INTERMEDIATE TECHNOLOGY CONSULTANTS

Overview of research findings

Low Cost Solid Waste Incinerator

Project No. 2C98028
Work Package Number
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Summary of work so far…

Open and uncontrolled burning of domestic and industrial waste is widespread in many developing countries. Evidence shows that, at present, uncontrolled burning of waste takes place at many waste disposal sites due to either spontaneous combustion or by deliberate attempts to reduce waste volume. Furthermore, uncontrolled dumping, with or without burning, is the standard method of disposal for solid wastes. There is growing concern as to the potential environmental impact due to the release of toxins and other pollutants to air, water and land as a result of this practice.

The most commonly proposed solution to these problems is the provision of controlled landfill disposal, which is perceived to be the lowest cost solution. Evidence from this research project suggests that low-cost incineration could be significantly less expensive than controlled landfill for smaller communities, whilst offering a substantial level of environmental improvement over the *status quo* and meeting the practical environmental criteria which are being established in countries such as South Africa.

SCALE AND ENVIRONMENTAL IMPACT

Recent studies suggest that in villages with populations up to 7000 people, open burning of waste at sites no closer than ½ kilometre from nearest dwellings will have no significant ill health effects due to air pollutants[1].

In areas where population density (towns of between 7,000 and 30,000 inhabitants) and volumes of waste are higher, there is increased health risk due to resulting emission of toxins to air and water. (Figures from the EPA in USA show that over the whole country, an estimated 1000g of dioxin are released annually into the local environment through burning of waste in back yards, and 1000g due to burning at dump sites per year[2]. To produce an equivalent amount of dioxin through incineration in a modern incinerator, would require the incineration of 2000 million tonne.eqiv. of waste).

In developing countries where levels of uncontrolled burning are high, even a simple incinerator could substantially reduce potential levels of this dangerous toxin.

In addition controlled incineration will also;

- reduce the overall volume of the waste and therefore the space required for disposal of residue,
- render the waste less attractive to vermin and livestock,
- reduce the leachate potential of the waste,

In areas of high population density and waste volume (towns of more than 30,000), analysis of the combined environmental and operational costs for various waste disposal options suggest that covered landfill would be the preferred option (GTZ Botswana report shows that the environmental and operation costs for open burning and covered landfill converge at this point).

It is clear therefore that there are waste disposal scenarios (defined by waste volumes and population densities), in which controlled burning (incineration) of waste can serve as a viable technology option. Recognition of the need for a technology solution to meet this growing demand has led to the current project.

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[1] Risk Assessment and Environmental Impact for Burning Small Quantities of Household Waste at Villages in Botswana – prepared for NCS/GTZ Waste Management Project March 1997

[2] EPA (USA) Dioxin Inventory 1999

ACCESS TO TECHNOLOGY AND CODES OF PRACTICE.

It is clear that in most developing countries those with responsibility for the safe disposal of municipal waste do not have access to sound technology options at this level. Just as important however are guidelines and codes of practice within which to operate such technologies. In some instances these are in the early stages of development (eg. South Africa) and represent a pragmatic approach to the issue of regulation which is in keeping with the needs of a developing nation. More often than not however, guidelines are not in existence at all. Any successful project which aims to offer a solution to waste disposal needs to address both issues of technology and codes of practice in order to arrive at a solution which is both affordable and acceptable.

RECOMMENDATIONS FOR PROJECT

GUIDELINES FOR OPERATION AND PERFORMANCE STANDARDS.

As a result of the socio-economic research that has taken place so far the project team recommend that we;

- Draw up initial guidelines for the operation a low-cost MSW incinerator technology according to Section 11 of the South Africa Report.
- Organise a multi-stakeholder workshop in the chosen partner country to develop such guidelines and to ensure that they are acceptable and appropriate.

TECHNICAL DEVELOPMENT

As a result of the technical research that has taken place so far the project team recommend that we proceed with the design and development of a scale test rig (built and tested in UK) for a low cost incinerator technology (£20,000 or less) using local materials and manufacturing techniques.

The best way forward in order to keep costs down and maintain acceptable emission standards would be to;

- Set emission targets equivalent to those achieved by the Ixopo plant.
- Integrate design aspects of the Ixopo incinerator and the Hoffmann Kiln
- Use all-brick constructions making it easy to be built in country. Skills should be locally available as a number of countries (including Zimbabwe) have Hoffmann kilns in operation.
- Use a multi-cell design for the primary chamber: waste in one cell can be incinerated while the other is being loaded and waste pre-dried; this would enable batch loading without disturbing the incineration process; helps maintain reducing conditions in cell undergoing incineration process (no air ingress through loading door);
- Use a common secondary chamber with large combustion volume and secondary air introduced at relatively high velocities to complete combustion: it may be necessary to use a fan to create required velocity.
- Use a brick built stack, which perhaps would incorporate a recouperator to pre-heat primary and secondary combustion air.
- Use support fuel to get cells up to temperature quickly before waste is added, waste oil may be used with simple gravity fed burners.
- Develop front and back end operations as an integral part of the project (these can be based on those used at Himeville and Ixopo in SA). As well as removing potential toxin bearing materials, the removal of materials such as glass and metals (which may inhibit incineration) can be used to generate income for the plant and help to create employment in the material recycling sector.

CONCLUSION

It is pertinent to state at this stage that in the view of the project team, the project does not represent an attempt to impose or encourage incineration as a universal waste disposal technology in developing countries. It does aim however, to provide those charged with the responsibility for waste disposal in developing countries with a low cost technology option for which the operational performance and environmental impact have been developed and tested under real conditions.

This in turn will enable low cost incineration to be assessed in terms of acceptability and affordability alongside other options, such as engineered landfill, using methodologies such as Best Practicable Environmental Option (BPEO) and techniques such as Best Available Technology Not Entailing Excessive Cost (BATNEEC).