COMMISSIONING OF A GRAVITY-DRIVEN ULTRAFILTRATION UNIT FOR DECENTRALISED WATER SUPPLY

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In order to meet the Millennium Development Goals, a market breakthrough for membrane-based systems for decentralised water supply is expected. In these regards, the development and demonstration of a new ultrafiltration low-energy unit are planned within the EU research project TECHNEAU (www.techneau.eu). This small-scale system (SSS) is based on a gravity-driven ultrafiltration (UF) process developed by Eawag, which enables operation without crossflow, backflush, aeration or chemical cleaning. Only a regular mechanical drainage of the membrane reactor is to be required. Hence, Eawag, KWB and Opalium conceived a membrane-based SSS, which can treat up to 5 m^3/d of natural surface water – enough to satisfy drinking water needs for a community of 100-200 inhabitants. Compacted in half a standard (20 Feet) maritime container, the prototype is composed of:

- a biological sand filter, which significantly improves the membrane permeability as the biological layer ("Schmutzdecke") on the sand surface consumes some of the raw water constituents [1]
- a flat-sheet UF module, whose long-term operation can produce a stable flux (about 10 lmh) over months although no maintenance is performed [1]
- a storage tank for residual chlorination to guarantee an overall integrity of the system.

Before being demonstrated in a real environment in South Africa, the compact unit is tested under controlled conditions in Annet-sur-Marne, France, on river water in order to ensure its technological reliability. This study further presents the results of these preliminary investigations, focusing on the process features of the unit (flow capacity, bacterial and virus removal efficiencies) in function of periodicities of mechanical cleaning and intermittent operation. Capital and operational costs of the systems will also be assessed, especially in regards to the pretreatment option. These investigations will demonstrate if UF membrane systems can be operated without chemicals and energy, and stand as cost-effective options for decentralised water supply.

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References:

[1] Peter. M., Pronk W. (2008). *Development of a household ultrafiltration system for developing countries.* International Congress on Membranes and Membrane processes, 12-18/07, 2008, Honolulu, Hawaï, USA.