

TREATMENT OF LIQUID WASTE FROM WWER PLANT'S

Klaus Blinn
Siemens AG, Offenbach, Germany

INTRODUCTION

The NPP Rheinsberg was shut down in 1990. As one of the first activities drainage of the storage tanks for liquid concentrates was planned. For this purpose the waste had to be removed from the storage tanks and separated in liquid and solid phase. Liquids undergo treatment in existing NPP's facilities whereas separated solids are packed directly into drums for final disposal at the ERAM (Morsleben) repository. The mobile equipment is in nuclear operation since autumn 1996.

CHARACTERISATION OF WASTE TYPES

The NPP's liquid concentrate storage facility houses two types of waste in three cylindrical double walled tanks, each of 500 m³ volume:

- PWR evaporator bottoms.
- Sludge, spent resins, aluminium sulphate, charcoal and other solids.

DESCRIPTION OF PROCESS AND EQUIPMENT

Emptying of storage tanks-

For suspending of sediments and removal of sludge's a mobile and reusable equipment was temporarily installed in either storage tanks through the man hole. The equipment consists of a moveable submerged mixing unit, an emptying unit and a piping system mounted on a moveable support. The mixing unit ensures a transport of solids all over the tank cross-section. The liquid waste is removed batchwise according to further treatment. The emptying unit is equipped with a crushing tool to disintegrate potential sludge and resin lumps. After emptying and cleaning-up one tank the equipment is transferred and installed into the next tank. The final cleaning of an emptied tank will be performed remote controlled using a cleaning high pressure water jets. The required equipment is mounted on a turntable and liftable support reaching the complete wall and bottom surface.

Adjusting of liquid waste before drying-

Generally some m³ waste from either sludge storage tank is pumped into an already existing buffer tank additionally equipped with a mixer unit. The liquid waste is mixed and adjusted to optimum centrifuge operation.

Evaporator bottoms need homogenizing of salt crystals and other solids in the buffer tank prior to the drying process.

Treatment of liquid waste-

The centrifuge at NPP Rheinsberg is a dismantable, mobile unit which is connected to the NPP's system. With the centrifuge unit sludge's as well as evaporator bottoms are treated to get liquids with only very small particle size and solids with low moisture and without free standing water.

The unit is installed in the liquid waste storage building on ground level.

The main skid mounted components are:

- Centrifuge feed pump
- Centrifuge modified for nuclear use
- Drum filling station

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- Exhaust gas ventilation system
- Drum transport and drum handling equipment.

By means of the feed pump the liquid waste is pumped from the buffer tank to the centrifuge. Samples of the feed may be taken and analysed to adjust the system properly. The centrifuge separates continuously the undissolved particles. The undissolved particles are dried in the centrifuge and removed into a 55 gal drum which is docked to the filling system. When the maximum filling level in the drum is detected the feed pump and the centrifuge are switched off and the drum with its outside shielding will be removed.

The drum filling system is kept under underpressure. The filtered off-gas will be send back to the NPP's ventilation system.

The decantate from sludge treatment can be reused as transport water for the next batch or it will be sent to other NPP's system for further treatment like evaporator bottoms which were cleared from solids.

CONCLUSION

With the installation of a mobile unit for:

- Tank volume mixing unit for the sludge
- Tank wall and bottom cleaning unit
- Mobile centrifuge system

the stored liquid waste at the NPP Rheinsberg could be treated cost effective and in time.

The treatment of liquid wastes e.g. waste water, sludge, spent resin and so on by means of centrifuge system shows the special advantages:

- High throughput
- High volume reduction
- No secondary waste
- No plugging
- Filling of the separated waste directly into containers
- Dry product meeting the requirements for final repository
- Proven technology
- Compact lay-out.