Closing the loop, harvesting with anaerobic membranes and accelerated resource recover techniques

ACTION GROUP (AG 036)
Anaerobic MBR for WATER Resource Recovery in CIRCular Economy: WATER CIRCLE

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ACTION GROUP (AG 108)
Accelerating Resource Recovery from Water Cycle: ARREAU

Dr. Kees Roest
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Introduction: Circular Economy Principles

- To improve recovery of resources:
  - Water
  - Nutrients
  - Energy

- To reduce negative impacts:
  - Energy consumption
  - Sludge production
  - GHG emissions

MOVING FROM WWTPs TO WRRFs
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**WATER CIRCLE** boosts **switching** from the conventional Industrial/Urban Wastewater Treatment (I/UWWT) to the Water Resource Recovery Facility (WRRF) concept, changing wastewater from waste into a source of energy, water, nutrients...

The main aim of this Action Group is the development of an **anaerobic membrane reactor for water treatment**, promoting its uptake within water sector and disseminating its **benefits in line with Circular Economy bases**.

www.eip-water.eu/AnMBR
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Waste → Source of Resources

Bioenergy

Energy demand 0.2-0.5 kWh/m³
Net energy SURPLUS of up to 0.2 kWh/m³
Reduction of up to 80% CO₂ and 100% N₂O emissions

Biosolids

Biosolids prod. of approx. 0.5 kg VSS/kg COD₀rem
Biosolids prod. of 0.05-0.10 kg VSS/kg COD₀rem

Water & Nutrients

Limited nutrient recovery potential
Energy savings by avoiding fertilizers production:
- N: 0.77 kWh/m³ reused water (N typical concentration 40 mg/L; N₉₉ : 15 mg/L and N₉₉₉ : 25 mg/L).
- P: 0.02 kWh/m³ reused water (P typical concentration 8 mg/L).

Current WWTPs vs. AnMBR
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Focus areas ARREAU
Recovery & upcycling of phosphorus

Phosphorus for fertilizer and basic chemicals market

www.p-rex.eu
Conclusions & Cross-cutting issues

• Many (local) project initiatives
• Several positive business cases
  • Integral value chain assessment
  • Partners: water utilities, tech providers, fertilizer companies, chemical industry, (organic) farmers...
• Uncertainty about legislation and financial risks
  • Need for EU wide policy development & support
  • Large scale demonstrations needed
European best practices on resource recovery from the water cycle

**ARREAU review** (Updates welcome)

www.eip-water.eu/arreau

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