

Decentralized Raw Sewage Utilisation for Irrigation of Green Areas in Arid Cities

Background

Public green spaces like parks or road medians are essential for life in arid urban areas as they positively influence the local climate and reduce the appearance of dust. To keep spaces in a proper condition despite arid climate they have to be intensively irrigated. Even in regions with scarce water resources, mostly potable water from public water supply systems is used for this purpose, resulting in an increasing lack of water for higher-valuable uses. On the other hand, particularly in arid developing countries, completely uncontrolled use of raw wastewater for irrigation purposes is widely spread, with all the hygienic problems linked to this.

Within a joint research project of the German Hans Huber AG and the Institute of Environmental Engineering and Management at the Private University of Witten / Herdecke (UTM/IEEM), a decentralized system for controlled utilisation of sewage as irrigation water in public green areas has been developed and should be demonstrated by a pilot plant in an arid location, using wastewater from the existing sewage system.

Aim of the project is not to offer a costly full purification facility for sewage but a comparatively efficient system with partial treatment and disinfection of raw wastewater, only as far as it is necessary for the specific use in urban green spaces.

Development of a pilot system

When talking about wastewater reuse for public green areas, appropriate wastewater disinfection is the main objective. The reduction of organics, nutrients etc is usually of minor relevance, as nutrients are often needed as fertiliser. Therefore, the technical treatment concept has to be focused on the mechanical purification and disinfection of wastewater.

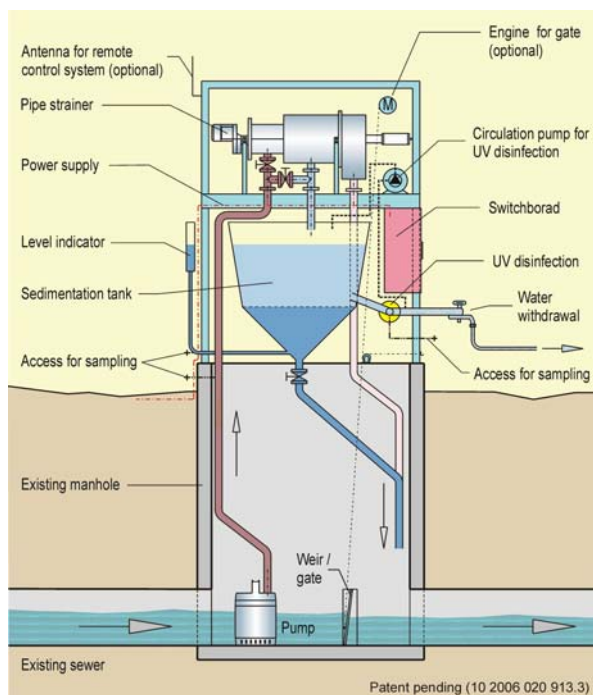


Figure 1 Schematic scheme of the pilot treatment system

To make it reliable especially for **decentralised** applications, the complete treatment unit should be as **compact** as possible and most **flexible** regarding the conditions of the application locality.

Funded by the German Federal Ministry of Research (BMBF), a specific pilot system has been developed, fulfilling these demands. The system is schematically displayed in figure 1. It mainly consists of four elements:

- a pump to feed the system with raw sewage from existing sewage systems,
- a mechanical separation of solid wastes by a pipe strainer,
- a sedimentation tank to reduce the suspended solids,
- a following disinfection unit with UV-radiation.

The compact system can be located on or next to a manhole of sewage systems and moved to other locations, if needed.

Multi-barrier strategy

In addition to the technical concept, a multi-barrier strategy for hygienic risk management regarding irrigation of public areas with wastewater has been outlined, as there are:

- (1) water reutilization suitable for the site conditions
(like geological situation, kind of plantings, etc.),
- (2) way of handling suitable for the water reutilization
(e.g. regarding transport and distribution of the irrigation water),
- (3) treatment suitable to the way of handling of raw sewage
(especially regarding pathogen reduction).

Experimental verification of the treatment process

Literature review has shown that there is little knowledge about disinfection of partly purified raw wastewater. At previous projects different disinfection technologies have been researched. UV disinfection was identified as the most appropriate disinfection technology in this context.

Within the project experiments with filtration, sedimentation and UV disinfection on laboratory scale are carried out (technically supported by WEDECO AG). One research focus deals with the question, to which extent UV disinfection efficiency is lower for poorly treated wastewater in comparison to the disinfection of fully treated wastewater.

Accompanying socio-economic study

To verify the acceptance and feasibility of the concept, an accompanying socio-economic study will be drawn up, taking into consideration the specific local and regional conditions.

Summary

Within the research project, a compact system has been developed for the efficient de-centralised reuse of wastewater from existing sewage systems for irrigation of green spaces like parks and road medians of cities in arid regions. The relatively simple and flexible system may be an important component to reduce the use of potable water for irrigation purposes in these regions.

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