

A Decontamination Trump Card for Reducing the Cost of Secondary Waste Processing

NitroJet®

Achieves ideal decontamination and decommissioning by using liquid nitrogen at a pressure of 3 000 atmospheres

The largest problem encountered when decontaminating and decommissioning nuclear facilities is the increasing costs of processing secondary contamination and liquid waste from the water used for decontamination. NitroJet® is expected to become the trump card in decontamination and decommissioning as it will essentially solve this problem with the use of liquid nitrogen.



NitroJet® spray



NitroJet® skid



Concrete scabbling

A highly anticipated debut of possibilities

The attention towards decommissioning of nuclear power plants in Japan has become increasingly heightened since the accident at the Fukushima Daiichi nuclear power plant which was caused by the Great East Japan Earthquake in 2011. IHI Nuclear Power Operations has a large record of past accomplishments in the field of new construction of nuclear power plants. This has included manufacturing of pressure vessels, piping design and the like, periodic inspection, remodeling, examination of earthquake resistance and processing and disposal of radioactive waste at reprocessing plants. With our achievements and technologies,

we are now advancing in new development of the work of decommissioning nuclear facilities. As part of this development we have welcomed to our group of companies, NitroCision, LLC, USA, which possesses innovative decontamination technology. We have actively begun improvement and proposal activities in order to apply NitroCision's NitroJet® technology which is capable of techniques such as scabbling and cutting.

Scabbling concrete surfaces such as walls and floors of radioactively contaminated areas can keep the amount of radioactive dismantled waste to a minimum. This is very important from the aspect of separating contaminated materials to minimize dismantling costs. NitroJet® is very useful as it possesses this kind of concrete scabbling

technology, and has already been applied in nuclear power facilities in Europe and North America.

NitroJet[®] is based on technology that was developed by the Idaho National Laboratory (INL) of the US Department of Energy (DOE). Its range of application has been improved and expanded upon by NitroCision, LLC and made into a product. It has been used mainly in the US market for the cleaning and cutting of vessels contaminated by radioactive material, decontamination of reprocessing plants, cleaning of heat exchangers, removing coatings or adhered matter on rockets and film on graphite or metal surfaces and dismantling weapons.

What is NitroJet[®]?

NitroJet[®] is technology that makes it possible to scabble concrete, remove coatings and cut metal by spraying a target object with highly pressurized liquid nitrogen at a very low temperature. The force that is utilized is generated when the liquid nitrogen at a very low-temperature, vaporizes and expands approximately 700 times.

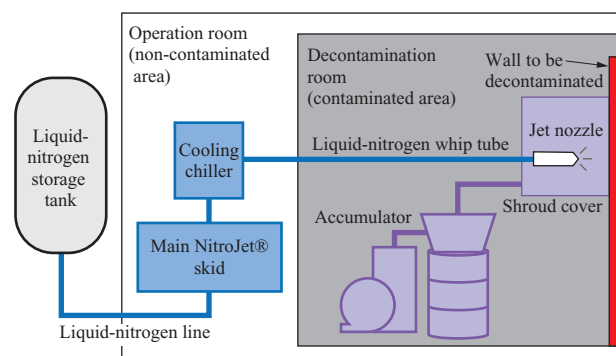
The NitroJet[®] system includes a liquid nitrogen storage tank, a main skid, a cooling chiller, a jet nozzle that sprays the liquid nitrogen, a shroud cover that recovers the contaminated matter, and an accumulator.

The shape of the jet nozzle can be selected according to the usage, and when the level of contamination is low, NitroJet[®] can be operated directly by workers wearing protective clothing and a full mask, and when the level of contamination is high, the jet nozzle can be held by a robot with work being performed remotely.

In order to ensure contaminated material and vaporized nitrogen are not scattered to the surrounding areas, the jet nozzle is covered by a shroud cover, making it possible to recover the contaminated material by collecting the contents with an accumulator. Before the nitrogen is discharged into the atmosphere, any contaminated dust is recovered with a filter, so it is possible to prevent the spread of radioactivity. The recovered material is handled as solid waste, so handling is also simple. It is also possible to mount NitroJet[®] together with the liquid nitrogen storage tank on to a trailer.

An incomparably powerful cleaning and cutting machine

NitroJet[®] differs from a water jet which uses typical decontamination technology because it is a dry process that sprays nitrogen gas at low temperature and so eliminates the fear of secondary contamination from contaminated water generated by traditional methods. The nitrogen used is normally found in air, so there is also no negative effect on the environment. Liquid waste is not generated, so it is possible to greatly reduce the overall processing cost, which is another large merit. Performing remote operations is also simple, so NitroJet[®] is also suitable for decontamination of high dose areas and narrow spaces. The powerful decontamination and cutting ability makes it possible to scabble concrete walls



NitroJet[®] process

which have a maximum thickness of 40 mm, and cut metal structures such as stainless steel of thickness 50 mm by using an abrasive. NitroJet[®] is on an equivalent or even higher level in all aspects when compared to other existing methods. The target object for cutting does not become hot, so there is no transformation or deformation of the base material. NitroJet[®] can even be used with combustible materials so the applications can be very wide ranging. The specifications of NitroJet[®] are mainly as given below.

The operating pressure is approximately 310 MPa (maximum pressure of approximately 410 MPa), which is very high pressure, the temperature of the liquid nitrogen is a very low temperature of approximately -150°C , and the rate of liquid nitrogen that is consumed is approximately 19 l/min. The dimensions of the main skid are 3.0 m (length) \times 1.8 m (width) \times 1.2 m (height), and the weight is 3.4 t. The power source is a three-phase alternating current 480 V, 150 kVA, the speed of decontamination is 10 m²/h when decontaminating a concrete surface, and 2.5 m²/h when scabbling concrete (depth 14 mm). Scabbling is possible up to a maximum depth of 40 mm.

By combining the abundant nuclear power related expertise that IHI has accumulated up until now with the technology of NitroCision, IHI is able to provide more added value and has objectives to contribute to the work of decommissioning nuclear power plants in Japan, which is expected to become an increasing market.

Mini commentary

Scabbling

Thinly scraping and removing metal, rock, wood and the like with a chisel or graver. (Daijirin: Sanseido)

Scabbling is also performed in pavement repair work of roads, and the technician that specializes in such work is called a cement/concrete finisher.

Inquiries:

Sales Department, Nuclear Power Operations,
IHI Corporation
Phone: +81-45-759-2157
Website: www.ihico.jp/en/