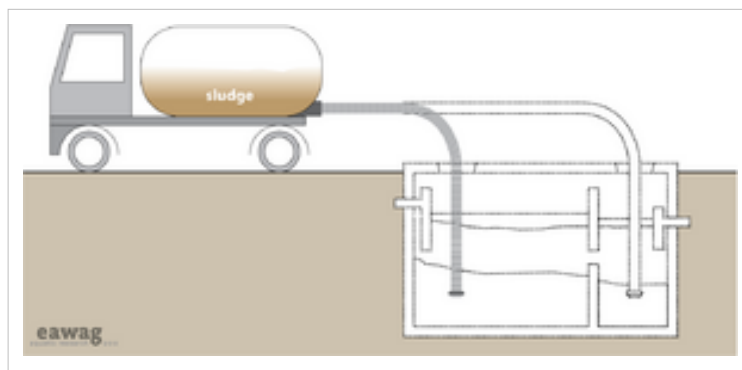


Motorized_Emptying_and_Transport

Application level		Management level	
Household	XX	Household	
Neighbourhood	XX	Shared	X
City	X	Public	XX



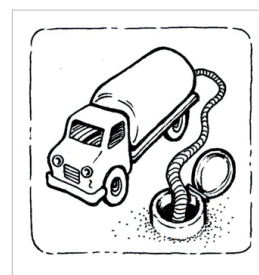
Applicable to systems:	Languages / langues / idiomas		
1, 5, 6, 8			

Inputs: Faecal Sludge , Urine , Blackwater

Outputs: Faecal Sludge , Urine , Blackwater

Motorized Emptying and Transport refers to a vacuum truck or another vehicle equipped with a motorized pump and a storage tank for emptying and transporting faecal sludge, septage and urine. Humans are required to operate the pump and manoeuvre the hose, but they do not lift or transport the sludge.

The pump is connected to a hose that is lowered down into a constructed tank (e.g. septic tank or aquaprivy) or pit, and the sludge is pumped up into the holding tank on the truck. Generally the storage capacity of a vacuum tanker is between 3,000 and 10,000L. Multiple truckloads may be required for large septic tanks.



Both the agencies responsible for sewerage and private entrepreneurs may operate vacuum trucks, although the price and level of service may vary significantly. Some public operators may not service informal settlements, whereas some private operators may offer a reduced price, but can only afford to do so if they do not empty the sludge at a certified facility. The cost of hiring a vacuum truck can sometimes be the most expensive part of operating a sanitation system for some homeowners.

Vacutug

The UN-HABITAT Vacutug Project was conceived in 1995 with the goal of developing 'fully sustainable system for emptying pit latrines in unplanned, periurban areas and refugee camps in the developing countries'. The Vacutug consists of a 500 litre steel vacuum tank connected to vacuum pump which is connected to a gasoline engine that has the capacity to remove sludge (or urine) at 1,700 litres a minute. On level ground, the vehicle is capable of around 5km/h. The waste sludge can be discharged under gravity or by slight pressurization from the pump. Recent results indicate that under certain circumstances (constant number of pits, transfer station, short transfer distance, etc.) the Vacutug can be sustainable and cover its operating and maintenance costs.

A manually operated version of the Vacutug is the MAPET.

Advantages	Disadvantages/limitations
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<ul style="list-style-type: none"> - Fast, and generally efficient. - Potential for local job creation and income generation. - Provides essential service to unsewered areas. 	<ul style="list-style-type: none"> - Cannot pump thick dried sludge (must be manually removed or thinned with water). - Garbage in pits may block hose. - Very high capital costs; variable operating costs depending on use and maintenance. - Pumps can usually only suck down to a depth of 2 to 3m and the pump must be located within 30m of the pit. - Not all parts and materials may be available locally. - May have difficulties with access.
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Adequacy

Although smaller more mobile vehicles have been developed, large vacuum trucks remain the norm for municipalities and sanitation authorities. Unfortunately, large trucks cannot access all pits/septic tanks especially in areas with narrow or non-driveable roads. Also, vacuum trucks can rarely make trips to peri-urban or rural areas since the income generated from emptying, may not offset the cost of fuel and time.

Depending on the collection or treatment technology, the material that needs to be pumped can be so dense that it cannot be pumped easily. In these situations it is necessary to thin the solids with water so that they flow more easily, but this may be inefficient and costly. If water is not available, it may be necessary for the waste to be manually removed. In general, the closer the vacuum can be to the pit, the easier it is to empty. The critical velocity of the sludge required for pumping is dependent on the distance from, and strength of, the vacuum pump; sludge is extremely site specific. Garbage and sand also makes emptying the pit much more difficult.

Health Aspects/Acceptance

The use of a vacuum tanker for emptying a pit latrine or Septic Tank presents two health improvements: (1) emptying maintains the Collection and Storage/Treatment technology and reduces the risk of overflows and (2) the use of a tanker reduces the need for manual emptying, which is quite unsafe and unhygienic. Still, those who operate vacuum trucks may be demonized by the community and may face difficulties with finding appropriate locations to dump and treat the collected sludge.

Maintenance

Maintenance is a crucial part of vacuum truck operation. Trucks are not usually brand new and they often require constant attention to prevent breakdowns. The lack of preventive maintenance is often the cause for major repairs. Most pump trucks are manufactured in North America or Europe. As such, it is difficult to locate spare truck parts and a local mechanic to repair broken pumps and trucks. New trucks are difficult to obtain, very expensive and thus rarely purchased. Local trucks are commonly adapted to serve as vacuum trucks by equipping them with holding tanks and vacuums. Maintenance accounts for at least one quarter of the costs incurred by the operator of a vacuum truck. Fuel and oil account for another quarter of the total operating costs. Owners/operators must be conscientious to save money for the purchase of expensive replacement parts, tires and equipment, whose replacement could be essential to the working of the vacuum truck.

Acknowledgements

The material on this page was adapted from: Tilley, E. et al. (2008). Compendium of Sanitation Systems and Technologies ^[2], published by Sandec ^[3], the Department of Water and Sanitation in Developing Countries of Eawag ^[4], the Swiss Federal Institute of Aquatic Science and Technology, Dübendorf, Switzerland. The publication is available in English, French, and will be made available in Spanish. Available in the IRC Digital Library ^[5]

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 [4] http://www.eawag.ch/index_EN
 [5] <http://www.irc.nl/docsearch/title/163208>



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