

STUDY ON THE DEVELOPMENT OF OZONATED WATER FOR A HEALTHY SANITATION

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Abstract: Commonly in developing countries public health suffers from a lack of sanitation from dirty drinking water. Keeping in mind the health perspectives, Ozonated water is highly beneficial for either healthy or sickly people. It's easy to make and should be consumed regularly. Besides providing more oxygen to the brain (greater alertness and mental clarity), Ozonated water will oxidize pathogens and synthetics residues in the body, allowing their complete elimination through excretion, as Ozone is one of the most powerful known oxidizers. As a disinfectant, it is about 3,000 times more effective than chlorine. It will kill any kind of micro-organisms or any other living cell on contact, and it will generally wreak havoc with any kind of organic molecule. So also it is used for fumigation and sterilization in operation theatres in hospitals, disinfecting food products to increase shelf life, ozone therapy and many more important applications. This work discusses the important features of a high-voltage (HV) corona controlled plasma-ozone generator and the various benefits as lower cost, lower maintenance costs, lower life-time cost of ownership also. Engineering details of this generator are described in present work.

Keywords: healthy sanitation, Corona controlled ozonator, disinfectant.

INTRODUCTION

In the present world, there is a widespread potential for human exposure to disinfection byproducts in drinking water because everyone drinks, bathes, cooks and cleans with water. The availability of safe drinking water is a substantive health concern. In all developing countries public health suffers from a lack of sanitation from dirty drinking water. In 1976, the U.S National cancer

Institute published results showing that chloroform one of the trihalomethanes that occur as a byproducts of drinking water disinfection, was carcinogenic in rodents (U.S. Ncl report, 1976). Since that time there has been a concern that disinfection of water, while providing protection against microbial risks, could also pose chemically induced cancer risk for humans (Melnick RL, Dunnick JK, Sandler DP, Elwell MR & Barrett JC, 1994). Keeping in mind the health perspectives, ozonated water is highly beneficial for either healthy or sickly people. Ozone is easy to make and should be consumed regularly. The main benefit of ozonated water as compared to other purification systems is that it removes or kill all micro-organisms or any other living cell. Disinfection is considered to be the primary mechanism for the inactivation/ destruction of pathogenic organisms to prevent the spread of waterborne diseases to downstream users and the environment. It is important that wastewater be adequately treated prior to disinfection in order for any disinfectant to be effective.

Ozone as disinfectant

Ozone is a powerful oxidant and very strong disinfectant (T Vijayan & Jagdish G Patil, 2010). Disinfection is the destruction, inactivation or removal of those micro-organisms likely to cause subsequent infection of people (Wright, 1997). The main characteristics of ozone as a disinfectant are following: (a) Ability to penetrate and destroy infectious agents under normal operating conditions; (b) Lack of characteristics that could be hazardous to people and the environment; (c) Safe and easy handling and storage; and (d) Absence of toxic residuals and carcinogenic compounds after disinfection. (Clement Solomon, Peter Casey, Colleen Mackne & Andrew Lake, 1998)

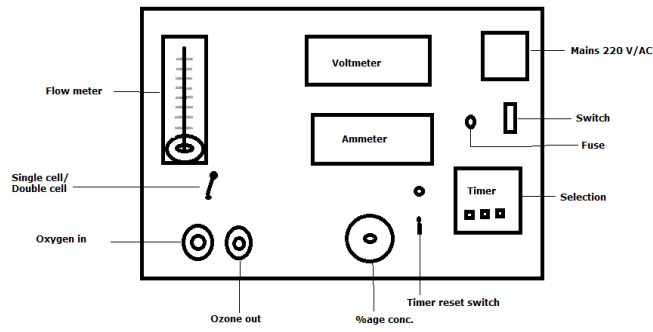


Figure 1: The entire generator cum processor

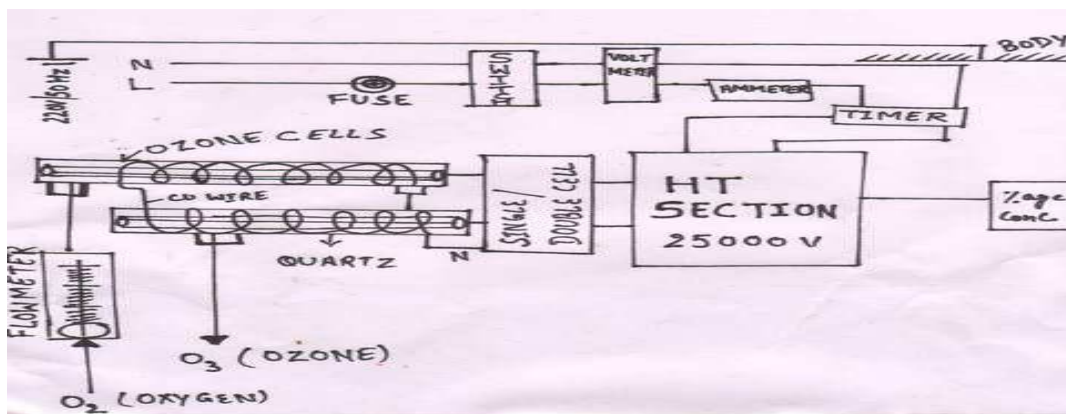


Figure 2: The internal circuit

Advantages

(a) Ozone is more effective than chlorine in killing viruses and bacteria. (b) The ozonation process requires a short contact time (approximately 10 to 30 minutes). (c) There are no harmful residuals that need to be removed after ozonation because ozone decomposes rapidly. (d) After ozonation, there is no regrowth of microorganisms. (e) There are fewer safety problems associated with shipping and handling, as Ozone is generated onsite (Mark Boner, 1999)

For healthy sanitation, this work discusses the important features of a high-voltage corona controlled plasma-ozonator which is under development presently in Nanomaterials Research Laboratory, Chitkara Institute of Engineering and Technology. The generator so developed will be used in many of the above applications.

Description of the Ozonator

The figures given below illustrate schematically the entire generator cum processor. It consists of fuse, voltmeter, ammeter, two ozone cells made of quartz glass and high tension transformer.

Working- In this ozonator, we produce ozone gas with the use of oxygen. Air or pure oxygen is used as feed gas source. Ozone is produced when oxygen (O_2) molecules are dissociated by an energy source into oxygen atoms and subsequently collide with an oxygen molecule to form an unstable gas, ozone (O_3), which is used to disinfect wastewater. Extremely dry air or pure oxygen is exposed to a controlled, uniform high-voltage discharge at a high or low frequency. Oxygen gas passes through two ozone cells where it is converted into ozone gas. It produces high purified concentration of ozone that is used in many important applications.

RESULTS

With the help of this ozonator, we are able to produce 70 to 80% ozone gas which can be used for purification of water. Further experimentation are still going on.

CONCLUSIONS

Ozonated water is highly beneficial for either healthy or sickly people. Beside so many benefits it has some limitations also, which are given below: (a) Low dosage may not be effectively inactivate some viruses, spores, and cysts. (b) Ozone is very reactive and corrosive, thus requiring corrosion-resistant material such as stainless steel. (c) Ozonation is not economical for waste water with high levels of

suspended solids, biochemical oxygen demand, chemical oxygen demand, or total organic carbon.

But these limitations can be overcome by taking precautionary measures. Ozonated water is easy to make and should be consumed regularly. Besides providing more oxygen to the brain (greater alertness and mental clarity), ozonated water will oxidize pathogens and synthetic residues in the body, allowing their complete elimination through excretion, as Ozone is one of the most powerful known oxidizers. As a disinfectant, it is about 3,000 times more effective than chlorine. It will kill any kind of micro-organisms or any other living cell on contact, and it will generally wreak havoc with any kind of organic molecule. So also it is used for fumigation and sterilization in operation theatres in hospitals, disinfecting food products to increase shelf life, ozone therapy and many more important applications. Ozone leaves no residuals or byproducts except oxygen and minimal amount of carbon dioxide and water.

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