WORKSHOP "B" SUMMARY
VOLUME REDUCTION

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Overall the workshop brought out again the often repeated point, namely, that adequate management of radioactive waste must involve a series of steps. These steps lead from the generation of the waste to its permanent safe disposal. They are generally conceded to include collection, segregation, treatment, volume reduction, solidification, interim storage, transport, and disposal. Each step must accommodate the preceding one and facilitate the ones that follow. The amounts and characteristics of the radioactive wastes generated at a facility, as well as the subsequent handling procedures required, have direct bearing on the choice of appropriate volume reduction methods.

Some of the physical and chemical volume reduction (VR) methods described, discussed, or alluded to during the workshop are listed in Table I. For most organic materials (solid and liquid) some type of incineration appears to be a logical choice. The VR methods that seem most promising for aqueous wastes that require some type of immobilization or solidification are: calcination, crystalization, drying, thin-film evaporation, or an appropriate form of incineration. The VR methods that seem most promising for noncompactible, noncombustible wastes are: dismantling, melting, size reduction (see Table I), and smelting.

A large fraction (~30-40 vol %) of the radioactive waste generated in nuclear facilities in combustible and can be reduced substantially in volume and weight by incineration. These incinerable wastes include paper (and other cellulosic materials); plastics (polyvinyl chloride, polyethylene, polypropylene, Teflon, etc.); synthetic rubbers (latex, neoprene, etc.); animal carcases; as well as diverse organic liquids and oils.

TABLE I. Some of the Volume Reduction Methods Suggested for Use with Radioactive Wastes.

PHYSICAL METHODS	CHEMICAL METHODS
Compression	Calcination
Baler	Incineration[a,b]
Compactor	Acid digestion
Crystallization	Agitated hearth
Evaporator	Controlled air
Tray	Cyclone drum
Dismantling	Fluidized bed
Drying	Microwave/Gas plasma
Fixed Bed	Molten glass (Joule heating)
Fluidized Bed	Molten salt
Evaporation	Multiple hearth
Hot carrier fluid	Pyrolysis (Controlled air)
Thin film	Rotary kiln
Melting	Slagging pyrolysis
Size Reduction	
Chopping	
Cutting	
Crushing	
Grinding	
Shredding	
Smelting	

From the beginning of the nuclear industry, small incinerators have been used to recover plutonium and large incinerators have been used (largely in Europe) to burn low-level wastes so as to reduce their volumes. Many of these incinerators had problems which ranged from incomplete combustion and clogged off-gas systems to excessive corrosion throughout the system. However, over the last decade or so technological advances have eliminated most of these earlier deficiencies, and incineration is now used in nearly all countries that have nuclear facilities to treat all kinds and levels of combustible wastes. Much of this advance is due to the experience gained by other industries and municipalities in treating (incinerating) nonradioactive industrial wastes and garbage.

Finally, another point made frequently throughout the workshop was that any secondary wastes (e.g., off-gas scrubber solutions) that may be generated in the process, as well as any treatment that may be required to convert such secondary wastes to a form suitable for storage and/or disposal must ultimately be taken into account.