Words You Should Know

Incineration:

The burning of waste at high temperatures to destroy hazardous organic compounds. About 22% of the mixed waste scheduled for processing at the AMWTP is expected to be incinerated.

Organic:

A chemical compound containing carbon. An example is carbon tetrachloride.

Secondary waste:

New waste generated by the treatment process itself.

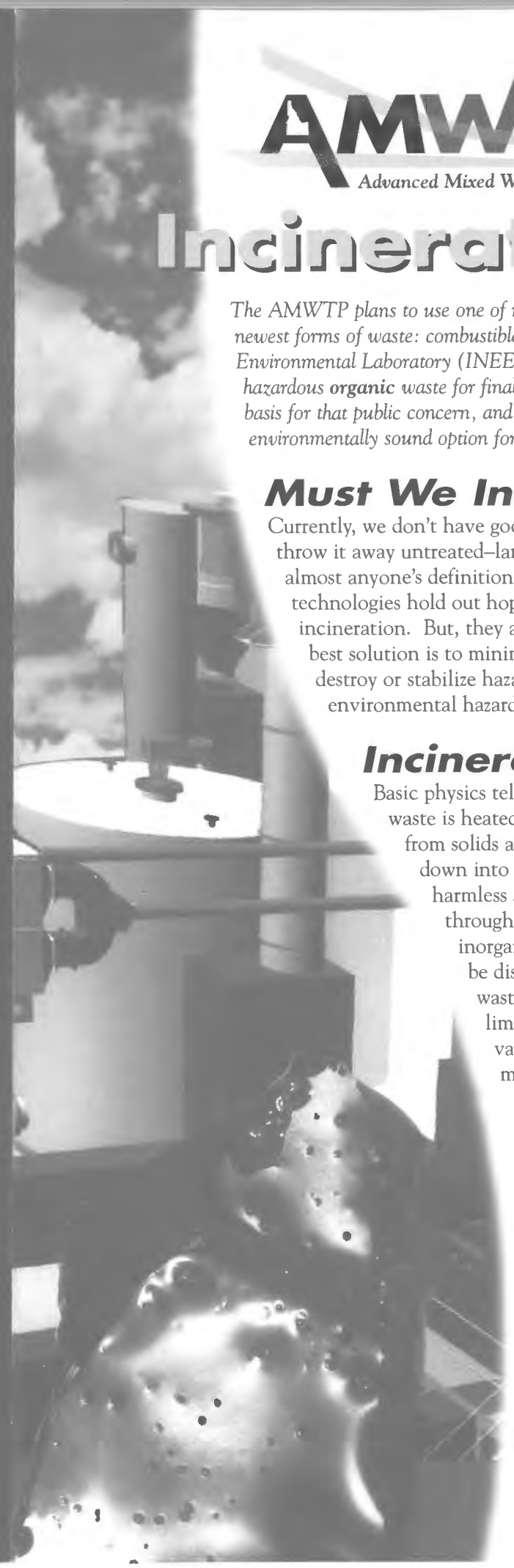
RCRA Protects Our Environment

Organic Compounds–RCRA requires a destruction and removal efficiency (DRE) of 99.99% or higher for selected principal organic hazardous compounds (POHCs).

Acid gases (such as nitrogen oxides, hydrogen chloride) may form in an incinerator. RCRA limits the amount of hydrogen chloride gas that can be released to the atmosphere.

Dioxins and furans are particularly hazardous compounds present in emissions from combustion devices, including incinerators. To obtain a RCRA incinerator permit, we must follow a rigorous process of testing, modeling, and risk assessment to show that dioxin/furan emissions are acceptable.

Solids–we plan to treat the ash produced by the AMWTP incinerator by vitrification to meet RCRA regulations for environmentally safe disposal.



AMWTP

Advanced Mixed Waste Treatment Project

Incineration

*The AMWTP plans to use one of man's oldest waste treatment technologies–incineration–to treat one of our newest forms of waste: combustible mixed wastes in temporary storage at the Idaho National Engineering and Environmental Laboratory (INEEL). While incineration is usually the treatment of choice for preparing hazardous **organic** waste for final disposal, it is often met with considerable public opposition. We understand the basis for that public concern, and we welcome this opportunity to tell you why we think incineration is an environmentally sound option for treating mixed transuranic and alpha low-level wastes at INEEL.*

Must We Incinerate?

Currently, we don't have good alternatives to incineration for treating mixed waste. We can't just throw it away untreated–landfills will eventually leak and wastes would contaminate groundwater. By almost anyone's definition, permanent storage is not a treatment, much less a solution. Emerging technologies hold out hope for destroying toxic compounds and may someday prove preferable to incineration. But, they are still in development and are not presently available. Of course, the best solution is to minimize production of such waste–but for existing stockpiles, we need to destroy or stabilize hazardous components in waste and dispose of it in ways that minimize environmental hazards and health risks.

Incineration of Hazardous Waste

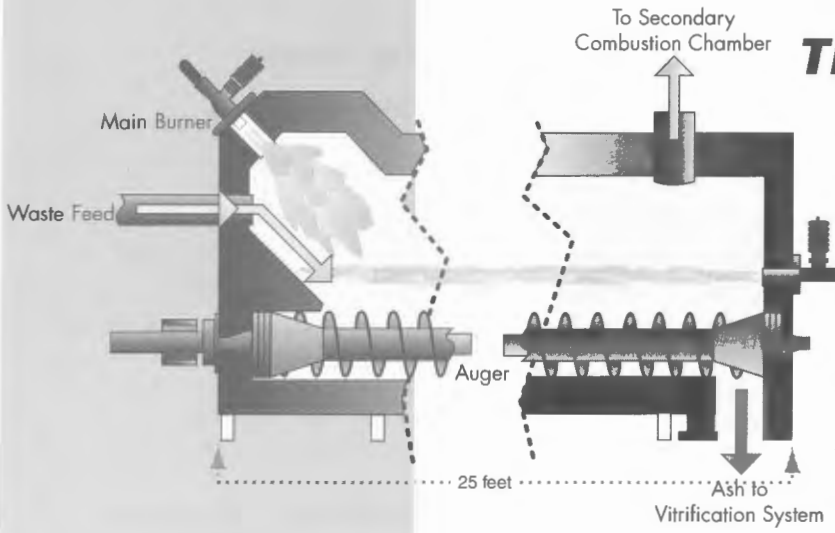
Basic physics tells us that matter cannot be destroyed–but its form can be changed. When waste is heated in an incinerator's combustion chamber, the organic part is converted from solids and liquids into gases. In the intense heat, the organic compounds break down into their constituent atoms. Most of those combine with oxygen to form harmless stable gases (such as carbon dioxide and water vapor) that are passed through a pollution control device and then released to the atmosphere. The inorganic part of the waste (metals, soils) remains behind in the ash, which must be disposed of. As an added benefit, incineration reduces the volume of the waste and conserves landfill space–or in the case of mixed transuranic waste, limited capacity at the Waste Isolation Pilot Plant (WIPP). Combustion also vaporizes water and other fluids, converting liquid wastes into more easily managed solids.

Incineration End Products

Combustion yields two types of end products: solids and gases. The gas may contain a very small quantity of the organic compounds found in the original waste, as well as new hazardous molecules formed from the breakdown and recombination of the original compounds. These new compounds, called "products of incomplete combustion" or PICs, are formed during combustion of any organic material–whether in an automobile engine, a fireplace, or a hazardous waste incinerator. In an incinerator, we keep the temperatures very high for a long enough time to minimize PIC formation. Plus, we design the air pollution control equipment to remove most of those that do form.

Incineration does not destroy inorganic compounds, such as metals, salts, and radionuclides–they end up in the solid product of incineration, ash. Most ash collects at the bottom of the combustion chamber (bottom ash), but some travels with the gases as small particles

(particulates), most of which are captured by the air pollution control system. AMWTP incinerator ash will be incorporated into glass–a process called vitrification–to put it in a form that resists leaching into the environment.



An auger will move waste along the 25 foot primary combustion chamber of the AMWTP incinerator. Heated air can be introduced from below the auger at four places and directed where needed to increase combustion efficiency to meet requirements.

The AMWTP Incinerator

In choosing technology to treat a waste type for which there are few options, we had to consider both program and environmental concerns. To avoid time delays and limit costs (and unpleasant surprises down the road), we only evaluated commercially-proven technologies. Although incineration has not been used to treat alpha-transuranic mixed waste for an extended period of time, the type chosen for the AMWTP (a horizontal auger hearth incinerator) already has a successful track record for treating low-level radioactive waste. The AMWTP incinerator would have two chambers. Waste would be fed into the primary chamber, to be burned in a controlled manner using supplemental heat from propane burners. Uncombusted material leaving the primary chamber would pass to the second chamber for destruction, and then to the air pollution control system.

Air Pollution Control

Incineration is not meant to shift contamination from one part of our environment (landfills) to another (air). While we know complete combustion of all organic compounds is not possible, environmental laws require that an incinerator and its air pollution control system meet very strict emissions limits. It is also not possible to monitor emissions for every potential contaminant, so through the Resource Conservation and Recovery Act (RCRA) permitting process we determine which compounds are of most concern and must be destroyed and monitored. These principal organic hazardous compounds (POHCs) are usually those in highest concentration in the waste feed or are the most difficult to burn. The reasoning is that if an incinerator can sufficiently destroy the most difficult and most concentrated compounds, the organics that are more easily burned would be eliminated, also. To get a RCRA permit, we will have to perform a trial burn to prove the AMWTP incinerator doesn't release POHCs to the environment above limits spelled out in the permit application.

Because the last thing we need is more radioactive waste, we only considered systems that remove particulates (including plutonium) up front, before the gas passes through the scrubbing system. This reduces radioactivity in the scrubber salt–which is by far the most dominant **secondary waste**. Today's air pollution control systems are designed not only to remove pollutants–such as acid gasses, particulates, and heavy metals—but also to keep some from forming. For example, the AMWTP system will rapidly cool the gas leaving the incinerator to minimize production of dioxins and furans. As with the other treatment technologies selected for the AMWTP, the incinerator and air pollution control system are designed to treat INEEL mixed waste in an environmentally sound manner to aid environmentally responsible disposal.

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For More Information on the AMWTP Please Call

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United States Department of Energy

BNFL Inc.

Other Regulations That Govern Air Emissions

Clean Air Act (CAA):

This law establishes limits for a broad range of emissions, including nitrous oxides (NOx), sulfur oxides (SOx), organic compounds, and metals. The AMWTP will have to obtain a Permit to Construct under the Act and meet CAA emissions limits.

Hazardous Waste Combustor (HWC) Maximum Achievable Control Technologies (MACT):

EPA's proposed new standards for hazardous waste incinerators would limit emissions of dioxins and furans, other toxic organic compounds, toxic metals, hydrochloric acid, chlorine gas, and particulate matter. This proposed rule is intended to consolidate most RCRA and CAA requirements and simplify the permitting process.

Toxic Substances Control Act (TSCA):

The incinerator must meet a destruction and removal efficiency (DRE) of 99.9999% for hazardous compounds (such as polychlorinated biphenyls) regulated under this law.