

Preparation of Fuel from Urine

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Abstract

For healthy environment and sustainable economic growth we need clean and efficient power generation systems. This report introduces a new renewable source of energy; i.e. energy from urine that can produce fuel and fertilizer by electrolytic conduction. In this paper we have summarized metro city Delhi. The total population of metro city Delhi is 18,686,902 and cost of petrol is 1.66 crore. Save the money by the conversion of urine in fuel is approx 51.80%.

Key Words: Urine, Electrolysis, Hydrogen as fuel

Introduction

Increasing of population and decreasing of resources has become a very serious environmental problem [1]. Urine is basically an aqueous solution containing more than 95% water, the other constituents, according to decreasing concentration are urea 2%, sulphate 0.18%, calcium 0.015%, phosphate 0.12%, chloride 0.6%, sodium 0.1%, potassium 0.6%, ammonia 0.05% and creatinine 0.1% [3]. In India daily 16690661.7 barrel of urine is wasted which is renewable source of energy. For healthy environment and sustainable economic growth we need clean and efficient sources of energy. In this urine is put into an electrolyte cell, which cracks the urea into nitrogen, water and hydrogen. Hydrogen and Nitrogen are used as fuel and fertilizer, respectively.

Materials and Methods

Urine is put into an electrolyte cell, which separates out the hydrogen. The hydrogen is then filtered in a water filter for purification, which then gets pushed into the gas cylinder pushes the filtered hydrogen into another cylinder that contains liquid borax, to remove moisture from the gas. This purified hydrogen is used as fuel (Fig 1).

The source we made from urine through is mostly evaluated by chemical composition. Actually, from chemical composition we perceived that when aluminum plates come in contact with uric acid movement of electrons being, generating fuel and

fertilizer (i.e., hydrogen and nitrogen).

Approximately 20-35 gram of urea is extracted through human urine per day. Urea (an important ingredient of urine) contains four hydrogen atoms per molecule. During electrolysis process these molecules are broken apart, having a new economic way for the oxidation of urea with the help of aluminum based electrode. Hence the former source of hydrogen is cheaper and economical.

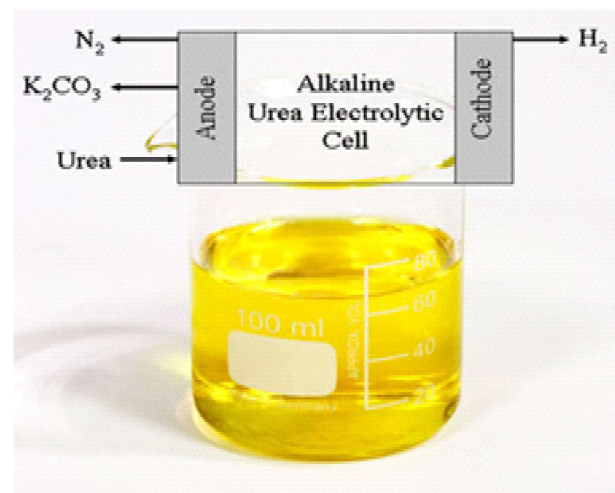


Fig. 1: Schematic representation of the direct urea to hydrogen process.

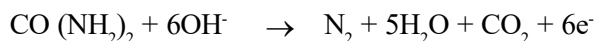
During the electrochemical process adsorption of urea takes place on the surface of aluminum electrode, which allows the electrons required to break up the molecules. Pure hydrogen is produced at the

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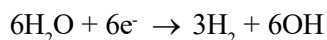
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cathode, while nitrogen in conjunction with trace of oxygen and hydrogen is available at the anode. The carbon dioxide produced during this reaction is not found in the gasses since it react with the potassium hydroxide present in the solution to give potassium carbonate. On the other hand Nitrogen gets yielded from the anode marking removal of nitrate from waste water and thus reduction of water takes place at cathode and hydrogen is produced as the final output [2].

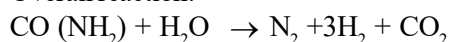
Anode reaction:



Cathode reaction:



Overall reaction:



Results and Discussion

Efficiency of fuel is about 60%.

Hence, it is about 2-3 times more efficient than

petrol and diesel internal combustion engine (Table 1). Calorific value of hydrogen = 142 KJ/kg. Hence, it has 3 times more calorific value than petrol (48 KJ/kg).

Now, Multiplication Factor = CT x VT

Where, CT = Customer's load requirement

VT = Load pattern

If we take the efficiency to be 60% over a period of time, amount of hydrogen collected is equivalent to 31843237.824 x 0.6 liters = 19105942.694

liters (Table 2)

Taking in consideration, the profits which can be obtained:

The table 3 indicate that the total cost can be taken to be approx = 80 lakhs (at the most including electrolysis cost, operational and maintenance cost)

Thus % saving in the cost = (166 - 80) x 100/166 = (86/166) x 100 = 51.80 %

Hence, the cost of fuel saved per day is 51.80 %.

Table 1: General information of India

World population	7,418,872,343 (7.41 billion)
India population	1,326,801,579 (1.32 billion)
Voltage required for electrolysis of Urine (Urea) per molecule	0.37 V
Voltage required for electrolysis of water per molecule	1.23 V
Average individual urine production per person per day	1.5 liter
Total urine production in India per day	1326801576 x 1.5= 1990202364 liters
Amount of hydrogen produced per liter of urine	2 grams.
Total potential of hydrogen from urine	1990202364 x 0.002 = 3980404.728 kg per day

Table 2: Oil consumption in India

Multiplication factor	2 x 3 = 6
Petrol equivalent of hydrogen	3980404.728 x 6 kg= 23882428.368 kg
Dividing this amount with the density of petrol (0.75 kg/liter)	23882428.368/0.75= 31843237.824 liters
Amount of oil consumption in India	3,660,000 bbl/day= 3660000 x 158.987295 = 581893499.7 liters/day

Table 3: Now considering the case of Metro City Delhi,

Population of Delhi compared to total population of India	1.34%
Petrol equivalent which can be produced in Delhi	19105942.694 x 1.34= 256019.63209 liters/day
Cost of 256019.63209 liter petrol	256019.63209 x 65 (price of petrol) = 16641276.085 = 1.66 crore
Population of Delhi	18686902
Urine which can be produced in Delhi	18686902 x 1.5 = 28030353 liter/day
Hydrogen which can be produced in Delhi per day	28030353 x 0.002= 56060.706 kg/day
Power required for electrolysis of 2 gms hydrogen	22 Wh
Power which is produced by burning	78 Wh
Cost of electrolysis	56060.706 x 11 kWh x 7 (per unit price) = 4316674.362 /-

Conclusion

The major applications will developments of cells at public locations were high concentration of urine as an organic substrate is available Very useful byproduct Nitric acid obtained from urine treatment which is use as natural fertilizer. Hydrogen used as fuel in vehicles. Water also generated used as gardening purpose. Provide fissile implementation of renewable energy source.

Pollution free, natural process, no cost of raw product, one time investment, automated, fertilizers as byproduct for agriculture (Natural green environment).

There is no evolution of green house gases. Maintenance cost is very low. It is an eco-friendly product.

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