

Patent Licensing Proposal

**Electronic Urinal: Design and Method
(201911005010)**

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Technical Field of Invention:

Technical Field of the current invention pertains to Urinal Sanitation, wherein process for which Patent Application is filed tend to improve existing process of Urinal System.

Introduction:

The current invention has the unique feature that allows effective use of urinal waste to produce electric energy by Mass Flow Controller (MFC). In earlier days, some researchers attempted to integrate MFCs with Urinal systems. However there is a gap in field trial studies describing pilot-scale MFC systems deployed under real conditions. The present invention has overcome those challenges to make the MFC based Urinal System scalable at large scale.



Figure 2: MFC Module assemble outside

Ieropoulos, I.A., Stinchcombe, A., Gajda, I., Forbes, S., Merino-Jimenez, I., Pasternak, G., Sanchez-Herranz, D. and Greenman, J., 2016. Pee power urinal–microbial fuel cell technology field trials in the context of sanitation. *Environmental Science: Water Research & Technology*, 2(2), pp.336-343



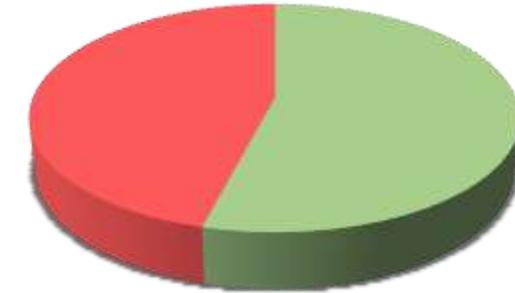
Figure 3: Dual Chamber MFC (batch mode)

Jadhav, D.A., Jain, S.C. and Ghangrekar, M.M., 2016. Cow's urine as a yellow gold for bioelectricity generation in low cost clayware microbial fuel cell. *Energy*, 113, pp.76-84.

Exemplary Facts and Figures about the problem:

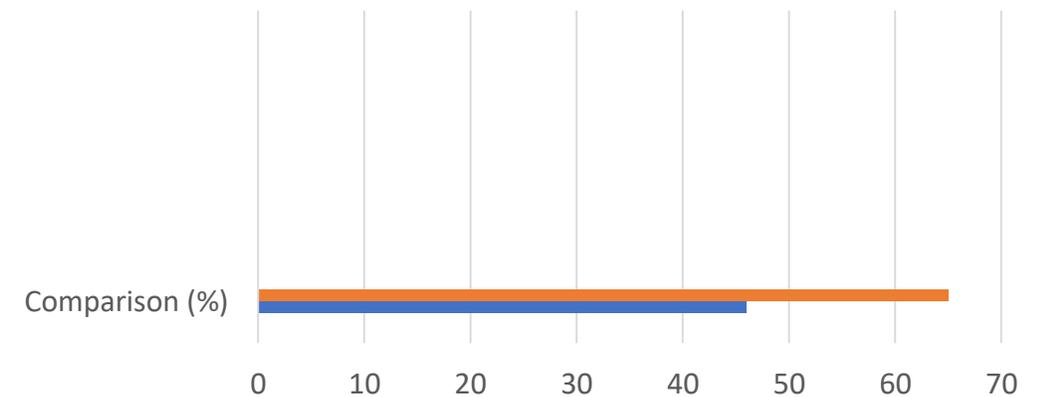
- Rural India faces sanitation problems beyond Western imagination. With its 1.30 billion inhabitants, nearly 600 million people in the country live without basic sanitation, which comes nearly to 46% of population living without basic sanitation.
- In rural India, this figure is as high as 65 percent. India lacks access to toilets and urinals both in private households and in public spaces.
- It is very unpleasant and offensive aspects of India for travelers to witness men openly lining up in front of walls, trees or on the pathways along the roadside, even after four years of Swachh Bharat Abhiyan. The reason being not enough public urinals, to the unhygienic practices that do exist.
- Private companies usually don't invest in public toilets and urinals as this is not a profitable business.

Comparison of Population of India living without Basic Sanitation



■ Rest of Population ■ People living without Basic Sanitation

Comparison of Overall Population Vs Rural Population living without Basic Sanitation



■ Rural Population living without basic sanitation

■ Overall percentage of population living without basic sanitation

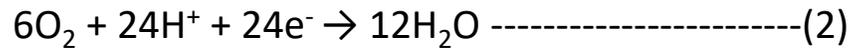
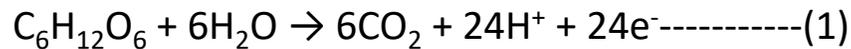
Requirement of a Low-Cost Urine Treatment System:

- There is a need to develop a low-cost integrated system which can treat urine along with some value-added products (like electricity, fertilizers).
- Such systems will be able to compensate their installation and operational cost.
- Urine is a major excretory waste, which is the cause of various water borne diseases and foul odor.
- Human urine takes up only 1% (by volume) of municipal wastewater, but accounts for about 80% of the contained nitrogen, up to 50% of the total phosphorus and 10% of COD in municipal wastewater.
- But the same urine is source of many electrolytes and can be efficiently utilized in Microbial fuel cells (MFCs) as anolyte.
- MFCs are bio-electrochemical systems; which convert chemical energy of organic matter like wastewater into electrical energy by using catalytic activities of microorganisms.

Introduction to Mass Flow Controller (MFC) Principles:

- MFCs are bio-electrochemical systems, used for the direct conversion of chemical energy of chemical compounds, into electricity using microorganisms.

The basic reactions involved can be represented as:



- By integrating the MFC in waterless urinals, the energy consumption of waste water treatment plants would be reduced.
- And some useful energy will be produced near the source (e.g. for charging phones, providing light or automation of sanitary peripherals).

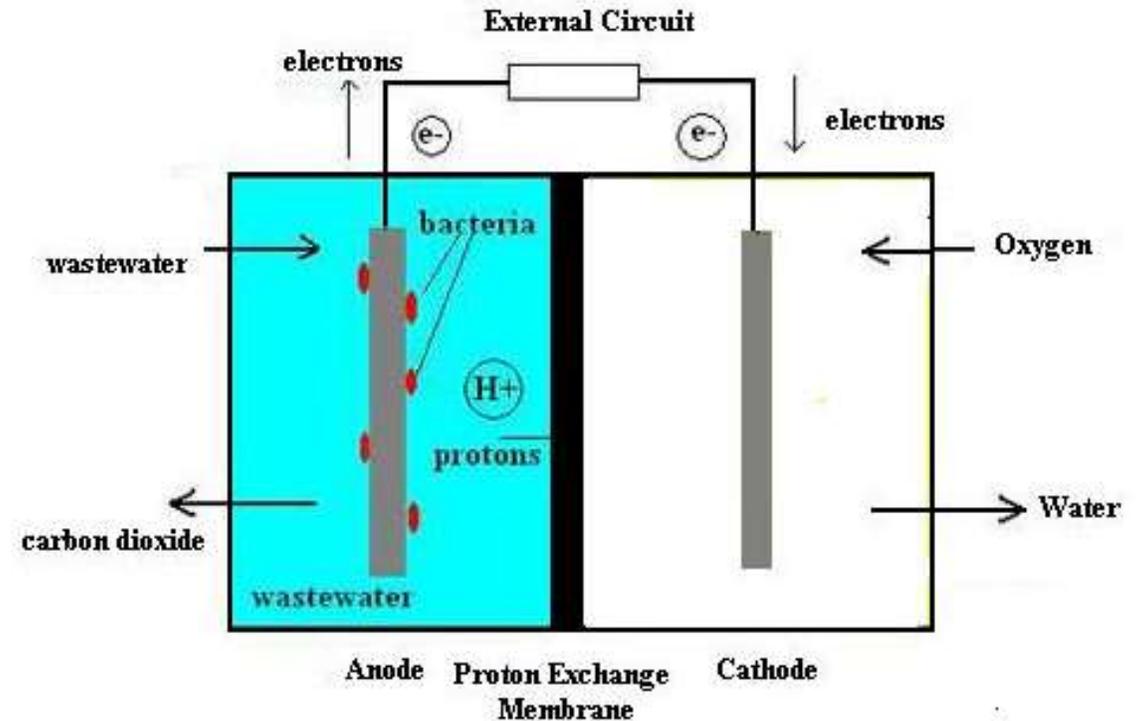


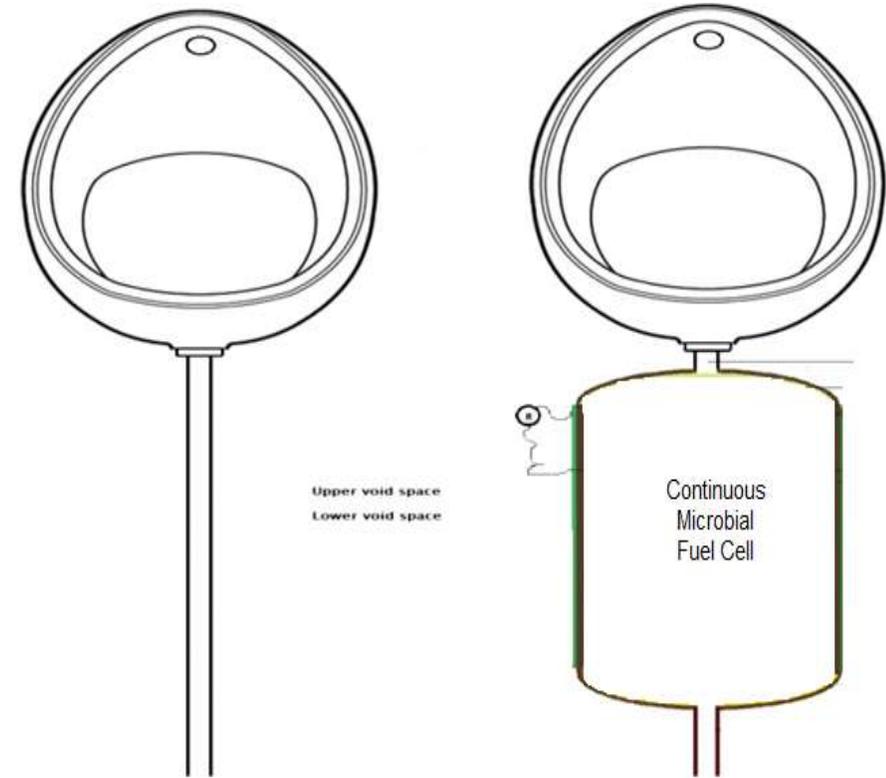
Figure 1: Schematic representation of two chamber Microbial Fuel Cell

About the Invention:

- The present invention is related to the development of electronic urinal (e-urinal) by **directly** integrating a dedicated **continuous flow MFC** into urinal and to utilize urine into anodic chamber of MFC.
- The direct integration of urinal with MFCs.
- Direct integration will reduce the cost of fabrication and installation and the chances of theft and breakage.
- The direct integration of urinal with MFC will reduce the space, increase the efficiency (the advantage of simplicity and functionality) and will reduce the chances of theft and breakage.
- The main aim is to increase the number of electrodes in one unit rather integrating multiple units, which will reduce the cost of fabrication and installation.
- The developed e-urinal will be evaluated for its performance and will be installed in real field.

Novelty of the Invention:

- Continuous flow air cathode MFC design.
- MFC design will eliminate the need of external power input for mixing of anolyte.
- MFC will produce electricity from urine and output liquid will act as low grade fertilizer.
- Increase in the number of electrodes in one MFC, rather than connecting multiple units (to enhance electricity production).
- This e-urinal system is proposed to produce enough electricity for internal lighting and/or sensor applications.
- Anodic bacteria reduce the chemical load of urine and convert it into fertilizer (reduce the waste load of municipal wastewater treatment plant and improve sanitation aspects of society)
- Design is low cost, compact, consumes less water and operated in ambient climate conditions.



Integration of MFC designs to urinal (e-Urinal)

E-urinal Design Merits:

- Designs eliminate the need of external power requirements.
- In addition, it can produce power, which can be utilized for internal lighting.
- Can treat chemical load of urine, and can generate low grade fertilizer.
- Very low or negligible operating expenses.
- Compact and scalable design.
- Can operate at variable flow rates.

Potential Area of Application:

- Army base camp
- Refugee camp
- Rural Housing
- Public toilets
- Fair and Festivals

Expectations:

- Inventor seeks alliance with Potential Licensees to assign Licensing Rights.
- Inventor is also interested in Sale of the Patents.

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