Clinical waste incinerator for rural hospitals

by Nigel Wakeham*

In 1992 I went to the Solomon Islands for the UK’s Department for Overseas Development (DFID), to manage two rural construction projects in the health sector. I was also asked to look at providing a clinical waste incinerator for the main hospital in Honiara, the capital of the Solomon Islands. There had been a project in existence for several years to supply an incinerator but a suitable one had not been found. A large diesel-run incinerator had been proposed but the hospital could not afford to run it. I had come across similar problems when working in Southern and West Africa and had been looking for some time for a simple incinerator suitable for rural health centres or hospitals that could use wood or other locally available biomass materials as fuel.

I eventually contacted a firm in Australia, Biomass Energy Services and Technology PTY Ltd (BEST), who specialise in renewable energy technology. They expressed interest in the problem and were commissioned to develop an incinerator that could use wood, coconut shells or similar materials as fuel.

DFID (then still known as ODA) agreed to enlarge the project in order to supply all the provincial hospitals as well as the main hospital in Honiara with incinerators. Information on the quantity and nature of the waste materials to be disposed of was collected and sent to BEST. The nature of the waste is such that highly toxic substances such as dioxins and furans are generated when it is burnt in the open and poor combustion can lead to some of the contaminated waste not being fully burnt or sterilised.

BEST developed two sizes of incinerator, a large one for the main hospital and a smaller one for the provincial hospitals, both of the same basic design and constructed of an outer skin of stainless steel lined with fire-clay bricks. The principle behind the design is that, in order to avoid the formation of dioxins and furans, it is necessary to burn the waste in an oxygen-starved environment and to break down the long chain and ring molecules by passing them through a bed of charcoal

closes into a water seal) at the top of the first chamber with alternate layers with dry wood or similar combustible material until the chamber is full. The ash door at the bottom of the chamber is opened and a small fire started. Once the first layer of fuel is burning the ash door is closed. Secondary air is introduced in the second, smaller combustion chamber that links the first chamber to the third, much larger one where the final reaction between the volatile gases takes place. The resulting gases are then discharged through a flue at the top. Once the incinerator is started it requires no further attention until the burning process is completed (in approximately three hours) and the incinerator has cooled down. The ash door is then opened and the ash and remaining materials that are completely sterile are removed. Even sharps are reduced in size and strength and can be safely handled.

A series of tests was carried out on a prototype and it was found that after combustion was started, the temperature rapidly reached 1000 degrees C, there was no visible smoke and no measurable hydrocarbons (<10ppm). The incinerators therefore provide a cheap, safe and very effective method of disposing of medical waste, which is badly needed in many rural areas. They have now been installed in most of the hospitals in the Solomon Islands and are working very successfully.

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