

Partnership for Building Expertise on Faecal Sludge Treatment in West Africa

About ten years ago, Senegal initiated a dynamic process to increase urban sanitation coverage, with on-site sanitation as its main focus. Provisions have also been made to treat the increasing volumes of faecal sludge (FS) in decentralised treatment plants. In 2005, the national sanitation agency (ONAS) engaged in a collaboration with Sandec to build FS management expertise and provide pilot facilities for testing and investigating appropriate FS treatment options in Senegal.

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Continuous upgrading of Dakar's sanitation system

Dakar, capital of Senegal, with a population of 2.5 million in 2005, is situated on a peninsula of about 550 km² at the most western point of Africa. It has one of the highest sanitation coverage in Africa. This is attributed to the willingness of Senegal's government to attain the "Millennium Development Goals" by 2015. ONAS was assigned the task of developing the "Target 10" of the MDGs, i.e. to reduce by half the number of inhabitants without sustainable access to safe drinking water and adequate sanitation. In 2002, the "Projet Eau à Long Terme" (PLT) was thus initiated with the support of the World Bank to substantially increase water supply and sanitation coverage. In particular, excreta management is to be improved by enhancing household access to on-site sanitation, developing effective pit emptying and implementing faecal sludge treatment plants in peri-urban areas of Dakar.

PaqpuD (*programme d'assainissement des quartiers péri-urbains de Dakar*), a component of PLT, will furnish 60,000 households with on-site sanitation systems and cater for the implementation of 160 condominiumal schemes¹ by 2008. Regarding sanitation access in Dakar, PaqpuD's objective

is to attain sanitation coverage of 85% of the population by 2015 (coverage in 2002 amounted to 57% and 64% in 2004), compared to 60% urban sanitation coverage in the country as a whole.

Both individual and condominiumal septic tank systems require the settled sludge to be pumped out at a frequency of once every 1–4 years, depending on the number of users and tank size. According to forecasts by ONAS, some 1,000 m³ of faecal sludge may have to be treated daily upon completion of the envisaged sanitation infrastructure by 2008.

Faecal sludge and wastewater disposal in Dakar

An integral component of sanitation upgrading in Dakar is the implementation of FS and wastewater treatment plants. Prior to the sanitation project, Dakar's faecal sludge was treated in the Belair treatment

plant located in the town centre and discharged into Hann Bay. Since very dense traffic often hindered the suction vehicles from reaching the septic tanks, most of the FS produced in Dakar never reached the treatment plant but were disposed of either in sewer manholes, on open land or buried into roadside holes or directly in courtyards. The Belair plant provided only partial treatment. The sewage from one sector of the city was partly treated in a wastewater treatment plant (WWTP) in Cambéréne, and the sewage from the other part of Dakar was disposed of directly into the sea (Fig. 1).

In recent years, three wastewater and FS treatment plants were constructed. The FS treatment plants, with an overall capacity of 220 m³ FS/day, were built at the same sites as the WWTPs. They comprise solids-liquid separation in sedimentation/thickening tanks. The solids are subjected

Figure 1: Overview of Dakar's faecal sludge and wastewater discharge before implementing PaqpuD, the World Bank co-financed sanitation upgrading programme.



¹ Condominial systems, which rely on cistern-flush toilet installations and make use of small-bore sewerage, may comprise a septic tank collecting the faecal matter from a group of houses. Such systems prove appropriate in densely built-up housing areas where there is a lack of space for latrines and emptying vehicles to access individual on-site sanitation installations. Such systems require an adequate and reliable quantitative water supply.

² The three-year Velux project includes a second sub-project located in Bangkok, Thailand, where a PhD thesis will be conducted on sludge reed bed (constructed wetlands) treatment, including the development of FSM dissemination material.

³ Velux is a Danish-Swiss firm producing in-roof windows.

to dewatering/drying on sludge drying beds followed by prolonged storage to reach hygienic standards. The liquids resulting from these plants (supernatant and percolate) are added to the raw wastewater entering the WWTPs. Components of the FS treatment plant in Cambéréne are illustrated in the photos on the right.

Further FS treatment plants will be constructed under the PLT in three secondary cities of Senegal, viz. Saint-Louis, Louga and Kaolack.

Reinforcing expertise in FSM – A component of the Velux project in Dakar

Right from the start of the PLT, ONAS was aware that project success would primarily depend on its acceptance by Senegal's sanitation experts. ONAS, conscious that sustainability of the newly built or future FS treatment plants in Dakar goes hand in hand with the training level of the staff responsible for the plants, approached Sandec in 2004 and requested its assistance in developing expertise in the FSM sector. A collaboration agreement was subsequently signed. Furthermore, a grant received from the Velux Foundation^{2,3} will allow establishing a pilot demonstration facility for FS treatment options and an investigation site for researchers. It will further contribute to gaining and disseminating knowledge on FSM. Training events will be organised for planners, managers and technical staff as well as for trainers.



Sandec



FS plants in Dakar prior to commissioning: (left) settling-thickening tank seen from the outlet end, (right) drying beds for the separated solids.

Sandec's training involvement will be high at first and decrease at the pace at which local expertise is being developed. ONAS and Sandec plan to expand their partnership to include UCAD (University of Cheikh Anta Diop, Dakar). The partners aim at involving MSc and PhD students to conduct applied field research on FS treatment. This will assist the University in creating a pool of competence and expertise in water and sanitation in Senegal and other West African countries.

The FS pilot plant

The plant, which will comprise several FS treatment options, shall serve as a demonstration and training site, as well as a place for investigations by researchers. It will supply information on performance, process understanding, design and operation of different treatment methods and pro-

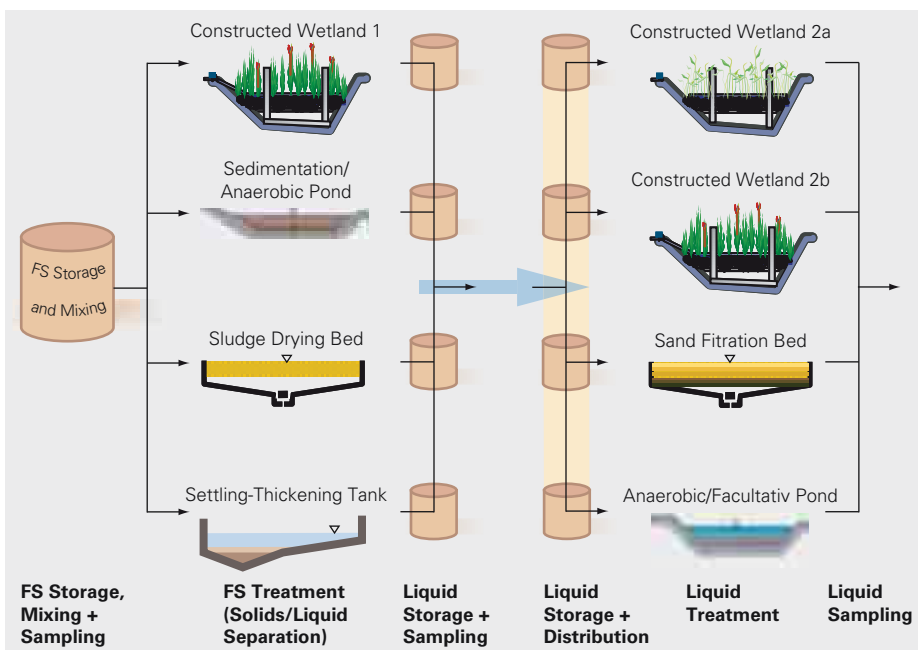
cess combinations. These combinations aim at producing effluents, which should not require further treatment prior to their discharge into receiving waters, and generating hygienically safe biosolids, which can be used as soil amendment-cum-fertiliser.

The FS pilot plant will be installed adjacent to the Cambéréne full-scale FS and wastewater treatment plants to make use of ONAS's own laboratory located on the same site. It is conceived as four 2-stage treatment series, each comprising a solids/liquid separation and a liquid treatment step. A functional sketch of the pilot plant is provided in Fig. 2.

Each option can be used as a large-scale "laboratory" unit for research on mechanisms of sludge/effluent treatment, and will be complemented by laboratory or yard-scale studies as required. Topics for the applied research to be conducted on the pilot station have not yet been identified but will be chosen based on related gaps-in-knowledge identified to date and upon joint deliberation.

The pilot plant design should allow inclusion of a wide range of studies in disciplines such as treatment engineering, microbiology, hydrobiology, and botany. We hope that the future FS treatment plants built in Senegal and elsewhere can profit from the enhanced knowledge on FS treatment mechanisms, and that a sound basis for the formulation of treatment standards for FS treatment plants can be laid. ○ ○ ○

Figure 2: Functional sketch of the planned FS pilot treatment plant in Cambéréne, Dakar, Senegal.



- [1] Web page of ONAS: www.onas.sn/onas.htm
- [2] CREPA-Sénégal: PROGEBOUE: Projet de Gestion des Boues de Vidange, État des lieux (2002).
- [3] ONAS: Mise en œuvre et état d'avancement, résumé réalisations PAQPUD (2005).
- [4] For general reference, consult Sandec's website on FS treatment and management www.sandec.ch/FaecalSludge