Treatment performance and suitability of EU-Certified DWWT-technologies treating strong wastewater representative for Jordan

Key findings

This study clearly showed that EU-certified DWWT-technologies are fully capable of treating strong wastewater representative for Jordan.

Post-certification of the EU-certified DWWT-technologies under local Jordanian socio-economic and climatic conditions should be mandatory.

A Jordanian certification system should include: 1) Technologies for decentralized wastewater treatment and reuse (DWWT&R), 2) O&M personnel and 3) Organizational framework for permission, control and approval.

Small wastewater treatment systems can contribute to cost-effective decentralized solutions in rural areas (Massoud et al., 2009).

Within the European countries, all wastewater treatment systems (up to 50 PE) must be certified according to EN 12566-3 (DIN EN 12556-3, 2005). In Jordan, no such standards for DWWT-technologies and their O&M exists. Therefore, a certification system for manufacturers, operators and products is required in Jordan to ensure a minimum quality and performance standards for wastewater treatment and reuse solutions in Jordan.

Wastewater in Jordan is typically 'strong' (e.g. BOD_5 > 500 mg/L) which is potentially due to high water scarcity and thereby low water consumption (ca. 40-70 L/capita/day). EU-certified smaller treatment systems are not automatically designed and tested to purify such strong wastewater containing high concentrations of BOD_5, ammonium, phosphorus etc.

This study compared the treatment performance and suitability of conventional DWWT-technologies treating wastewater representative for Jordan.

A three-phase experiment was carried out with a mean BOD_5 concentrations of 300, 600 and 1200 mg/L in Phase I, II and III, respectively, at the BDZ site in Leipzig (Fig. 1). Modified wastewater with increasing BOD_5, N, P, TSS concentrations was prepared (Maisonnave et. al., 2011). For simulating different wastewater compositions, a dosing station with a storage tank and a mixing tank was constructed at the site (Fig. 2).

Figure 1: The distribution system for loading and O&M of the DWWT-technologies at the BDZ.

Four (4) DWWT-technologies (4-8 PE) were used in this study: 1) Moving Bed Biofilm Reactor (MBBR), 2) Sequencing Batch Reactor (SBR),

Figure 2: A dosing station (22 m³) and a container with a mixing tank inside.

3) Membrane Bioreactor (MBR), 4) Aerated Vertical-flow Constructed Wetland (AVFCW). 24-h mixed samples were collected and analysed on a weekly basis from each plant outlet.

SMART - Sustainable Management of Available Water Resources with Innovative Technologies in the Lower Jordan Valley - A region, shared by Jordan, Israel, and the Palestinian Territories, that is characterized by severe water scarcity and has a long history of political tensions.

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The results with a mean BOD_5 and COD concentration of <10 and <70 mg/L in the effluent from the systems showed a mean BOD_5 and COD removal of 99% and 97%, respectively (Fig. 4).

The removal of TN, TP, ***E. coli*** and TSS also showed highly efficient treatment performance of the technologies and no sign of clogging or fouling were observed.

Mean DO concentrations were also in the range of 7 to 10 mg/L in the outlet of all the systems (Fig.3).

It can be concluded that these four selected DWWT-technologies are fully capable of treating wastewater representative for Jordan (BOD_5 > 500 mg/L) and can be adapted to operate in rural areas of Jordan.

However, a post-certification of the EU-Certified DWWT-technologies under local Jordanian socio-economic and climatic conditions should be mandatory before the final permitting process. Beside the post-certification of technologies, a future Jordanian system should also include the organizational framework as well as the certification of the O&M personnel.

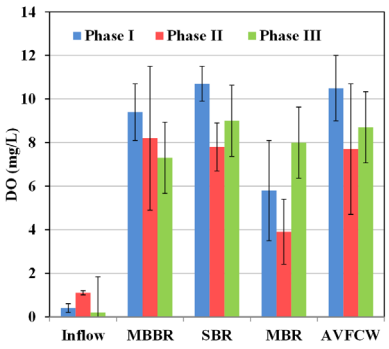

Figure 3: DO concentrations in different experimental phases

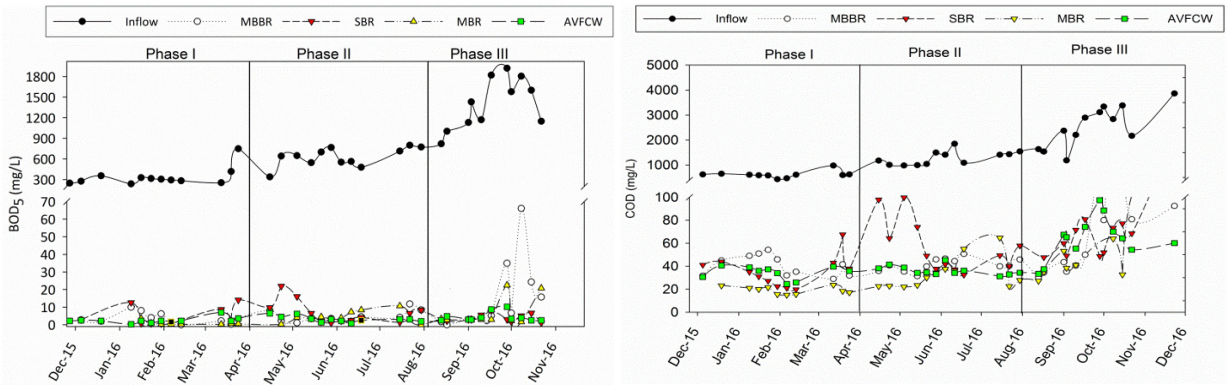

Fig. 4: BOD_5 & COD concentrations

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