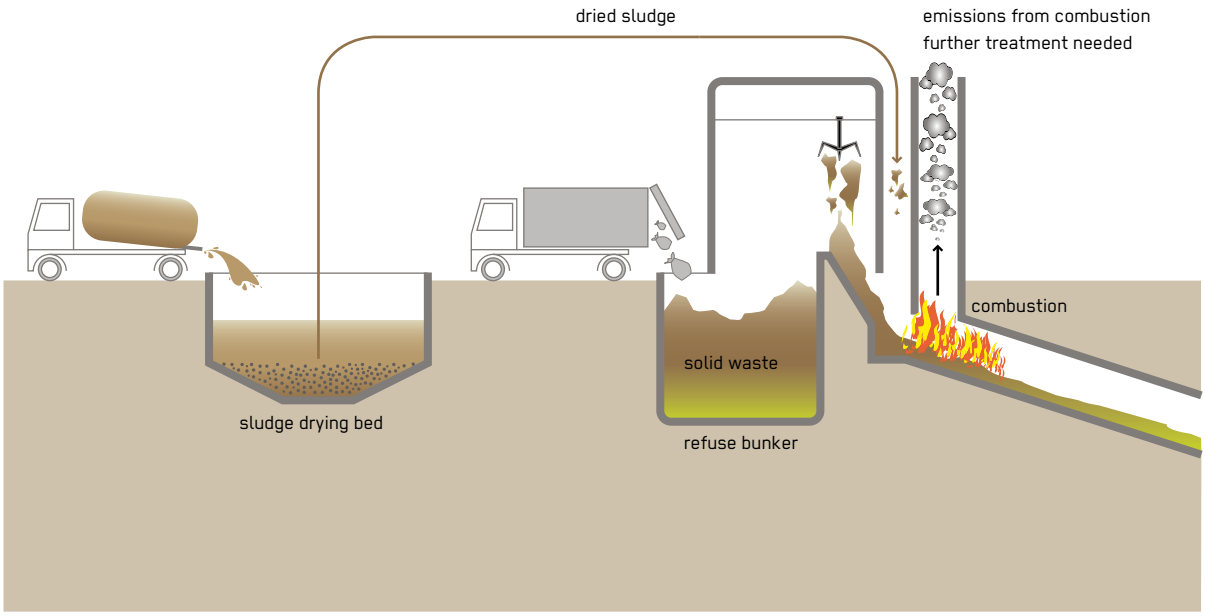
Co-Combustion of Sludge

Phase of Emergency	Application Level / Scale	Management Level	Objectives / Key Features
Acute Response Stabilisation ** Recovery	Household Neighbourhood ** City	Household Shared ** Public	Volume reduction, Pathogen removal, Heat production
Space Required	**Technical Complexity**	**Inputs**	**Outputs**
*** High	*** High	● Dried Sludge	



Co-Combustion of Sludge through the process of incineration is an effective disposal and resource recovery option for dewatered faecal sludge.

In Co-Combustion the pathogens are killed and the sludge is sanitised. As part of the process energy is generated, which can be used for heating or the production of electricity.

Design Considerations: In Co-Combustion of Sludge or more general thermo-chemical conversion, some form of heat is applied to sanitation products such as faecal sludge to destroy pathogens and drastically reduce the sludge volume, with energy produced in the form of heat. Before incineration, sludge needs to be dewatered e.g. in Unplanted or Planted Drying Beds **(T.9, T.10)**. Co-Combustion (or incineration) of Sludge together with solid waste happens at temperatures of 850–900 °C. The energy can be used for example, to power cement kilns. The ash produced can be used in construction or can be safely disposed of. The ash may be hazardous as it could have a high heavy metal content, depending on the source of the sludge. Methods for incineration include mass burn incineration, fluidised-bed incineration and co-incineration with municipal solid waste or in cement factories. An emerging technology in heat application treatment is pyrolysis or gasification of faecal sludge. Pyrolysis or gasification happens through heating in an oxygen-depleted environment, thus preventing combustion. Gasification occurs at temperatures above 800 °C, pyrolysis between 350 and 800 °C. In these processes char is produced, which can be used in furnaces and kilns in the same way as coal.

Materials: The main requirement for incineration is an incineration furnace. An incineration furnace requires many different special parts and materials, particularly for the treatment of the exhaust gases, which can be dangerous for public and environmental health. The required special

parts are often not locally available. With an existing solid waste incineration plant, Co-Combustion of Sludge can be done immediately. Pyrolysis and gasification reactors can be constructed with locally available materials (e.g. oil drum, locally produced burner) on a small scale.

Applicability: Co-Combustion of Sludge is an option, if a functioning incineration plant is within an acceptable distance to keep transport costs down. With an existing, functional incinerator, this technology can be used straight away in the acute phase of an emergency. As there is only some dewatering needed as a pre-treatment, sludge can be disposed of very quickly. The necessities in terms of skills, institutional set-up and financial resources to implement such a system from scratch are very high and only suitable for the recovery phase.

Operation and Maintenance: Highly skilled workers are needed to operate and maintain an incinerator and a pyrolysis or gasification reactor. Since high temperatures are reached, only trained staff should operate and maintain the reactor and be in the vicinity. Regular monitoring of the plant or reactor is needed.

Health and Safety: Along with heat, by-products of incineration and pyrolysis include several gaseous pollutants, as well as tar, ash and unburned solid residues. These by-products need further treatment or safe disposal, as they might be hazardous to human and environmental health.

Costs: The costs of installing a new incinerator are very high. Operation and maintenance (O & M) costs are also high, as specialised personnel must operate the plant. Other important costs to consider are the transport of products to the plant, which is often located outside of urban settlements. Capital costs for small-scale pyrolysis or gasification reactors are low to medium while O & M costs are relatively high as specialised personnel is needed.

Social Considerations: Co-Combustion of Sludge may not be appropriate in all cultural contexts. The incineration of sludge coming from human excreta and the use of incinerated sludge products in the cement industry might therefore be disregarded and need to be properly addressed as part of awareness raising measures.

Strengths and Weaknesses:

⊕ Effective pathogen reduction
⊕ Fast treatment time
⊕ High reduction of sludge volume

⊖ High energy input needed
⊖ High O & M costs
⊖ Residual ash and tar

→ **References and further reading material for this technology can be found on page 195**