

RADIOACTIVE WASTE MANAGEMENT RADIOACTIVE WASTE TRANSPORTS

RADIOACTIVE WASTE MANAGEMENT

Jaslovské Bohunice Site

Nuclear Facility

Radioactive Waste Processing and Treatment Technologies (RAW PTT)

Liquid and solid radioactive waste (RAW) from decommissioning and operation of the nuclear power plants, institutional radioactive waste as well as radioactive waste from providing further commercial services is treated and processed in the nuclear facility Radioactive Waste Processing and Treatment Technologies.

RAW Processing and Treatment Technologies

- Bohunice RAW Treatment Centre
- Bituminization lines
- Cleaning station of waste water
- Technological lines for separation, fragmentation and decontamination of metallic RAW
- Technological lines for processing of used ventilation filters and used electric cables



Bohunice RAW Treatment Centre

1. BOHUNICE RAW TREATMENT CENTRE

The Bohunice RAW Treatment Centre (BRWTC) consists of a complex of facilities for RAW treatment and processing. It was built in 1993 – 1999. It has been in operation since 2000. The BRWTC is structurally and technologically connected with bituminization line and cleaning station of waste water in its active part.

Technological Lines in Operation

- separation of solid RAW
- high force compacting of solid RAW
- incineration of solid, liquid RAW and saturated sorbents
- concentration of liquid RAW in thickening facility
- RAW treatment by cementation into fibre concrete containers

Separation of RAW

After the transport to BRWTC the solid RAW is moved to the workstation for separation and fragmentation. After separation in the sorting box according to its type, the RAW is consequently treated in technological lines of the BRWTC of incineration or high force compacting.

High Force Compacting of RAW

After weighting and measurement of radionuclide activity, compressible solid RAW is compacted in 200 l barrels. The produced pellets are inserted into fibre concrete containers (FCC), in which the free space is subsequently filled with cement grouting in cementation line.

Incineration of RAW

Incineratable solid and liquid RAW as well as saturated sorbents are burned in the incineration facility. RAW incineration is performed at temperature 750 – 950 °C. Ash arising from the incineration process is fixed in 200 l barrels into a fixation matrix – paraffin. Used wash water from purification of gas is processed into cement grouting. Gas is exhausted by ventilating stack after final processing and chemical and radiological emissions are monitored.

Concentration of Liquid RAW

Concentration – thickening of liquid RAW is realized in an evaporating facility of flow-through type. At evaporation process radioactivity of input liquid RAW remains in a concentrated residue – concentrate, which is further processed into the cement grouting of the FCC.

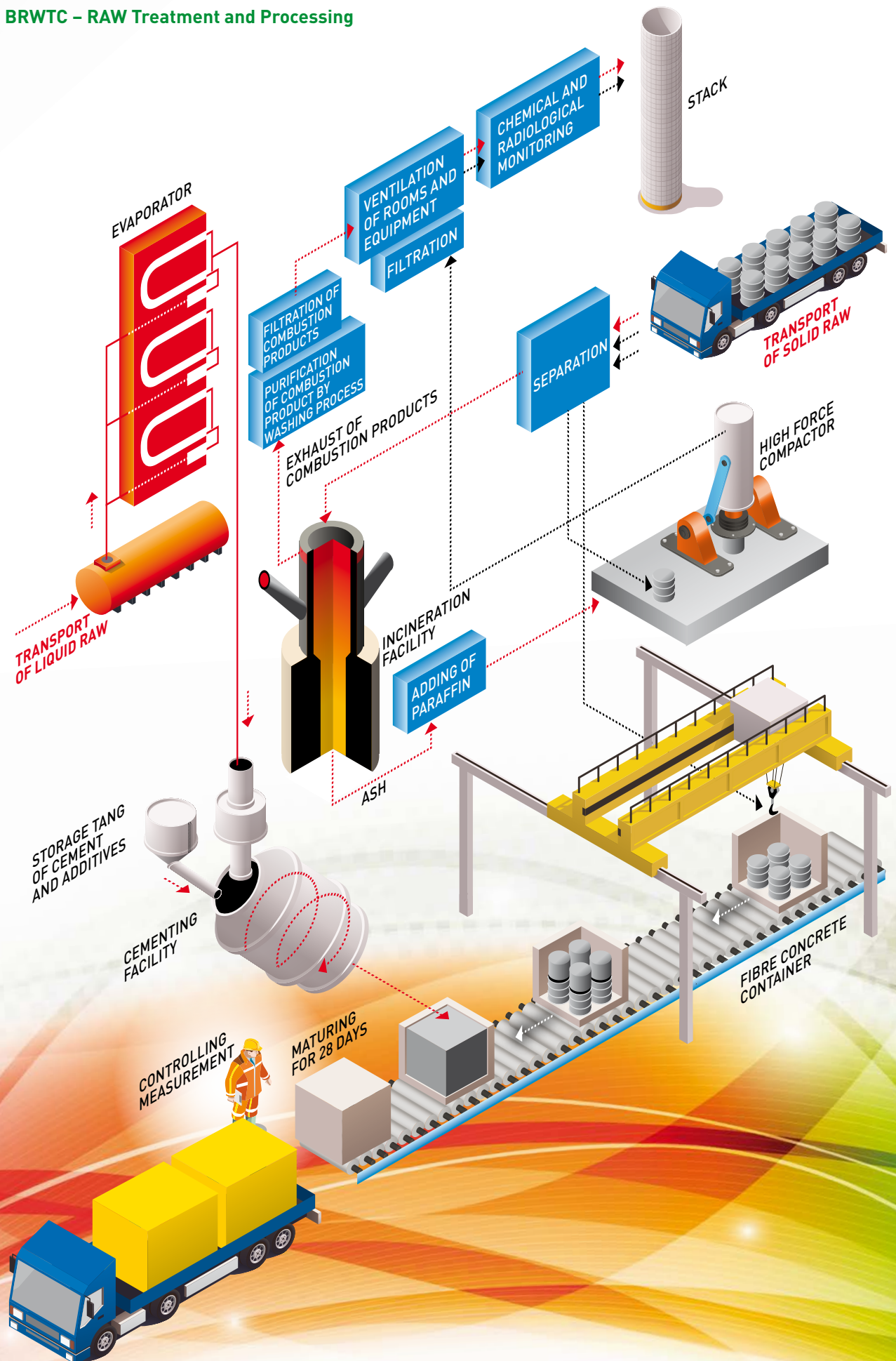
RAW Treatment by Cementation

The cementing facility allows processing of solid RAW or fixed RAW in matrix – (e.g. paraffined ash from the combustion facility; compacted pieces from high force compactor, non-combustible liquid RAW fixed in barrels in bitumen, cement or SiAl matrix) cementing grouting in a mixture with concentrates, sludge and saturated sorbents into the FCC. The FCCs sealed after its filling and stored in expedition hall of the BRWTC for maturing for specified time period.

Final Product – Fibre Concrete Container

The FCC, filled with cement mixture with solid or fixed RAW and reaching the stated limit conditions for final disposal of RAW is transported from BRWTC by road traffic or by train into the National RAW Repository in Mochovce. An accompanying letter of the container with all data from radiation and final inspection in the BRWTC, creates an important document for archiving data of RAW disposed in the National RAW Repository during its operation as well as institutional control of the repository after the termination of its operation.

BRWTC – RAW Treatment and Processing



2. BITUMINIZATION LINES

Low level liquid RAW from decommissioning and operation of the nuclear power plants is treated in bituminization lines.

Technological Lines in Operation

- bituminization of radioactive concentrates (ra-concentrates)
- concentration of low level radioactive water in thickening evaporator
- discontinuous bituminization of saturated sorbents

Bituminization of Ra-Concentrates

Film rotor evaporating equipment is basic equipment for bituminization of the ra-concentrates. After evaporation of water from the radioactive concentrate, dry soft crystals of dried salts are subsequently covered by bitumen – fixation medium.

Bituminization of Saturated Sorbents

The bituminization of saturated sorbents and sludge is based on their homogenization and their subsequent dewatering and drying. Dried sorbents and sludge are dosed from the dryer into the homogenizer and mixed with bitumen and polyethylene. The resulting product of bituminization of concentrates and sorbents is discharged into 200 l barrels, which are after their sealing prepared for the embedding and RAW treatment by cementation into FCCs in the BRWTC.

Thickening Evaporator

The circulating thickening evaporator serves for thickening of low level radioactive water. Thickened concentrate proceeds into a collecting concentrate tank and then for bituminization of concentrates in the film rotor evaporator.

3. CLEANING STATION OF WASTE WATER

Liquid RAW is thickened in the evaporator with natural circulation. Thickened radioactive concentrate is further treated after reaching optimal concentration by bituminization in bituminization lines or by cementation into the grouting of the FCCs in the BRWTC.

4. TECHNOLOGIES FOR SEPARATION, FRAGMENTATION AND DECONTAMINATION OF METALLIC RAW

Methods of Metallic RAW Fragmentation

- thermal (burning with plasma and an oxygen-acetylene cutter)
- cold (cutting with a hydraulic shear, cutting with a circular, cross-wise and longitudinal saw)

Decontamination of Fragments of Metallic RAW

- in high-capacity decontamination lines using wet method
- on blasting facility (clean up using a dry method of decontamination)

The decontaminated metallic materials fulfilling strict release limits are after monitoring released to the environment. Contaminated material is passed for further treatment by other methods.

Metallic RAW fragmentation



RAW high force compactor



RAW incinerator facility



5. TECHNOLOGIES FOR TREATMENT OF USED AIR-CONDITIONING FILTERS AND USED ELECTRIC CABLES

Treatment of Used Air-Conditioning Filters

- crushing, separation of metallic parts, dosing and mixing of chemicals into the crushed material
- treatment of resulting product by high force compacting or combustion in BRWTC

Treatment of Used Electric Cables

- manual decontamination, separation, removal of external insulations, crushing and separation from valuable non-ferrous metals
- treatment of generated solid RAW by high force compacting in BRWTC

CHROMPIC VITRIFICATION TECHNOLOGY

Vitrification of chrompic is a special technology of RAW processing. Vitrification facility is used for liquid RAW – chrompic, which is the A1 NPP spent fuel assemblies coolant media, fixation into a glass matrix. Glass vitreous containing active concentrate is released from the vitrification furnace into a metallic capsule and this is stored in an interim storage.

RAW STORAGE

To provide sufficient RAW storage capacities there are certified storages for solid and fixed RAW built in Jaslovské Bohunice in the RAW PTT nuclear facility. Solid and fixed RAW in the matrix not complying with limits for disposal in the National RAW Repository in Mochovce shall be stored in the nuclear facility Interim Radioactive Waste Storage together with large-dimensioned metallic RAW from decommissioning of the A1 NPP and the V1 NPP and another RAW before its treatment and processing on the lines of Radioactive Waste Processing and Treatment Technologies nuclear facility or the FCCs with processed RAW before their disposal at the National RAW Repository.

Large capacity decontamination line for metallic materials



Vitrification furnace with inductor



Processing of used ventilation filters



Mochovce Site

Nuclear Facility

Liquid Radioactive Waste Final Processing (LRAW FP)

The nuclear facility Liquid Radioactive Waste Final Processing is intended mainly for treatment and processing of liquid RAW, which is generated during the operation of the Nuclear Power Plant (NPP) in Mochovce. Besides that it is used for solid RAW treatment by means of cementation into the FCCs, following their transport from Jaslovské Bohunice site.

LRAW FP nuclear facility is located directly on the site of the operational units EMO 1,2 in Mochovce.

Technological Lines in Operation

- bituminization of ra-concentrates
- discontinuous bituminization of saturated sorbents
- concentration of liquid RAW in thickening evaporator
- RAW treatment by cementation to FCCs

Liquid RAW and saturated sorbents are transported from the operated reactor units of the Mochovce NPP (EMO 1, 2) by pipeline connections into the storage tanks of LRAW FP, from where they are pumped into the operational tanks of the corresponding technological lines of LRAW FP. Solid and fixed RAW are transported from nuclear facilities in Jaslovské Bohunice site into the nuclear facility LRAW FP for treatment by cementation into the FCCs, in licenced transport equipment.



Liquid Radioactive Waste Final Processing

Bituminization of Concentrates

The film rotor evaporator is basic equipment for bituminization of concentrates. After evaporation of water from radioactive concentrate, dry soft crystals of dried salts are subsequently covered in bitumen. The resulting product is discharged into 200 l barrels, which are after sealing prepared for embedding and cementation into fibre concrete containers.

After its purification in carbon filters the secondary circuit condensate is pumped into the tank of purified secondary circuit condensate and subsequently pumped into the overflow tank of waste water in the Mochovce NPP.

Bituminization of Sorbents

Bituminization of saturated sorbents and sludge is based on homogenization and subsequent dewatering and drying. Dried sorbents and sludge are dosed from the dryer into the homogenizer and they are mixed with bitumen and polyethylene. The resulting product of bituminization of concentrates and sorbents is discharged into 200 l barrels. Sealed barrels are cemented into fibre concrete containers.

Concentration of Liquid RAW

Concentration-thickening of liquid RAW is realized on a circulating thickening equipment. The thickened concentrate proceeds to the concentrate collecting tank and then to operational cementation tank, where it is used in the process of RAW cementation into the cement grouting of the FCCs. Condensate of secondary circuit steam is led into the purified secondary circuit condensate tank and subsequently pumped into the overflow tank of waste water in the Mochovce NPP.

RAW Treatment by Cementation

The active cement filling is prepared in the mixer into which thickened concentrate and other operational mixtures according to prescribed procedure. The mixture in the mixer is being homogenized for prescribed time and it is discharged into the fibre concrete container filled with 200l barrels with solid or fixed RAW in the matrix. After filling, the FCC is sealed and stored in an expedition hall for a time specified for maturation.

Final Product – Fibre Concrete Container

The FCC is filled with cement mixture with solid or fixed RAW and if it complies with the stated technical and radiation limit conditions for the RAW final disposal, it is transported by road traffic from LRAW FP to the National RAW Repository in Mochovce. An accompanying letter of the container with all data from radiation and final inspection in the LRAW FP is an important document for archiving data of RAW disposed in the FCCs in the National RAW Repository throughout the operation as well as the institutional control of the repository after termination of operation.

Fiber concrete containers with radioactive waste



Film rotor evaporator



Cement grout mixer



LRAW FP – RAW Treatment and Processing



RADIOACTIVE WASTE TRANSPORTS

The company JAVYS, a. s., transports solid and liquid RAW in Jaslovské Bohunice site to the RAW PTT nuclear facility by transport equipment in licenced transport containers (solid RAW in ISO containers, 200 l barrel, container PK III /barrels; liquid RAW in containers PK / SK and PK III / sludge). The liquid RAW from the A1 NPP nuclear facility can be transported to the RAW PTT directly by pipeline.

The solid or fixed RAW from the nuclear facilities in Jaslovské Bohunice site is transported to the LRAW FP nuclear facility in Mochovce by transport equipment in licenced transport containers – ISO containers. The liquid RAW from the operational EMO units can be transported to the LRAW FP only by pipeline connection.