

# Microbial Fuel Cells for Recycle of Process Water from Cellulosic Ethanol Biorefineries

**Applications:**

- Recycling of wastewater from cellulosic ethanol fermentation
- Removal of inhibitors of the bio-fermentation process from water
- Bioenergy or bioelectricity production
- Applicable to corn mills

**Advantages:**

- Decreased water consumption
- Enables wastewater recycling
- Electricity or hydrogen generation
- Inexpensive
- Versatile

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**Summary:***Problem*

A significant problem encountered in the biomass-to-ethanol production process is the production of inhibitory compounds (e.g., acetate, furfural (and other aromatic aldehydes), ketones, and alcohols, such as hydroxy aromatics) during the pretreatment process of the raw cellulosic material. Inhibitor compounds have the deleterious effect of inhibiting one or more process steps (e.g., the saccharification or fermentation processes), thereby causing a decreased level of ethanol production.

Since copious amounts of water are used in the processing of cellulosic biomass materials, it is highly desirable to recycle used process water that has been separated from ethanol at the end of the fermentation process. However, since the process water contains inhibitory compounds, recycling process water to an earlier step has the effect of causing an accumulation (i.e., increasing concentration) of inhibitory compounds used in the process.

*Technology Solution*

The present invention provides a method for removing inhibitor compounds from process water used in a cellulosic biomass-to-ethanol process wherein one or more microbial fuel cells (MFCs) consume the inhibitor compounds and advantageously produce electrical energy or hydrogen therefrom. The energy can advantageously be used to power any desired process, and more preferably, one or more processes in the cellulosic biomass-to-ethanol process. The hydrogen can serve as a valuable reagent in the biorefinery or sold as a chemical/fuel.

**Inventor:** Abhijeet Borole, PhD

**Stage of Development:** Proof of Principle

**Patent Status:** Patent Application Filed US 12/366,713

**Licensing Status:** Exclusive and non-exclusive licenses available