

WASTE STREAM	9F14	Desiccant and Catalyst from Gas Conditioning Plant
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SITE Sizewell A
SITE OWNER Nuclear Decommissioning Authority
WASTE CUSTODIAN Magnox Limited
WASTE TYPE ILW

WASTE VOLUMES

		Reported
Stocks:	At 1.4.2019.....	4.9 m ³
Total future arisings:		0 m ³
Total waste volume:		4.9 m ³
Comment on volumes:	-	
Uncertainty factors on volumes:	Stock (upper): x 1.1	Arisings (upper) x
	Stock (lower): x 0.9	Arisings (lower) x

WASTE SOURCE Reactor gas driers (humidriers) - desiccant removal. Also some catalyst from the recombination units in the Gas Conditioning Plant.

PHYSICAL CHARACTERISTICS

General description: Desiccant pellets stored in the Reactor Gas Driers and Gas Conditioning Plant. There are no large items. Waste is expected to be placed in neoprene liners on retrieval from the plant.

Physical components (%vol): Desiccant pellets (82%), catalyst pellets (12%), neoprene drum liners (6%). 4m3 Desiccant, 0.6m3 catalyst, 0.3m3 neoprene liners.

Sealed sources: -

Bulk density (t/m³): 0.8

Comment on density: Density of desiccant measured as 0.84 g/cc. Density of catalyst measured as 0.8 g/cc.

CHEMICAL COMPOSITION

General description and components (%wt): Desiccant: molecular sieve (sodium aluminium silicate), catalyst (platinum on alumina) and neoprene drum liners.

Chemical state: Neutral

Chemical form of radionuclides: H-3: Tritium is expected to be present as water. Some may also be present in other inorganic or organic compounds.
 C-14: The carbon 14 content is insignificant.
 Cl-36: The chemical form of chlorine 36 has not been determined.
 Se-79: The selenium content is insignificant.
 Tc-99: The technetium content is insignificant.
 Ra: The radium isotope content is insignificant.
 Th: The thorium isotope content is insignificant.
 U: The uranium isotope content is insignificant.
 Np: The neptunium content is insignificant.
 Pu: The plutonium isotope content is insignificant.

Metals and alloys (%wt): No bulk or sheet metal items present.

Stainless steel.....	0
Other ferrous metals.....	0
Iron.....	
Aluminium.....	0
Beryllium.....	0
Cobalt.....	
Copper.....	0
Lead.....	0
Magnox/Magnesium.....	0
Nickel.....	

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	Titanium.....	
	Uranium.....	
	Zinc..... 0	
	Zircaloy/Zirconium..... 0	
	Other metals..... NE	Platinum associated with the catalyst.
Organics (%wt):	The only organic material is a neoprene drum liner.	
	Total cellulose..... 0	
	Paper, cotton..... 0	
	Wood..... 0	
	Halogenated plastics 0	
	Total non-halogenated plastics..... 0	
	Condensation polymers..... 0	
	Others..... 0	
	Organic ion exchange materials.... 0	
	Total rubber..... 6.0	
	Halogenated rubber 6.0	Neoprene drum liner.
	Non-halogenated rubber..... 0	
	Hydrocarbons.....	
	Oil or grease	
	Fuel.....	
	Asphalt/Tarmac (cont.coal tar)...	
	Asphalt/Tarmac (no coal tar)....	
	Bitumen.....	
	Others.....	
	Other organics..... 0	
Other materials (%wt):	-	
	Inorganic ion exchange materials. 0	
	Inorganic sludges and flocs..... 0	
	Soil..... 0	
	Brick/Stone/Rubble..... 0	
	Cementitious material..... 0	
	Sand.....	
	Glass/Ceramics..... 0	
	Graphite..... 0	
	Desiccants/Catalysts..... 94.0	Desiccant pellets (82%), catalyst pellets (12%).
	Asbestos..... 0	
	Non/low friable.....	
	Moderately friable.....	
	Highly friable.....	
	Free aqueous liquids..... 0	
	Free non-aqueous liquids..... 0	
	Powder/Ash..... TR	

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Inorganic anions (%wt):

Silicate is present, other inorganic anions are not fully assessed.

Fluoride.....	NE
Chloride.....	NE
Iodide.....	NE
Cyanide.....	0
Carbonate.....	NE
Nitrate.....	NE
Nitrite.....	NE
Phosphate.....	NE
Sulphate.....	NE
Sulphide.....	NE

Materials of interest for waste acceptance criteria:

Powder may be present in trace quantities.

Combustible metals.....	0
Low flash point liquids.....	0
Explosive materials.....	0
Phosphorus.....	0
Hydrides.....	0
Biological etc. materials.....	0
Biodegradable materials.....	
Putrescible wastes.....	0
Non-putrescible wastes.....	
Corrosive materials.....	0
Pyrophoric materials.....	0
Generating toxic gases.....	0
Reacting with water.....	0
Active particles.....	
Soluble solids as bulk chemical compounds.....	

Hazardous substances / non hazardous pollutants:

None expected.

Acrylamide.....	
Benzene.....	
Chlorinated solvents.....	
Formaldehyde.....	
Organometallics.....	
Phenol.....	
Styrene.....	
Tri-butyl phosphate.....	
Other organophosphates.....	
Vinyl chloride.....	
Arsenic.....	
Barium.....	

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Boron.....
 Cadmium.....
 Caesium.....
 Selenium.....
 Chromium.....
 Molybdenum.....
 Thallium.....
 Tin.....
 Vanadium.....
 Mercury compounds.....
 Others.....
 Electronic Electrical Equipment (EEE)
 EEE Type 1.....
 EEE Type 2.....
 EEE Type 3.....
 EEE Type 4.....
 EEE Type 5.....
 Complexing agents (%wt): No
 EDTA.....
 DPTA.....
 NTA.....
 Polycarboxylic acids.....
 Other organic complexants.....
 Total complexing agents..... 0

LAW TREATMENT, PACKAGING AND DISPOSAL

Waste that is currently ILW: The waste is planned to be washed and incinerated with an alternative option of decay storage being investigated.

Planned on-site / off-site treatments(s):

Treatment	On-site / Off site	Stream volume %
Low force compaction Supercompaction (HFC) Incineration Solidification Decontamination Metal treatment Size reduction Decay storage Recycling / reuse Other / various None		100.0

Comment on planned treatments:

Intention is to wash prior to incineration to reduce tritium burden, residual ash to be disposed of as VLLW.

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Disposal Route	Stream volume %
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known	100.0

Upcoming (2019/20-2021/22) waste routing (if expected to change from above)

Disposal Route	Stream volume %		
	2019/20	2020/21	2021/22
Expected to be consigned to the LLW Repository Expected to be consigned to a Landfill Facility Expected to be consigned to an On-Site Disposal Facility Expected to be consigned to an Incineration Facility Expected to be consigned to a Metal Treatment Facility Expected to be consigned as Out of Scope Expected to be recycled / reused Disposal route not known			

Waste Packaging for Disposal: (Not applicable to this waste stream)

Container	Stream volume %	Waste loading m ³	Number of packages
1/3 Height IP-1 ISO 2/3 Height IP-2 ISO 1/2 Height WAMAC IP-2 ISO 1/2 Height IP-2 Disposal/Re-usable ISO 2m box (no shielding) 4m box (no shielding) Other			

Other information: -

Waste Consigned to the LLW Repository:

Container voidage: -

Waste Characterisation Form (WCH): -

Waste consigned for disposal to LLWR in year of generation: -

Potential for the waste to contain discrete items: -

Non-Containerised Waste for In-Vault Grouting: (Not applicable to this waste stream)

Stream volume (%): -

Waste stream variation: -

Bounding cuboidal volume:

Inaccessible voidage: -

Other information: -

RADIOACTIVITY

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Source:	The waste is exhausted desiccant and catalyst from the reactor gas drier system. The main source of activity is from tritium.
Uncertainty:	Activity estimates are considered to be accurate to a factor of 10.
Definition of total alpha and total beta/gamma:	Total beta/gamma is defined as the sum of the listed activities of all nuclides other than alpha emitters.
Measurement of radioactivities:	Activities have been measured.
Other information:	Mn 54 and Fe 55 may be present in trace quantities. Specific activity is a function of operating history.

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Desiccant and Catalyst from Gas Conditioning Plant

Nuclide	Mean radioactivity, TBq/m ³				Nuclide	Mean radioactivity, TBq/m ³			
	Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code		Waste at 1.4.2019	Bands and Code	Future arisings	Bands and Code
H 3	8.62E-02	CC 1			Gd 153		8		
Be 10		8			Ho 163		8		
C 14	3.54E-05	CC 1			Ho 166m		8		
Na 22					Tm 170		8		
Al 26					Tm 171		8		
Cl 36	1.57E-04	CC 1			Lu 174		8		
Ar 39		8			Lu 176		8		
Ar 42		8			Hf 178n		8		
K 40		8			Hf 182		8		
Ca 41		8			Pt 193		8		
Mn 53		8			Tl 204		8		
Mn 54		6			Pb 205		8		
Fe 55	4.27E-07	CC 1			Pb 210		8		
Co 60	1.56E-07	CC 1			Bi 208		8		
Ni 59		8			Bi 210m		8		
Ni 63	3.32E-08	CC 1			Po 210		8		
Zn 65		8			Ra 223		8		
Se 79		8			Ra 225		8		
Kr 81		8			Ra 226		8		
Kr 85		8			Ra 228		8		
Rb 87		8			Ac 227		8		
Sr 90	9.3E-06	CC 1			Th 227		8		
Zr 93		8			Th 228		8		
Nb 91		8			Th 229		8		
Nb 92		8			Th 230		8		
Nb 93m		8			Th 232		8		
Nb 94		8			Th 234		8		
Mo 93		8			Pa 231		8		
Tc 97		8			Pa 233		8		
Tc 99		8			U 232		8		
Ru 106		8			U 233		8		
Pd 107		8			U 234		8		
Ag 108m		8			U 235		8		
Ag 110m		8			U 236		8		
Cd 109		8			U 238		8		
Cd 113m		8			Np 237		8		
Sn 119m		8			Pu 236		8		
Sn 121m		8			Pu 238		8		
Sn 123		8			Pu 239		8		
Sn 126		8			Pu 240		8		
Sb 125		8			Pu 241	4.01E-09	CC 1		
Sb 126		8			Pu 242		8		
Te 125m		8			Am 241		8		
Te 127m		8			Am 242m		8		
I 129		8			Am 243		8		
Cs 134	5.57E-07	CC 1			Cm 242		8		
Cs 135		8			Cm 243		8		
Cs 137	2.59E-08	CC 1			Cm 244		8		
Ba 133		8			Cm 245		8		
La 137		8			Cm 246		8		
La 138		8			Cm 248		8		
Ce 144		8			Cf 249		8		
Pm 145		8			Cf 250		8		
Pm 147	7.13E-07	CC 1			Cf 251		8		
Sm 147		8			Cf 252		8		
Sm 151		8			Other a				
Eu 152	7.03E-09	CC 1			Other b/g				
Eu 154	4.05E-06	CC 1			Total a	0			0
Eu 155	1.45E-06	CC 1			Total b/g	8.64E-02	CC 1		0

Bands (Upper and Lower)

- A a factor of 1.5
- B a factor of 3
- C a factor of 10
- D a factor of 100
- E a factor of 1000

Note: Bands quantify uncertainty in mean radioactivity.

Code

- 1 Measured activity
- 2 Derived activity (best estimate)
- 3 Derived activity (upper limit)
- 4 Not present
- 5 Present but not significant
- 6 Likely to be present but not assessed
- 7 Present in significant quantities but not determined
- 8 Not expected to be present in significant quantity