

Handling radioactive therapeutic waste

In its development of cancer treatment services, Belfast City Hospital Trust has installed a vacuum drainage system for dealing with radioactive therapeutic waste.

Advances in cancer treatment over recent years have benefited patients throughout the world, and radioactive isotopes are used for the treatment of some malignant tumours.

With nearly 9,000 new cancers and approximately 3,800 cancer deaths each year in Northern Ireland, the Belfast City Hospital Trust has been implementing a major programme of change and development in cancer services across Northern Ireland.

As part of this programme, the Trust has constructed a new purpose-built cancer centre on the Belfast City Hospital campus on the Lisburn Road in Belfast and patients who would have previously received this treatment at Belvoir Park Hospital, (a small radiotherapy hospital), will have transferred to the new purpose-built unit.

This new facility ensures that Northern Ireland is now a leader within the UK and Ireland in the field of cancer diagnosis, treatment and research.

Through the creation of an environment conducive to delivering sustained improvements in cancer care, cancer

patients in Northern Ireland will receive care of the highest quality and standard.

Among the many treatments offered within this new facility is ablation therapy or unsealed source therapy. This therapy consists of treating the patient with a radioactive isotope, (typically radioiodine ¹³¹I for the treatment of thyroid cancer). Other radioactive isotopes are utilised on a variety of other cancers.

Excreted

One side effect of the treatment for thyroid cancer is that while much of the iodine is absorbed by the thyroid or thyroid metastases, the balance of the radioactivity is excreted from the patient's body, primarily in urine.

Considering the requirements of the OSPAR Convention concerning the discharge of radioactive material into the environment, and its own health and safety requirements, the hospital authority in Belfast, together with the Environment and Heritage Service and the design team, determined that they would provide the safest possible protection for this facility and elected to use a vacuum

Sampler drains are provided to enable levels of radioactivity in the tank to be monitored as an extra safety check prior to discharge to the public sewer

drainage system for the storage and disposal of the radioactive excreta.

With a radioactive half life of eight days, the authorities sought to provide a delay tank system that would facilitate storage through approximately 11 half lives, (90 days) and reduce the level of radioactivity by a factor of 2,400 prior to discharge.

The specialist vacuum drainage supplier Jetvac undertook the design and supply of the vacuum drainage package. The company's CEO Alan Russell oversaw



Beneath the grated floor are vacuum pumps, macerators and vacuum tank.



Prefabricated motorised valve manifold.



View down onto the valve manifold. Two storage tanks are to the right, but hidden.

Systems

all aspects of the design through to the final commissioning.

Alan Russell said: "We realised the importance of this system both from the hospital's and the Environment and Heritage's point of view and we were determined to provide the best bespoke system for this application."

Comprising four stainless steel tanks, the whole system, including pumps, valves, blowers and the vacuum unit are housed in approximately 40m² within the hospital building. The system provides a 300% safety factor with the vacuum pumping and discharge capability.

Controlled by a specifically designed software package that forms an integral part of the building management system and is protected by UPS, three of the four storage tanks permutating on a 30/90 day cycle provide the half life decaying period required to allow the waste to be discharged. Computer controlled aeration within the tanks prevents the tanks turning septic and effectively treats the sewage prior to discharge. Sampler

drains are also provided to enable levels of radioactivity in the tank to be monitored as an extra safety check prior to discharge to the public sewer.

Safety first

Throughout the exercise, safety for the health service employees and the public, as well as protection of the environment, have been the main features of the system and this has been engineered into every aspect of this facility. This has been achieved with substantial over-capacity in the vacuum and discharge elements and remote access to control the system with even a dedicated Internet link to allow Jetvac, as well as the hospital engineers, to monitor the performance from a position of safety. Extra storage capacity is available within tank four and, in the event of leakage from any of the tanks, floor drains built into the facility will automatically open and drain any spillage to tank four.

Additional benefits from the vacuum system are that it generates

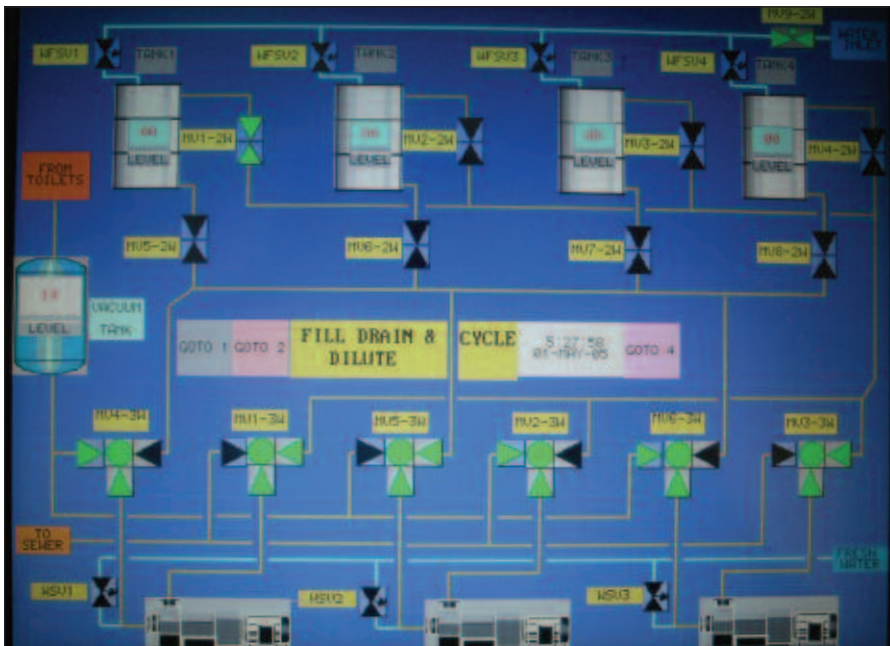


One of the storage tanks.

approximately 15% to 20% of the waste generated by a conventional system and so reduces storage capacity. It is a totally sealed unit providing protection to health service employees and the public and any accidental damage that may occur within the pipeline will only cause the system to suck in air and trigger the alarms, unlike a pumped conventional piped system that could lead to a spill of radioactive waste.

Current guidelines regarding the UK Discharge Strategy are being revised by DEFRA and the devolved administrations and if, as may be anticipated, establishments with low level discharges may have to be more accountable for the treatment of their wastes then it is anticipated that the Jetvac Therapeutic Waste Disposal System will provide an ideal solution for the disposal of these materials and can offer a consistent and controlled level for Environmental Agencies throughout the British Isles to work with. +

■ This article contains contributions by Robert Larmour (NI Environment and Heritage Service) and Brian Gilmore (Northern Ireland Regional Medical Physics Agency).



Clearly displayed information.