

The Applications of Zero Water Discharge (ZWD) Systems for Environmental Management

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Abstract : China declared the “zero discharge rules which leave no toxics into our living environment and deliver blue sky, green land and clean water to many generations to come”. The achievement of ZWD will provide conservation of water, soil and energy and provide drastic increase in Gross Domestic Products (GDP). Our society’s engine needs a major tune up; it is sputtering. ZWD is achieved in world’s space stations – no toxic air emission and the water is totally recycled and solid wastes all come back to earth. This is all done with solar power. These are all achieved under extreme temperature, pressure and zero gravity in space. ZWD can be achieved on earth under much less fluctuations in temperature, pressure and normal gravity environment. ZWD systems are not expensive and will have multiple beneficial returns on investment which are both financially and environmentally acceptable. The paper will include successful case histories since the mid-1970s. ZWD discharge can be applied to the following types of projects: nuclear and coal fire power plants with a closed loop system that will eliminate thermal water discharge; residential communities with wastewater treatment sump and recycle the water use as a secondary water supply; waste water treatment Plants with complete water recycling including water distillation to produce distilled water by very economical 24-hours solar power plant. Landfill remediation is based on neutralization of landfilled gas odor and preventing anaerobic leachate formation. It is an aerobic condition which will render landfill gas emission explosion proof. Desert development is the development of recovering soil moisture from soil and completing a closed loop water cycle by solar energy within and underneath an enclosed greenhouse. Salt-alkali land development can be achieved by solar distillation of salty shallow water into distilled water. The distilled water can be used for soil washing and irrigation and complete a closed loop water cycle with energy and water conservation. Heavy metals remediation can be achieved by precipitation of dissolved toxic metals below the plant or vegetation root zone by solar electricity without pumping and treating. Soil and groundwater remediation - abandoned refineries, chemical and pesticide factories can be remediated by in-situ electrobiochemical and bioventing treatment method without pumping or excavation. Toxic organic chemicals are oxidized into carbon dioxide and heavy metals precipitated below plant and vegetation root zone. New water sources: low temperature distilled water can be recycled for repeated use within a greenhouse environment by solar distillation; nano bubble water can be made from the distilled water with nano bubbles of oxygen, nitrogen and carbon dioxide from air (fertilizer water) and also eliminate the use of pesticides because the nano oxygen will break the insect growth chain in the larvae state. Three dimensional high yield greenhouses can be constructed by complete water recycling using the vadose zone soil as a filter with no farming wastewater discharge.

Keywords : greenhouses, no discharge, remediation of soil and water, wastewater

Conference Title : ICSWRM 2015 : International Conference on Sustainable Water Resources Management

Conference Location : Melbourne, Australia

Conference Dates : December 13-14, 2015