Abstract

At the present situation of waste generated all over in the world people are interested in management of all types of waste generated by them. Mainly it deals with waste which is not easily managed and which is more danger and problematic like Radioactive Waste. Mainly radioactive waste is any material that is either radioactive itself or is contaminated by radioactivity, for which no further use is envisaged. Government policy means that certain nuclear materials such as uranium, plutonium and spent nuclear fuel have not been declared as wastes by their owners. It has categorised as mainly high level and low level radioactive waste which is generated by nuclear reactors, medical facilities and by industry and research institutes. Radioactive waste then undergoes some stages like pre-treatment, compaction, conditioning, retrieval and disposal of radioactive waste.
1. Introduction

Any industrial activity results in generation of some waste material. Nuclear industry is no exception and the presence of radiation emitting radioactive materials which may have adverse impact on living beings and which is likely to continue to the subsequent generation as well is what sets nuclear or radioactive wastes apart from other conventional hazardous wastes. Another unique feature of the radioactive waste is the decay of radioactivity with time. This fact is gainfully exploited by the nuclear waste managers [2]. A multi barrier approach is followed in the disposal of radioactive solid wastes. The overall safety against migration of radionuclide is achieved by proper selection of waste form, suitable engineered barriers, backfill materials and the characteristics of the geo-environment of the repository site. Based on the nature and type of the radionuclide present in the solid waste and its concentration the repository could be near-surface or in deep geological formations. Operation of various Near Surface Disposal Facilities (NSDF) has led to considerable expertise in this field [4]

Since the beginning of nuclear power the major claim is that there will be a solution for nuclear waste soon that the waste problem really is not a technical problem but a social problem, but, anyway, we are near a solution. So there is no reason to stop producing it or endanger the future of nuclear energy. As this worldwide overview radioactive waste repository is seen as one of the main problems due to socio-political circumstances. Almost without exception, all radioactive waste management programs state that this generation must solve its own problems and not lay the burden of solving the waste problem on the next generations. But those same programs propose, again almost without exception, to postpone a decision on final disposal and/or reprocessing into the far-future, and consider interim storage Fact is that the problem of final disposal of high-level radioactive waste or spent fuel has not been solved, more than half a century after the first commercial nuclear power plants entered into operation and used fuel was unloaded from the reactors. Although we briefly describe the storage and disposal of low and intermediate level waste, the focus of this report is clearly on spent (or 'used') fuel from nuclear power plants. Waste from uranium mining is not even mentioned. It is also not about fuel from research reactors, which is mostly returned to the country of origin [8].

The Nuclear Waste Policy Act of 1982 (NWPA) calls for disposal of spent nuclear fuel in a deep geologic repository. NWPA established the Office of Civilian Radioactive Waste Management (OCRWM) in the Department of Energy (DOE) to develop such a repository, which would be licensed by the Nuclear Regulatory Commission (NRC). Amendments to NWPA in 1987 restricted DOE’s repository site studies to Yucca Mountain in Nevada. DOE submitted a license application for the proposed Yucca Mountain repository to NRC on June 3, 2008 [9].

2. Background To The Study

- K.T. Thomas, V.M. Efremenkov et al (4) point out the Radioactive waste is any material that is either radioactive itself or is contaminated by radioactivity, for which no further use is envisaged. Government policy means that certain nuclear materials such as uranium, plutonium and spent nuclear fuel have not been declared as wastes by their owners.
- V.M. Efremenkov (4) investigated High-level waste contains most of the radioactive fission products of spent fuel, but most of the uranium and plutonium usually has been removed for re-use. Radioactive waste that is radioactive enough for the decay heat to significantly increase its temperature and the temperature of its surroundings. This means that heat generation has to be
taken into account when designing storage and disposal facilities. Highly radioactive residue created by spent fuel reprocessing (almost entirely for defence purposes in the United States). Relatively low-activity waste that contains more than a certain level of long-lived elements heavier than uranium (primarily plutonium). Radiation shielding may be required for handling of some types of TRU waste. In the United States, transuranic waste is generated almost entirely by nuclear weapons production processes. Because of the plutonium, long-term isolation is required.

- According to investigation of Health and safety executive et al. (1) most LLW today arises from the operation of nuclear power stations and nuclear fuel reprocessing facilities, as well as the decommissioning and clean-up of nuclear sites. Operational LLW is principally lightly contaminated miscellaneous waste arising from maintenance and monitoring, such as plastic, paper and metal. LLW from decommissioning is mainly soil, building materials and metal plant and equipment. Four classes of low-level waste have been established ranging from least radioactive and shortest-lived to the longest-lived and most radioactive. Although some types of low-level waste can be more radioactive than some types of high-level waste, in general low-level waste contains relatively low amounts of radioactivity that decays relatively quickly. Uranium mill tailings in that the Sand-like residues remaining from the processing of uranium ore. Such tailings have very low radioactivity but extremely large volumes that can pose a hazard, particularly from radon emissions or groundwater contamination.

- Health and safety executive et al. (1) suggested that the Very low-level waste is a subset of LLW and falls into two distinct categories:
  a) Low-volume VLLW (‘dustbin disposal’) Radioactive waste that can be safely disposed of to an unspecified destination with municipal, commercial or industrial waste. The radioactive risk from such material is low enough that controls on disposal of this material, after removal from the premises where the wastes arose, are not necessary.
  b) High-volume VLLW (‘bulk disposal’) Radioactive waste that can be disposed of to specified landfill sites. After the waste is removed from its site of origin, it will be subject to controls on its disposal, which will be specified by the environmental regulators.

- Some radioactive waste is exempted from regulation by an Exemption Order issued under the Radioactive Substances Act 99(RSA9). Exempt waste does not need an authorisation for disposal

- USNRC Technical training center (10) suggested that the chemically hazardous waste that includes radioactive material. High-level, low-level, and TRU waste, and radioactive by-product material, often falls under the designation of mixed waste. Such waste possesses complicated institutional problems, because the radioactive portion is regulated by DOE under the Atomic Energy Act, while the Environmental Protection Agency (EPA) and states regulate the non-radioactive elements under the Resource Conservation and Recovery Act (RCRA).

### 3. Stages Depending On The Type Of Waste And The Strategy For Its Management

According to Health and safety executive, Environment agency, et al (1) and with reference of P.K.Wattel (2) the radioactive waste will undergo some of the following stages depending on the type of waste and the strategy for its management.
I. Pre-treatment
Pre-treatment is the initial step that occurs just after waste generation. It may involve collection, segregation, chemical adjustment and decontamination and may also include a period of interim storage. The aim of this step is to segregate waste into streams that will be managed in similar ways, and to isolate non-radioactive wastes or those materials that can be recycled.

II. Treatment
It involves changing the characteristics of the waste by volume reduction, radionuclide removal or change of composition. Typical treatment operations include compaction of dry solid waste or incineration of solid or organic liquid wastes (volume reduction); filtration or ion exchange of liquid waste (radionuclide removal); and precipitation or flocculation of chemical species (change of composition).

III. Conditioning
It involves transforming radioactive waste into a form that is suitable for handling, transportation, storage and disposal. This might involve immobilisation of radioactive waste, placing waste into containers or providing additional packaging. Common immobilisation methods include solidification of LLW and ILW liquid radioactive waste in cement, and verification of HLW in a glass matrix. Immobilised waste may be placed in steel drums or other engineered containers to create a waste package.

IV. Storage
Storage of radioactive waste may take place at any stage in the radioactive waste management process and aims to isolate the radioactive waste, help protect the environment and make it easier to control its disposal. Storage may be used to make the next step in the management process more straightforward or to act as a buffer between or within steps. Waste might be stored for many years before it undergoes further processing and disposal. Some storage facilities are located within a nuclear power plant or a licensed disposal facility, others are separate facilities.

V. Retrieval
It involves recovering waste packages from storage either for inspection, for disposal or for further storage in new facilities. Some storage facilities are designed so the equipment that deposits waste can be operated in reverse to retrieve waste packages. Others may need retrieval equipment to be installed.

VI. Disposal
Disposal occurs when packages of radioactive waste are deposited in a disposal facility with no intention of retrieval. Disposal may also include discharging radioactive wastes such as liquid and gaseous effluent into the environment and transfer of wastes from one site to another.

These all basic steps in radioactive waste management are illustrated in Figure 3.1. These basic steps in radioactive waste management are employed in a particular situation depends on the types of radioactive waste and the methods of radioactive waste management that are to be used. In some
cases individual steps may be closely linked or carried out together. The whole process needs to take place so that the way wastes are managed at each step is compatible with the subsequent steps. On most nuclear licensed sites there are a number of radioactive wastes to manage, particularly if nuclear facilities are being decommissioned. In all cases, an integrated approach to managing radioactive wastes and non-radioactive wastes is required [1].

![Diagram of basic steps in radioactive waste management]

**Figure 3.1: Basic steps in radioactive waste management**

**4. Discussion**

- We can use method of disposal or radio waste like uranium or radium which emits rays like alpha or beta that can be handled near to waste generation.
- Treatment and conditioning is best way to minimize waste which is goes to environment directly.
- Separation of waste in various categories with respect to content of waste helps to further process to be done on same.
- Finally radioactive waste should be treated or reused for public as well as environment safety.
5. Conclusion

From this all the discussion we conclude that the disposal of radioactive waste will be a key issue in the continuing nuclear power debate. Also spent fuel from nuclear power plants must be stored on-site indefinitely. This situation may raise public concern near proposed reactor sites, particularly at sites without existing reactors where spent nuclear fuel is already stored. Lack of a nuclear waste disposal system could also affect the licensing of proposed new nuclear plants. So we must know the various types of ways to avoid or to decrease the radioactive waste in to make our life away from such a hazardous pollution. Also the experimentation and analysis of referred outcome of this paper can do near to waste source with mentioned processes.

References