Germicidal Ultraviolet LED Fixture For Public Waterless Urinals And Wash Basins To Control TB Using Solar PV Panel

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***Abstract*— UVGI is an air-cleaning technology that consists of the use of special lamps that give off germicidal ultraviolet irradiation (wave length=254 nm). The lamps are used to inactivate the tubercle bacilli contained in the droplet nuclei. This technology is invented back 100 years ago, This can be effectively used in waterless urinals and hospital wash basins to avoid spread of TB. TB is spread (transmitted) from person to person by tiny airborne particles containing tubercle bacilli. Particles, called "droplet nuclei," containing these bacteria are coughed up by persons with untreated or inadequately treated, clinically-active, pulmonary or laryngeal TB. Droplet nuclei are carried on air currents and disperse rapidly throughout a room. Therefore, the goal of environmental infection control is to prevent the spread of TB by protecting susceptible people from inhaling airborne particles generated by infectious individuals**

***Keywords*— UVGI, ultraviolet irradiation, tubercle bacilli, airborne particles, droplet nuclei, infection control**

I. INTRODUCTION

Airborne infections such as TB can be prevented by killing the infectious microorganisms in the air with ultraviolet (UV) radiation.Ref.[7] UV lamps are inexpensive, easy to install and maintain, and are effective at killing airborne microorganisms. Therefore, some health authorities recommend UV lamps for certain high risk environments The no-flush urinal ignores sanitation and no arrangement to provide consistent cleaning of the urinal wall. Wall washing reduces bacteria counts by 100 times, but non-flush urinals don't wash the urinal walls between each use at all, allowing dangerous bacteria and viruses to remain behind for each new user. The lack of wall washing is believed to contribute to the odor problems that have been frequently reported for non-flush urinals.

II. PRESENT THEORIES & PRACTICES

Non-flush urinals, also known as waterless urinals widely used in India poses serious risks to public health and the environment. Based on the research, non-flush urinals appear to be harm our health and environment more than help it, There is a risk to people who use non-flush urinals and clean non-flush urinals. Ref[1] Sewer gases pose serious risks to public health from toxic gases including hydrogen sulfide (H2S), methane, carbon dioxide and ammonia, and also from airborne pathogens including tuberculosis, dysentery, rotavirus, common cold, hepatitis A, typhoid and SARS. The incidence of diarrhea, cholera, diphtheria, and dysentery increased four-fold after toilets were moved indoors, due primarily to the unsanitary conditions of these fixtures. Ref[2].Germicidal UV LED'S can be used in waterless urinals and wash basins used in hospitals . In Indian waterless urinals and wash basin it is observed that spitting is common activity by some class of peoples ,which may include TB patients. And this can gives rise to spread TB in air through droplet nuclei. In waterless urinals many peoples are using daily these common facilities at public places and there is no any provisional provided yet, but we can fix UV LED fixture focus in such a way that it will irradiate droplet nuclei and kill harmful bacteria in sputum and urine through UV radiation. The fixtures are shielded on the top so that the radiation is directed only to required area in waterless urinals and wash basins. Mostly all outdoor water less urinals don't have electricity supply, for these facilities we propose to provide solar PV panel with battery backup which will provide electrical supply to UV LED fixture. Advancement in UV LED technology provide us to availability of low cost, low power durable germicidal ultraviolet lightsource. Fig. 1 .

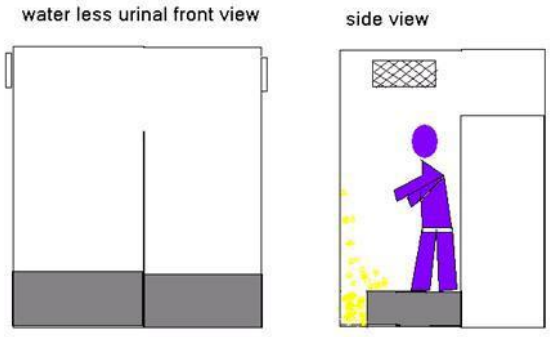

Fig. 1 Water Less Urinal

Even though wash basins having flush facility in hospitals which treat TB patients are homes of TB bacteria in sewage pipes and can act as source of droplet nuclei, so we propose two stage UV radiation fixtures for germicidal irradiation. One fixture of UV LED's is focused from outer periphery of basin and focus towards drain hole. Other fixture is fitted inside the drain pipe so that it can kill all bacteria in the sputum flowing through pipe. Ref[4] The following factors, which are discussed in detail below, play a part in determining whether or not exposure to UV radiation will kill a microorganism:

1) Type of microorganism,
2) Dose of radiation to which it is exposed
3) Amount of moisture in the air.

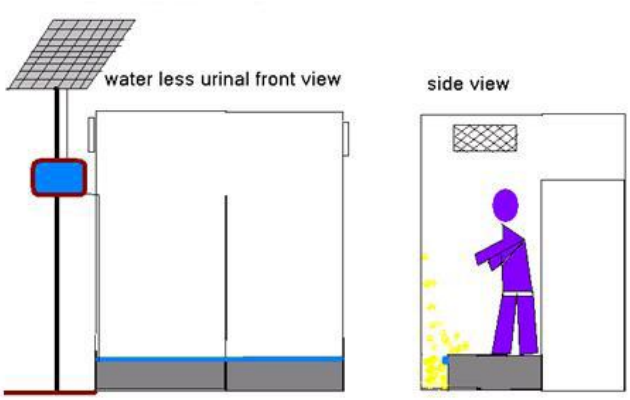

Fig. 2. Water less unit after modification

III. DESIGN

For this we will use following components block-

Details of Blocks Used

Solar Panel–solar panels are used for conversion of solar energy into electrical energy by solar cells and used for energy saving or non conventional energy source generations system.

Solar Power Controller –Due to continuous unavailability of solar energy in rainy season or during night some microcontroller based power controller system is required control charging patterns of DC batteries to store energy

9 volts D.C. Batteries –Solar power which is converted into electrical energy required to store in some form, so DC batteries are used to store this power and further this power is used power the germicidal UV LED's fixture.

Germicidal UV Fixtures –Germicidal UV LEDS are special type of LEDs who radiates Ultraviolet light when fed to DC supply in forward biased condition and there light waves kills the TB bacteria and other harmful bacteria contained in the waterless urinals. Ref[5].

All these above blocks when totally integrated will be looks like as shown in Fig.3.

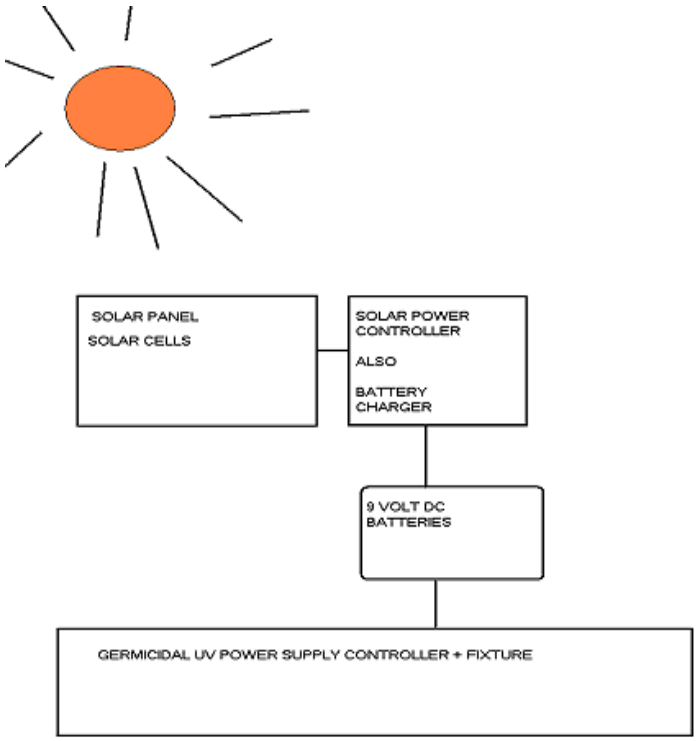

Fig.3 Block diagram of total integration germicidal uv fixture

IV. CONCLUSION

Germicidal UV LEDS are special type of LEDs who radiates Ultraviolet light when fed to DC supply in forward biased condition and there light waves kills the TB bacteria and other harmful bacteria contained in the waterless urinals.

V. FUTURE SCOPE

Initially we will prepare germicidal UV fixtures for waterless urinal using solar panel, also we will design and develop germicidal UV fixtures for wash basins for use in hospitals . Trials can be taken at laboratory as well as public facilities. this will help to reduce spread of TB through common public urinals. Initially we will use advanced UV leds for germicidal irradiation, it's mechanical design and fixing in public wash basins and urinals where more occurance of droplet nuclei observed. One prototype will be prepared for that we require to design electronics power

supply for UV LEDS and it's connectivity design with solar PV panel so that no need of external energy for continuous operations of UV irradiation process. Testing and reports to avoid harmful Uv radiation to humans using that urinals.
The work is in progress for obtaining patent.

VI. ACKNOWLEDGEMENTS

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