WASTEWATER TECHNOLOGY FACT SHEET

METland® Microbial Electrochemical Technologies (METs)

Metfilter technology
developed under the EU-funded NYMPHE project

PROBLEM

CONVENTIONAL CONSTRUCTED WETLANDS REQUIRE LARGE LAND AREAS AND SHOW LIMITED EFFICIENCY IN REMOVING ORGANIC MATTER AND MICROPOLLUTANTS, LEADING TO INSUFFICIENT WASTEWATER TREATMENT.

Target pollutants:
COD, nutrients, pharmaceuticals, herbicides, and others.

TECHNOLOGY

System setup:

- Combines Microbial Electrochemical Technologies (METs) with Constructed Wetlands (CWs).
- Replaces inert gravel with biocompatible electroconductive material ("microbial snorkel").
- Compact footprint (0.1 m^2/pe) compared to traditional CWs, monitored through electric potential sensors that track ionic and electron fluxes.

Operation:

- No anode/cathode system; uses a single electroconductive bed in short-circuit mode.
- Boosts electroactive bacteria growth and interconnection between microbial communities.
- Electrical potentials (EP) measured with tailor-made sensors, allowing calculation of ionic current density (J).

Function:

- Enhances pollutant removal (organic matter & micropollutants) beyond conventional CWs.
- Robust, low-maintenance, nature-based wastewater treatment.
- Prioritizes treatment efficiency over energy harvesting.

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INNOVATION

Infinite conductive bed:
Microbes use DIET and CIET for electron transfer concentrations.

Performance:
Effective removal of recalcitrant micropollutants, including stereoselective biodegradation.

Key taxa:
Geobacter spp. and other electroactive microorganisms.

TRL:
9 for urban wastewater & wineries;
7 for complex matrices (e.g., polluted groundwater).

RESULTS

- **METland Modular System can reduce footprint:** Microbes use DIET and CIET for electron transfer concentrations.
- **Scalability:** Modular, plug-and-play units allow flexible capacity expansion.
- **Demonstrated detoxification:** Complete effluent safety verified with Daphnia magna and Raphidocelis subcapitata bioassays.
- **Industrial wastewater treatment:** Handles high organic loads (3k–15k mg COD/L) with removal rates:

2–10kg*
COD/M²/DAY

*2 kg COD/m²/day (oil & gas), 10 kg COD m²/day (winery).

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