. pathogens, trace organics, and unknowns) and not BOD, TSS, and/or nutrients
- Eliminate the need for soil characterization for the dispersal of treated effluent
- Develop more effective distribution and dispersal systems

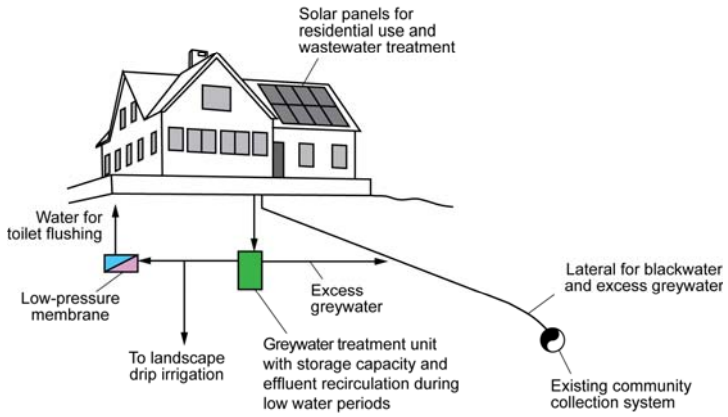
Importance of Holdup Time in Removal of Trace Organics in Soil Treatment



Integrated Wastewater Management With Decentralized, Satellite, Centralized Facilities



Satellite Systems for Greywater Reuse in Urban Areas



Research Needs For Sustainability

- New designs based on modification of wastewater characteristics
- New designs for septic tank pretreatment units
- Research on how to optimize the use of the soil system for pathogens and trace organics
- Hydraulic model to predict holdup times to optimize the dosing system to account for wet weather conditions

What to Expect in the Future

- Onsite systems cannot be considered temporary solutions, but must be designed for the long-haul
- Changes in waste characteristics (e.g. reduced flow rates) due to changes in consumer attitudes, products and fixtures and appliances
- Significant advances in separation, treatment, and reuse technologies
- Utilization of soil for treatment of trace organics
- As conventional treatment becomes more costly, DWM systems will play a vital role in wastewater management

THANK YOU

FOR LISTENING