Poster Session (P)
Poster Lunch (1)

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HIGH-TEMPERATURE OXIDATION EQUIPMENT FOR SOLID WASTE TREATMENT IN A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM EXPERIMENTAL PLATFORM

Abstract

There are several kinds of competing technologies for resource recovery from solid wastes for long-term space missions such as a lunar or Mars base, Certainly, high temperature oxidation technology is one of the most promising and the most advantage candidate technology in the now time. Over the last year, we successfully completed the 4 Crews 180 days' CELSS test system experiment.In this systema high-temperature oxidation equipment was used to deal with most of solid waste produced during the 180days, to make carbon, hydrogen, oxygen and mineral elements in Solid Waste cycling back into the system, meanwhile to increasing the closure of material flow of the system. In order to accommodate with CELSS's Special environment, the High-temperature Oxidation Equipment have a number of groundbreaking designs. The system composed of 4 modules, namely the gas-powder feeder moduleIncineratorash clean up module and a catalytic flue gas clean up bed. The high-temperature oxidation equipment use combustion gas to blowing the powder of solid waste , making them vortex flow along the inner wall of the incinerator, in this way, to ensure adequate mixing of combustion gases with the powder of solid waste, also to ensure good heat transfer from the inner wall of the incinerator to the powder of solid waste. Ash clean up module is one of the most important part in the system, during the system running period, it solve the ash accumulation and slagging in the incinerator. Incineration exhaust gas after dehydration, dedusting, then reacting in the catalytic flue gas clean up bed, After treatment, all of the concentrations of CO, TVOCs, NOx, SO2 almost near zero. The equipment has been stable operation of 180 days, reaching CELSS's experiments requirement. This paper will describe in details as follows (1) Physical and chemical properties of solid waste, such as water content, bulk density, ash (inorganic salt) content, calorific value and so on. (2) Calculation of material flow in solid waste during high temperature oxidation; (3) The groundbreaking designs of the High-temperature Oxidation System;(4) Optimization of Process Parameters for System Operation;(5) Research on the technical field of the exhaust gas purification especially CO, TVOCs, NOx and SO2.