

OFFSHORE DISMANTLING AND DECONTAMINATION OF LSA CONTAMINATED PRODUCTION INSTALLATIONS

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ABSTRACT

Reym and RTD have gained experience with the offshore dismantling, cleaning and decontamination of LSA (Low Specific Activity) contaminated production installations. Performance of these activities offshore has several advantages over performing them onshore.

INTRODUCTION OF DEKOTEK

Reym bv is an industrial cleaning company that has a long experience with cleaning (parts) of oil and gas production installations, e.g. the cleaning of production vessels that is needed before a statutory inspection is performed by the relevant authority according to the Dutch Steam law. These production installations include the ones that are LSA-contaminated.

RTD bv, department Radiation Protection Services provides radiological services to the oil and gas industry with respect to the LSA problem, including the supervision of cleaning jobs on LSA-contaminated installations.

Together, Reym and RTD have started the joint-venture Dekotek with the objective to perform offshore (and onshore) dismantling, cleaning and decontamination jobs.

CLEANING VERSUS DECONTAMINATION

The regular cleaning of production vessels during the operational phase of a platform is done with the aim to make it accessible, and ready for inspection. Sludges are sucked from the vessel using vacuum techniques, and pollution is removed from the walls using high pressure water jetting. When a vessel is LSA contaminated the cleaning is performed according to special LSA procedures.

However because after an inspection the vessel is brought back into operation, no attempt is made to make the vessel LSA free. When cleaning is performed with this objective it is called decontamination. It goes without saying that the boundary between cleaning and decontamination is a grey area. The result of cleaning with more and/or more specialised effort is decontamination. Offshore cleaning of LSA contaminated installations already has been performed for many years without any essential problems. These jobs always are reported to State Supervision of Mines (SSoM) by the operator.

REGULATORY FRAMEWORK FOR THE NETHERLANDS

In the Netherlands the possession, treatment and transport of radioactive materials and waste are regulated in the Nuclear Energy Act, and the Radiation Protection Ordinance. The latter is included in the Mining regulations for the Dutch continental shelf.

According to the present regulations a license is required for LSA contaminated materials if the total specific activity is higher than 100 Bq/g, and the total activity is higher than 5 kBq. These limits are important if decisions have to be made about what has to be done with LSA contaminated waste coming from installations, e.g. LSA contaminated sludges that have been removed from production vessels. In the Netherlands the Central Organisation for Radioactive Waste (COVRA) is the only recognised institution for the collection of radioactive waste. All Dutch radioactive waste has to be stored at their facility, and therefore this is the only disposal route for LSA contaminated waste.

In the case of selling parts of LSA contaminated materials as scrap the limits mentioned in the Radiation Protection Ordinance are not sufficient, because in practice scrap metal traders refuse all objects showing an enhanced radiation level.

OBJECTIVE OF DEKOTEK

The objective of Dekotek is to remove LSA material from oil and gas production installations in an efficient and safe way, thereby minimising the volume of radioactive waste. In order to fulfil this objective we tackle the problem at the source.

The following situations can occur:

1. (Part of) an installation has to be cleaned for inspection and/or maintenance (in situ);
2. (Part of) an installation has to be cleaned and decontaminated before selling it as scrap;
3. (Part of) an installation has to be cleaned and decontaminated before selling it to another operator, re-using it on another platform, or sending it to a workshop for maintenance.

If a big LSA contaminated production vessel has to be scrapped, the following options exist: One option is that it is removed from the platform intact for decontamination at a facility onshore. Then, the first step is to clean it, i.e. to remove the sludge from it. The sludge has to be transported to COVRA, but not after it is brought into a physical form that is acceptable for this institution. The second step is that some modifications have to be made to the platform to be able to load the vessel on a ship, i.e. the platform has to be damaged, and therefore after the removal of the vessel it has to be repaired. The third step is the transport of a radioactively contaminated vessel across the sea and on the road to the onshore decontamination facility. After decontamination the LSA free vessel is transported to a scrap yard, and, after it has been brought into an acceptable physical form, the released radioactive waste has to be transported to COVRA. A second option is that the vessel is decontaminated, i.e. cleaned with more and/or more specialised effort, and cut into pieces on the platform, and that the waste streams are also separated and treated on the platform. In this case there is only one transport of LSA free scrap, and radioactive waste. Further no modifications have to be made to the platform. Steps that are performed double in the first option, are only performed once in the second option. Moreover less personnel and equipment is involved. From our experience the second option is preferable both with respect to the risks for personnel and the environment, and with respect to the costs.

PREPARATION AND ORGANISATION OF PROJECTS

The efficient and safe performance of dismantling and cleaning/decontamination projects depends on a good preparation and organisation. In co-operation with the customer, Dekotek will draw up a project plan and safety case or HAZOP study for submission to, and approval by the relevant authorities, i.e. the State Supervision of Mines. In such a safety case each stage of the project is described, and possible deviations from normal operations are identified. For each such deviation the possible causes, the potential consequences, and the precautions to be taken to prevent it from happening are established.

If for example we look at the cleaning of a production vessel, possible deviations from normal operation are the uncontrolled release of radioactive materials and contamination of personnel. A cause of such a deviation is the vessel inner surface being LSA contaminated, and the consequence is an occupational health risk. A precaution to be taken is the performance of radiation measurements before cleaning is carried out. If enhanced radiation levels are measured the cleaning job has to be performed according to LSA procedures, which include the installation of a controlled area, instruction to personnel carrying out the job, and use of special personal protection equipment.

Depending on the size of the project, and therefore the number of controlled areas that are installed at the same time, there can be one central radiation protection supervisor that is assisted by several radiation protection technicians.

Another deviation from normal operation is the release of radioactive waste, in addition to chemical waste. So the first thing to do after enhanced radiation levels in a vessel are measured is to assess if it contains radioactive materials for which a license according to the Nuclear Energy act is required. If this is the case a second step is to map the radioactive contamination. This step is essential in minimising the amount of radioactive waste, and in the prevention of the mixture of radioactive and non-radioactive material, and therefore possible dilution, which is forbidden. For example, in most cases the sludge in a vessel is not homogeneously radioactively contaminated, and a certain part of the sludge might not contain radioactive material with an activity concentration above 100 Bq/g. So, when removing the sludge it will be important to remove and treat these parts separately. For both steps samples have to be taken from the vessel which have to be analysed. In order to perform projects in an efficient way, it is important to obtain the results of these analysis quickly. Therefore, in bigger projects Dekotek uses an offshore laboratory.

OFFSHORE DECONTAMINATION OF PRODUCTION INSTALLATIONS

After the mapping of the contamination of a vessel, the first step is to suck the sludge from it, the radioactive part in one tank and the non-radioactive part in another. The second step is removing the LSA scale with high pressure water jetting, sucking the scale into one of the tanks, depending on whether it is radioactively contaminated or not. Internals can be removed from the vessel for separate treatment.

In Figure 1, a scheme of offshore decontamination is shown. We make a distinction between the decontamination of vessels, and the decontamination of other objects such as pipe pieces and internals. In the performance of decontamination jobs it is important to have a closed system and confined area in order to prevent the uncontrolled release of radioactive materials.

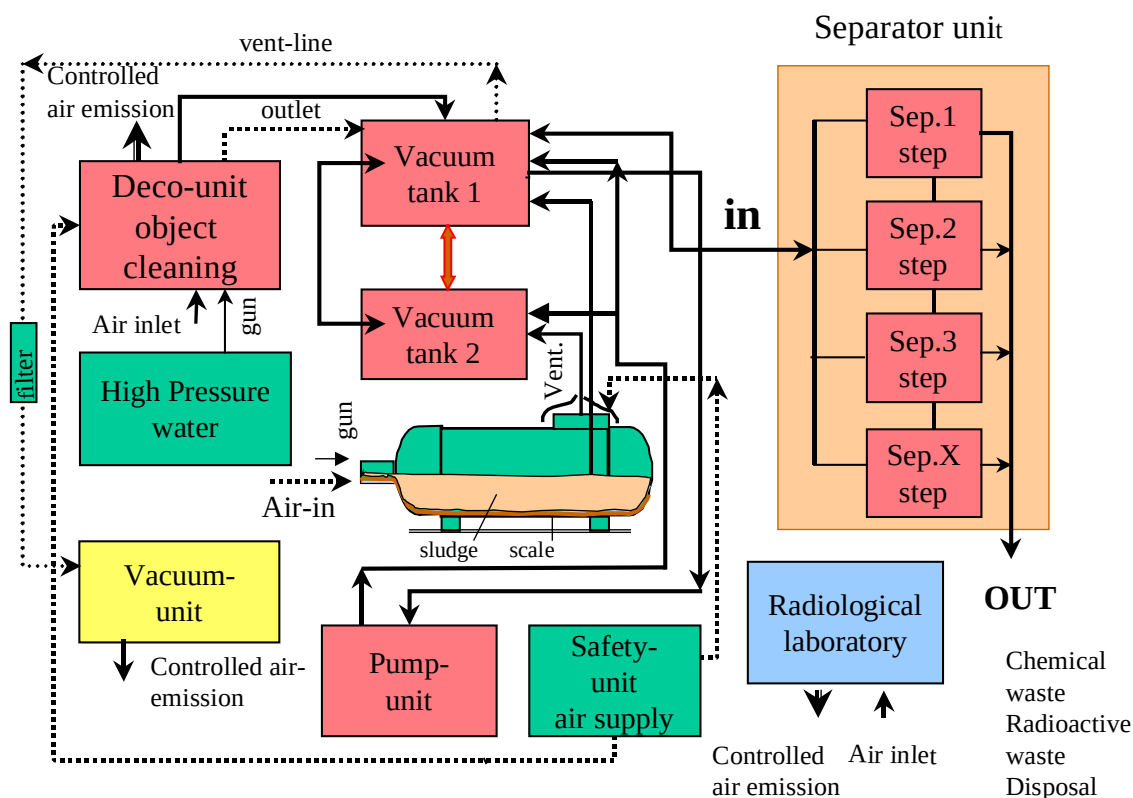


Figure 1 Scheme of offshore cleaning/decontamination

From our experience with cleaning jobs, in the case of decontamination of a vessel this is no problem, and therefore vessels can be decontaminated in situ.

The same closed system and confined area is created for the smaller items by using a specially created "Deco-unit". The Deco-unit is constructed in such a way that these smaller items can be decontaminated with high-pressure water jetting without the uncontrolled release of radioactive material. LSA contaminated material coming from the decontaminated objects falls through a grating, and is sucked into a vacuum tank. Again in order to minimise radioactive waste and to avoid dilution it is essential that items with different levels of radioactive contamination are treated separately, i.e. again sample analysis is an important step.

Both the vessel and the Deco-unit are treated as controlled areas and are supervised by a radiation safety expert.

After the high pressure water jetting has been performed the vessels and/or the objects are checked for radioactive contamination with portable radiation monitors and through the analysis of wipe tests.

OFFSHORE TREATMENT OF RADIOACTIVELY CONTAMINATED SLUDGES AND SCALES

The next step is to treat the sludges and scales that were sucked into the vacuum tanks. The non-radioactively contaminated sludges and scales are treated as chemical waste. The radioactively contaminated sludges and scales are treated offshore in order to concentrate the volume of radioactive waste and to bring them into an acceptable form for COVRA.

The proposed treatment of radioactively contaminated sludges and scales is shown in Figure 2 and Figure 3.

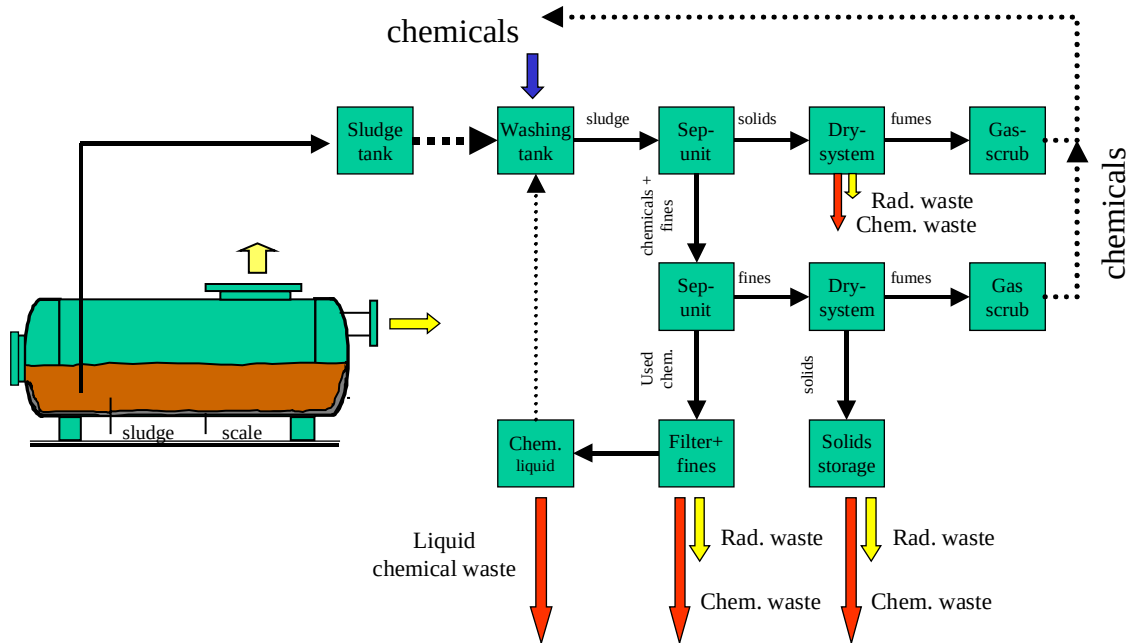


Figure 2 Offshore sludge treatment.

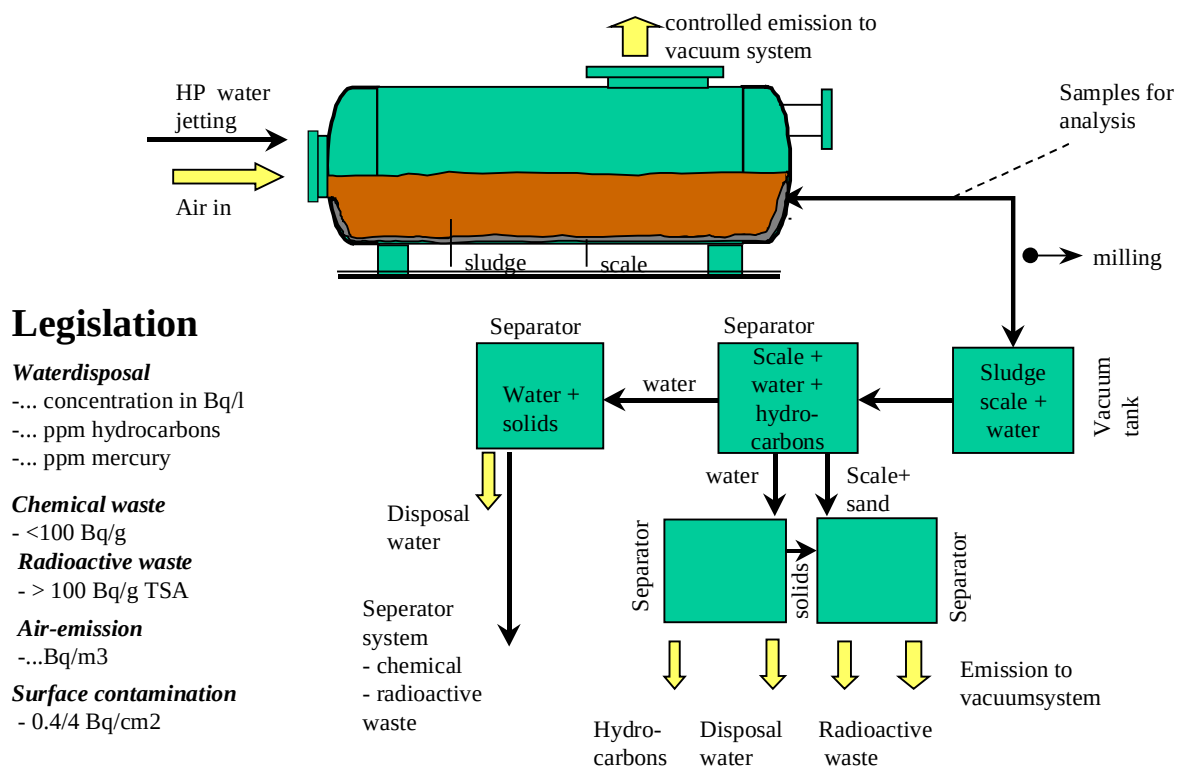


Figure 3 Offshore scale treatment