

Life Cycle Management of Advanced Wastewater Recycling Technology in Textile Industry

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Waste2Fresh

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Introduction

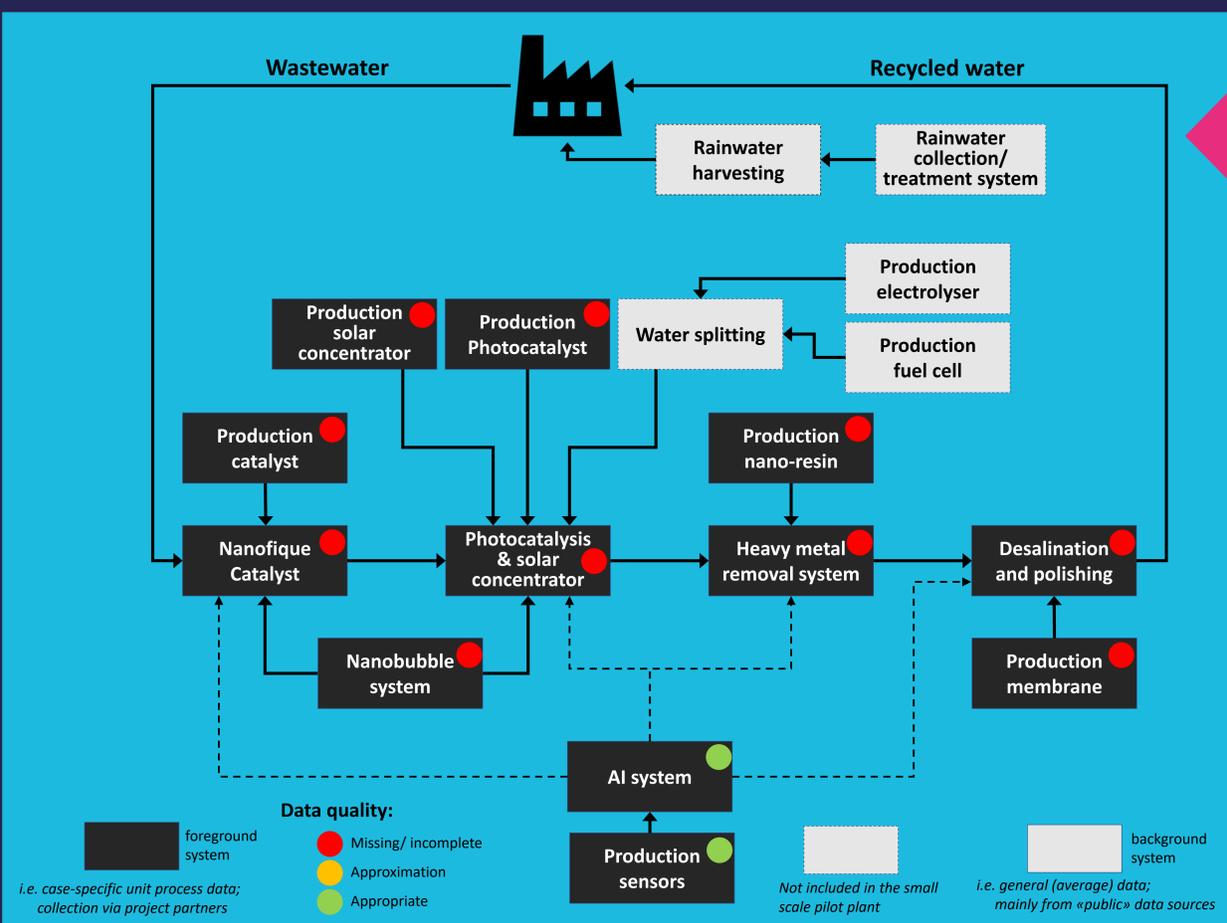
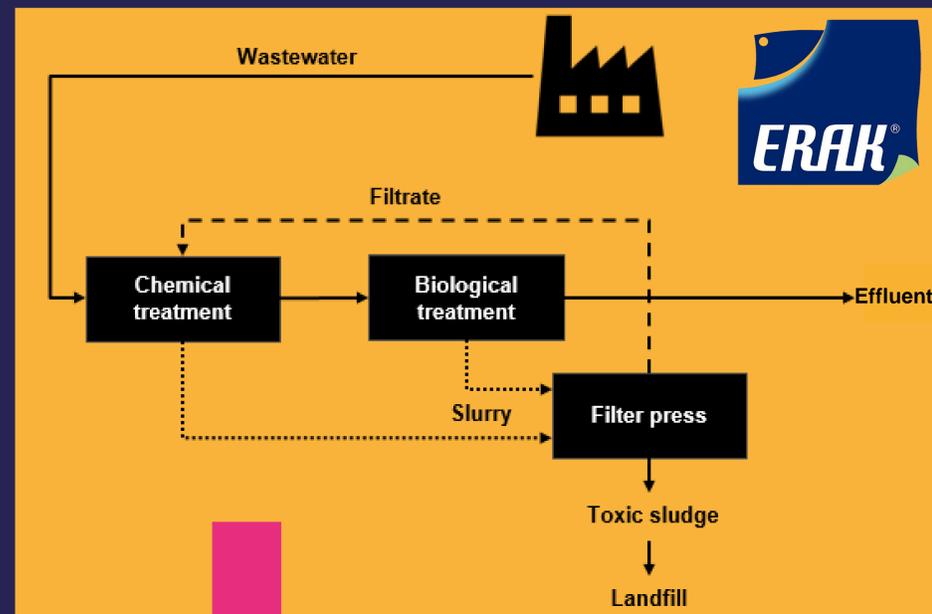
- Every European spends ~ 600 €/y for clothes, with associated environmental and human health impacts along the entire value chain.
- While production, use and disposal of textiles have been analysed extensively, wastewater treatment (WWT) from textile production is neither extensively studied with LCA nor are convincing recycling technologies installed broadly.
- Wastewater from the textile industry has high levels of organic chemicals and coloring agents, low biodegradability, and high salinity. It comprises highly toxic chemicals as well as heavy metals. It can cause severe contamination of surface and underground water, resulting in adverse effects on flora and fauna.
- Breakthrough innovations are needed to **recycle water & create closed loops** in industrial processes so as to reduce the use of fresh water and improve water availability, as outlined in the EU Water Framework Directive.

LCA & LCC : System setup

- The goal of the LCA and LCC study is to evaluate the sustainability of the W2F system at an early stage of development and to assess the total cost performance of the components and the integrated system, respectively.
- The functional unit is defined as 1m³ of treated wastewater.
- The W2F system is compared with the current WWT process of the denim factory ERAK, one of the partner companies of the W2F project.
- The current WWT process installed at ERAK is a tertiary WWT plant combining mechanical, biological and chemical processes.
- The newly designed W2F system consists of several processes: nanofique catalyst, photocatalyst & solar concentrator, nanobubble system, heavy metal removal, desalination and polishing, water splitting and the real-time monitoring system.
- Primary data is used for compiling the LCI collected via surveys from the W2F partners. If primary data is unavailable, proxy values are used.

The Waste2Fresh Project

- Objective of the **Waste2Fresh (W2F)** project is to develop and demonstrate a closed loop recycling system for dye wastewater from textile manufacturing factories.
- This system contains novel catalytic degradation approaches with highly selective separation and extraction techniques to deliver an integrated circular solution that assures:
 - Near-zero discharge
 - Reduced freshwater use and
 - Increased recovery of water, energy and other resources (organics, salts and heavy metals)
- Our target is to provide a holistic view on the environmental and cost performance of the innovative system through LCA and LCC applied at different scales of the W2F technology.



Conclusions & Next Steps

- The W2F technology and the access to ERAK's facilities allowed: (i) the drawing of the system boundaries, (ii) an understanding of the involved technologies, and (iii) research on WWT in the textile industry.
- As the project goes on, the stock of primary data will grow and the move from a screening LCA to a full LCA & LCC will be realized.
- Environmental impacts & cost burdens of the W2F will be assessed in the upcoming months for different scales.



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