

KEY TERMINOLOGY:

Faecal sludge: Faecal sludge is the solid or settled contents of pit latrines and septic tanks. Faecal sludge differs from sludge produced in municipal wastewater treatment plants. Faecal sludge characteristics can differ widely from household to household, from city to city, and from country to country. The physical, chemical and biological qualities of faecal sludge are influenced by the duration of storage, temperature, intrusion of groundwater or surface water in septic tanks or pits, performance of septic tanks, and tank emptying technology and pattern.

Effluent: the wastewater that flows out of a treatment system or supernatant liquid discharged from the septic tank.

Sludge: It is the settled solid matter in semi-solid condition. It is usually a mixture of solids and water that settles at the bottom of septic tanks, ponds, etc. The term sewage sludge is generally used to describe residuals from centralized wastewater treatment, while the term septage is used to describe the residuals from septic tanks.

Septage: Septage is the contents of septic tanks. It includes the liquids, solids (sludge), as well as the fats, oils and grease (scum) that accumulate in septic tanks over a period of time. Grey water or

Sullage: Domestic dirty water not containing human excreta. Sullage is also called grey water. It may be the waste water from housecleaning, kitchens and bath rooms.

Scum: It is extraneous or impure matter like oil, hair, grease and other light material that floats at the surface of the liquid in the septic tank, while the digested sludge is stored at the bottom of the septic tank.

Sewage or Black water: Wastewater generated from toilets containing human excreta and faecal matter is called sewage or black water.

Pit Latrine: latrine with a pit for collection and decomposition of human excreta and from which liquid infiltrates into the surrounding soil.

Pour-flush Latrine: Latrine that depends on its operation of small quantities of water, poured from a container by hand, to flush away feces from the receiving pan.

Septic Tank: An underground tank that treats wastewater by a combination of solids settling and anaerobic digestion. The United States Environmental Protection Agency (US EPA) defines a septic tank as an on-site treatment system of domestic sewage, consisting of two or more compartments, in which the sanitary flow is detained to permit concurrent sedimentation and sludge digestion.

Desludging: The operation of removing sludge from septic/digestion tanks, pit latrines or any other primary treatment unit is called de-sludging. Usually this is done by mechanical means (by vacuum suction pump

Faecal Sludge Treatment Plants (FSTPs): An independent faecal sludge and septage treatment facility for remediating the solid and liquid components to prescribed standards for safe disposal and reuse.

ABBREVIATIONS:

FSSM	Faecal sludge and septage management
FSTPs	Faecal Sludge Treatment Plants
STP	Sewerage treatment plant
СРСВ	Central Pollution Control Board
GPCB	Gujarat Pollution Control Board
CPHEEO	Central Public Health and Environmental Engineering Organisation
FCO	Foreign & Commonwealth Office
UDD	Urban Development Directorate
UASB	Upflow Anaerobic Sludge Blanket Reactor
ASP	Activated Sludge Process
SBR	Sequential Batch Reactor
US EPA	United States Environmental Protection Agency
AMC	Ahmedabad Municipal Corporation
ULBs	Urban Local Bodies

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1. INTRODUCTION

1.1 What is FSSM?

Faecal Sludge and Septage Management is the process of safe collection, conveyance, treatment and disposal/ reuse of Faecal sludge and septage from onsite sanitation systems such as pit latrines, septic tanks, etc., i.e. the management of the faecal waste which is not conveyed by a centralized sewerage system.



The sanitation chain.

Figure 1. Schematic Diagram of FSSM Operation

A typical FSSM system involves mechanized desludging of a septic tank/pit latrine using a suction emptier machine, which then stores the collected waste in a sealed container and transports it to a treatment facility. In some cases there is a transfer station for temporary storage of faecal sludge before being transported to a treatment facility by a different vehicle. At the treatment facility (either a dedicated FSTP or cotreatment in STP), the Faecal sludge/septage undergoes pre-treatment, followed by primary and secondary treatment (even tertiary treatment and polishing). Some efficient treatment facilities also incorporate resource recovery (methane, reuse of treated wastewater, manure/ soil conditioner, etc.) in the treatment process. The final residual product from the treatment plant is either recycled/reused or disposed safely in the surrounding environment that would comply with all pollution and quality standards. There can be multiple deviations of this process at various stages across the sanitation value chain depending on site situation, techno-economic feasibility and capacities of the operators & regulators. The challenge is to streamline all these processes. This entails various concomitant interventions including institutional and regulatory measures, such as formulating bye-laws/regulations related to onsite sanitation, creating database on on-site sanitation arrangements in the city, explore possibilities for private sector involvement in FSSM & levy tax / charges to finance FSSM activities, monitoring and evaluation framework and public awareness/ stakeholder engagement activities.

Efficient FSSM operation entails streamlining all processes and components along the 'sanitation value chain for on-site sanitation systems' during planning, design, implementation, operation and monitoring. Successful FSSM operations need active coordination and participation among relevant stakeholders – ULBs, service providers, operators, ward councilors, residents/community groups, state government, funding agencies, etc. While FSSM may not be complete stand alone sanitation solution (as it deals primarily with faecal waste and management of liquid waste is secondary), it is one of the fastest, economical and least intrusive approach in achieving immediate health and environmental improvement, especially considering budgetary and human resource constraints of smaller urban settlements. It also provides flexibility to incrementally improve the system to achieve complete sanitation coverage in consonance with settlement growth and investment flow.

2. PROCESS OF FSSM:

The responsibility of septage management lies with the concerned Urban Local Bodies (ULBs). The following are the key components of a Septage Management Plan:

- 1. Collection & Transportation.
- 2. Treatment.
- 3. Reuse/ Recycle/ Dumping.



2.1 COLLECTION & TRANSPORTATION:

Proper collection and transportation of septage is one of the most important components of septage management.

As per the CPHEEO Manual on Sewerage and Sewage Treatment, 2013"yearly desludging of septic tanks is desirable, but if it is not feasible or economical, then septic tanks should be cleaned at least once in two - three years, provided the tank is not overloaded due to use by more than the number of persons for which it is designed."

Under the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 desludging / emptying of septic tanks is to be under taken by mechanical devices like suction emptier trucks / vacuum tankers. These desludging trucks collect septage at the household level and transport it to treatment.

2.2 TREATMENT:

Once collected, the septage needs to be treated as per the CPCB and GPCB norms before disposal. Septage has constituents similar to municipal waste water, which make the co-treatment of septage along with sewage feasible. If the Sewage Treatment Plants (STP) is not designed to deal with the septage, the plants can increase their aeration capacity and in some cases also expand their facility to cater to the excess waste. For septage to be treated at STPs, the following approaches can be adopted. Septage addition to nearest sewer manhole Septage addition to STP Septage addition to sludge digesters/sludge drying beds

However, in the absence of an STP, ULB should plan a new septage treatment facility taking the following parameters into consideration (UDD, 2016)-accessibility of the treatment site; availability and reliability of electricity; appropriate distance from residential areas; geological conditions.

2.3 RECYCLE/ REUSE/ DISPOSAL:

Reusing refers to the act of returning the products to the environment as either useful resources or reduced-risk materials. The treated septage can be used as a soil enriched or as filling material at construction sites. Properly treated sludge can be reused in the following ways.

Soil Conditioner- It can be applied on parched land as a soil conditioner, oras a fertilizer in agriculture. Crops which could be safely grown are corn, fodder, cotton, trees including fruit trees, eucalyptus and poplar. Aquaculture- Settled septage effluent can be applied to freshwater where it is possible to achieve dilution to ensure dissolved oxygen is above 4 mg /l. Fish species of tilapia and carp are preferred since they tolerate low dissolved oxygen.

ULBs should carry out a primary assessment for the availability of markets for treated sludge and the demand for reuse. However, for dewatered septage to be used as a fertilizer it should satisfy the following criteria of Classification as per FCO norms.

3. FSSM ACTION PLAN:

Out of 64 nos of Sewage Pumping Station of Ahmedabad Municipal Corporation, faecal Sludge is discharged to pumping stations with help of various machineries of area having no regular Sewage network and faecal sludge from this designated point reaches to Nine STPs for further treatment. The detailed location of STPs and relevant SPS is as below.

Zones	No. of Sewage Pumping stations	No. of Storm water pumping station		
North	12	08		
South	15	12		
East	12	09		
West	15	02		
Central	10			
New West				
Total	64	31		

Table 1. Zone wise pumping Station Details

Table 2. List of STPs

Sr.No.	Name of STP with Capacity	Treatment Technology	Year of commissioning
1	106 MLD, Old Pirana	Upflow Anaerobic Sludge Blanket Reactor (UASB)	2003
2	126 MLD, Vasna	UASB	2003
3	180 MLD, New Pirana	Activated Sludge Process (ASP)	2009
4	60 MLD, Old Pirana	ASP	2009
5	35 MLD, Vasna	ASP	2009
6	240 MLD, Vasna	ASP	2011
7	70 MLD, Vinzol	ASP	2011
8	60 MLD, Jalvihar, Vadaj	Sequential Batch Reactor (SBR)	2019
9	48 MLD, Vasna	SBR	2018

Ahmedabad Municipal Corporation has 114 Nos of machinery for Desilting/Cleaning of Sewer Manhole and line. Ahmedabad Municipal Corporation also provides machinery on Rental basis for sewer manhole and line cleaning in inside the city as well as outside of city. The table below shows the various categories of machineries available with AMC.

Name of Zone	Super Sucker machine	High flow jetting machine	Eicher mounted jetting machine	suction machine	Jetting cum suction machine (combined)	Mini jetting cum suction cum rodding machine	Total machine Qty
East Zone	2	2	1	1	3	2	11
West Zone	1	2	1	0	2	1	7
North West / South West Zone	1	1	1	0	3	2	8
North Zone	2	2	1	1	2	2	10
South Zone	2	2	2	1	3	2	12
Central Zone	2	2	2	0	3	3	12
NWZ / SWZ /CZ	0	0	0	1	0	0	1
NWZ /SWZ/ SZ	0	1	0	0	0	0	1
Grand Total	10	12	8	4	16	12	62

Ahmedabad Municipal Corporation provides above machineries as per requirement of Citizen on rental basis and as per rate approved by competent authority. To get facility, Citizen can approach nearer ward office or relevant zone office and submit the application to get the facility available. Competent officer get it approved at appropriate level and inform applicant to remit the deposit & rent and after completion of financial formalities machine being sent to site of the complaint of applicant.

Ahmedabad Municipal Corporation	2018