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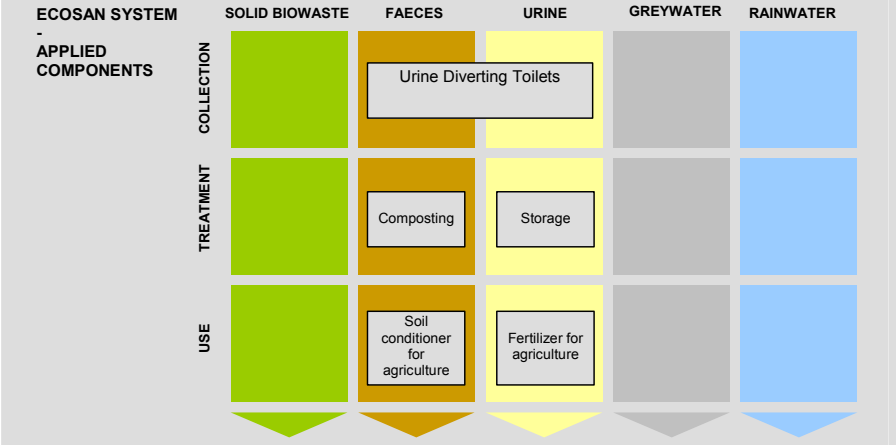
Gebers collective housing project

Orhem, Sweden



1 General Data

Type of Project:
Ecological cooperative housing project

Project Period:
start of the project: 1998

Project Scale:
32 apartments, 80 inhabitants, 3500 m² living area

Address:
Gebersvägen 20-30, S-12865 Orhem, Sweden

Planning Institution:
HSB (The National Association of Tenants Savings and Building Societies) and EKBO (Ecological Collective Housing in Orhem)

Executing Institution:
HSB and EKBO

2 Objective of the project

Along with having a series of social aims, the main objectives of this project were environmental protection and the installation of systems which close the loop to the greatest possible extent. This resulted in the implementation of a holistic sanitation system that recycle all nutrients from human waste for the benefit of agriculture.

3 Location and general conditions

The “Gebers” collective housing project is located in an area with a Nordic climate on a 3,2 ha site on the lake of Drevviken, in Orhem, a southern suburb of Stockholm, near a nature reserve.

The project was promoted by a network of friends and neighbours, who had a vision of communal living based upon practical, human and ecological considerations. They formed an organisation called *”EKBO”* (Ecological Collective Housing in Orhem) in 1995. In 1998 work began to convert the

Figure 1: Gebers Building
(source: VERNA Ecology Inc.)

“Gebers” site, a former convalescent home which had become a deserted and vandalised building complex of 3500 m², to 32 apartments and facilities for collective use, including a large kitchen, a dining-hall, a sauna and a laundry room. Currently around 80 people live at the Gebers.

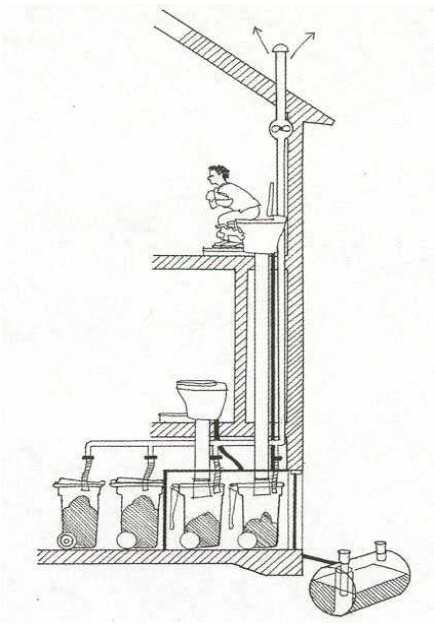


Figure 2: Gebers system scetch
(source: SEI)

Figure 3: Bathroom at Gebers
(source: EKBO)

4 Technologies Applied

Right from the start EKBO decided to install toilets that separate urine, with the single-flush urine-diverting toilets, the *“ES-Classic”* model of Wost Man Ecology AB being installed.

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With this model the urine bowl is flushed with 0.1 l of water. It is piped in polypropylene pipes of 50 mm diameter to groups of polypropylene collection tanks of 10-15 m³ under the house.

Figure 4: Urine Collection Tank *(source:* VERNA Ecol.*)*

The faeces are collected without flushing water and fall straight down through gravity pipes of 200 mm diameter into individual ordinary plastic bins of 140 l in the cellar, which are removed when full.

Figure 5: Faeces Collection Bin *(source: VERNA Ecol. Inc.)*

No additional solid waste is allowed to be thrown into the toilet. An extraction system draws air from the ventilation outlet of the bathrooms through the faeces collection area and to a vent pipe on the roof of the house. This keeps the faeces bins under negative pressure, improves their dehydration and removes odours even when the toilets are in use.

At present greywater is not treated locally. It is instead led to conventional gravity sewers and the Henriksdals wastewater treatment plant.

5 Type of reuse

The urine tanks below the house are emptied 2-3 times a year. It is then transported to a farm 30 km south of Stockholm, where it is stored in 3 reservoirs of 150 m³ for 6 months for hygienic reasons.

The treated urine is then used as fertiliser in agriculture and is enough for approximately 2 ha of barley.

Figure 6: urine application on the barley field *(source: VERNA Ecology Inc.)*

When full, the faeces bins are transported to a composting site, approximately 200 meters from the building.

Figure 7 : Faeces compost *(source: VERNA Ecology Inc.)*

Here it is composted and need only be removed after 5-6 years. It is planned to use the compost in agriculture as soil conditioner for racing horse feed on a farm 10 km away.

6 Further project components

- As stated, the adaptation to natural processes and recycling were and still are major objectives of the project. The use, and reuse, of all material related to the site and a strict use of ecological building materials were maxims for the work. A cooperative for joint buying and selling of the apartments was founded.
- it is planned to minimise the consumption of public drinking water by increasing the use of lake and rain water as well as to provide a constructed wetland for grey water treatment.
- The existing central oil heating was replaced by a pellet furnace with an accumulator tank for peak heating requirements.
- Solar panels are used to heat water.
- All electrical equipment is PVC free and as energetically economical as possible.
- The composting of faeces is combined with organic household waste.

7 Project History

After forming EKBO and buying the property a co-operation contract with HSB, Sweden's biggest association for cooperative housing, was concluded. They were jointly responsible for the management of the project and ran it together; with HSB providing financing and construction know-how, and EKBO providing the initiative, the organisation of the residents and the generation of ideas and practical solutions.

Such a participatory and ambitious project requires individual and innovative solutions at nearly every level. It therefore resulted in intensive discussions between the authorities, the companies involved , the future inhabitants and a range of consulting services which required a large input of both time and money.

The vague building regulations for such a conversion in particular led to some very elaborate solutions being requested by the authorities for caution reasons.

Also the building itself turned out to be defective in various respects (with asbestos, damp, rot, mould).

8 Costs

The extra investment cost for the sanitation system were calculated to be around 90,000 USD - less than 3000 USD per apartment. This included the price for the Wost Man Ecology "ES-Classic" toilet of around 300 USD. The price for the urine collection system was approximately 500 USD per flat.

The price for the faeces collection system became very high due to strict fire safety regulations, which led to additional consulting costs. This required approximately 3000 USD per apartment.

Running costs for the evacuation of the urine collection tank costs approximately 1,000 USD per year.

9 Operation and Maintenance

Each apartment owner is responsible for the control and emptying of the their faeces collection bin. They are normally emptied twice a year and deposited collectively at the composting site. The composting process is overseen by two dedicated residents of the Gebers. When completely composted it has a soil-like appearance.

The urine tanks are emptied at three collection points by a tanker truck with a vacuum system and delivered to the farm.

For the time being the use of these fertilisers is a service provided by the farmers to the project, as the use of excrements is not yet officially recognised in Sweden and artificial fertiliser is relatively cheap.

10 Practical experience and lessons learned, comments

- Generally the project highlights how motivated and flexible stakeholders are able to find appropriate solutions for a more sustainable lifestyle.
- The overall system performance is satisfactory for the users. Some problems have occurred but were solved by improved planning and management.
- Most problems were related to urine sediments which are surprisingly voluminous. Pipes tend to get clogged if the diameter is rather small (under 50 mm) and if there are any water traps (which initially existed in the form of a narrow horizontal wastewater hose between toilet and downpipe). Cloggings can be cleaned mechanically and with low amounts of hot water under pressure. This should be best performed when the tanks are emptied to avoid dilution of the urine.
- Any Water-traps should be avoided and are in any case unnecessary because of the ventilation system.
- Based on practical experience, a urine pipe diameter of 110 mm is recommended for the common part of the system to which all toilets are collected.
- Fly barriers, installed in places that allow an easy cleaning, should be integrated into the ventilation system.
- The addition of ash, or a more frequent (less than 6 months) emptying of the faeces bins, have both proved suitable to prevent fly invasions.
- Conventional plumbers need intensive instruction since they are normally not familiar with how the system works system.
- Toilets with integrated collection bins could have saved investment costs compared to the existing system, which connects even the toilets on the second floor to the bins in the cellar.
- The average water consumption is apprixomately 110 l, which is considered very low in Sweden.

11 Available documents and references

Website: http://www.ekbo.se

Sven Ingvar-Nilsson, 2001: *Nutrient Recycling in Gebers Housing Project, Sweden*, (case study No.4), http://www.iees.ch/cs/cs_4.html

Elisabeth Kvarnstörm: *Alternatives to Conventional Wastewater Systems* www.ccb.se/downloads/gebers_bk.ppt

Andersson. Pia: *Gebers, a Recycled Building* http://www.ekbo.se/sidor/hsb_brochure_english.html

SEI (Stockholm Environment Institute), 2004: *Ecological Sanitation*, SEI, Stockholm, Sweden.

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