ARUP

Subject	Industrial Emissions Licensing - BATC for common waste water- Pfizer Ireland Pharmaceuticals (Ringaskiddy)
Date	06 September 2019
Job No/Ref	267677-00

Attachment C.3 – Waste Hierarchy

Waste Hierarchy

Waste streams arising at the Pfizer Ringaskiddy facility from process, laboratory, packaging and other typical sources are both hazardous and non-hazardous in nature and are classified in accordance with EPA classification requirements and relevant waste legislation.

Typical hazardous wastes generated during production include:

- Organic solvents (halogenated and non-halogenated)
- Aqueous washings and other liquors
- Filter cake, spent absorbents
- Packaging, absorbents, wipe clothes, PPE filter material
- Lab samples and waste
- Obsolete chemicals and stock
- Solid waste containing dangerous substances
- Spent catalyst with precious metals

Other hazardous wastes which arise at site and are not associated with production include:

- Waste Electrical and Electronic Equipment (WEEE).
- Ozone Depleting Substances
- Sharps
- Fluorescent tubes
- Lead acid batteries
- Waste engine, lubricant and gear oils

- Contamination construction waste

Pfizer continues to maximise the quantity of non-hazardous waste undergoing recycling. Currently the site segregates and recycles the following non-hazardous waste streams:

- Uncontaminated mixed packaging
- Toner cartridges
- Cardboard, paper, plastic packaging
- Glass
- Iron and steel, empty metal drums
- Clean construction/ demolition

The site continues to implement its established waste minimisation and reduction programmes for the purposes of compliance with the waste hierarchy. The waste management programme at the Ringaskiddy facility incorporates the following waste hierarchy in priority order:

1) **Avoidance;** this is the most highly effective waste reduction method whereby processes are being optimised to increase yield improvements and combine steps.
2) **Reduce**: numerous laboratory trials have been carried out which have successfully reduced solvent usage in the manufacturing processes. Further trials are in progress and new trials will continue to be implemented as part of the ongoing optimisation efforts onsite.
3) **Reuse;** as part of the Total Waste Management Programme, suitable waste streams are stored and segregated at the Recycling Centre prior to collection.
4) **Recycling;** there are nine distillation towers and a pervaporation recovery unit on site for solvent recovery. Over the past 5 years Pfizer Ringaskiddy has reclaimed/regenerated over 7,800 tonnes of organic solvents on-site. Recovery

programmes continue to be developed and optimised for the Ringaskiddy operations and the company's sister facility (Upjohn) in Little Island. In addition to onsite solvent recovery, Pfizer Ringaskiddy has recycled/ reclaimed approximately 7,000 tonnes of organic and inorganic wastes and metals over the past five years.

5) **Energy recovery:** As mentioned in Attachment C.1, Pfizer successfully commissioned a project in 2014 whereby wastes generated at the Ringaskiddy site, which were previously sent to landfill, were recategorized as Refuse Derived Fuel (RDF) and used as a fuel source in cement kilns. Since 2014, approximately 32,000 tonnes of waste have been recovered and used as a fuel and/or energy source.

6) **Treatment (e.g. incineration):** No incineration is carried out on site. Hazardous waste streams that cannot be reused or recycled are sent for incineration off site, with energy recovery where possible. Since 2015 the quantity of waste sent from incineration has decreased.

7) **Disposal (e.g. landfill):** Since the initiation of the waste programme to reduce the volume of waste sent to landfill, the quantity of waste has diminished significantly. No waste was sent to landfill in 2018.

A review of waste generated from 2014-2018 (refer to **Table 1**) clearly demonstrates how the waste hierarchy is implemented on site. The volume of hazardous and non-hazardous wastes which are recovered (on-site and off-site) each year exceeds the volume of waste sent for incineration and landfill.

Table 1: Overview of waste recovery/disposal methods employed by Pfizer Ringaskiddy

Year	Waste Type	Total (tonnes per year)	On-site Recovery	Landfill	Incineration	Recovery	Other
2018	Hazardous	11,783.31	412.13	0	6,512.43	4,855.89	2.85
	Non-hazardous	3,442.20	0	0	0	3,442.20	0
2017	Hazardous	11,514.15	1,418.46	0.38	5,835.77	4,255.73	3.82
	Non-hazardous	3,786.32	0	0	0	3,786.32	0
2016	Hazardous	16,975.61	2,455.4	0	9,583.3	4,916.3	20.6
	Non-hazardous	4,650.52	0	0	0	4,650.5	0
2015	Hazardous	22,203.53	2,308.21	0	11,798.42	8,091.63	5.27
	Non-hazardous	2,257.67	0	26.14	0	2,231.53	0
2014	Hazardous	18,058.96	1,270.16	0	10,311.51	6,416.58	60.7
	Non-hazardous	3,366.69	0	87.44	0	3,279.25	0

Waste collection and segregation

Where hazardous and non-hazardous wastes materials cannot be avoided or reused, these waste streams are collected, segregated and transported off-site by permitted waste collectors for appropriate treatment, recycling and/or disposal. As previously

mentioned, Pfizer Ringaskiddy operates a Total Waste Management (TWM) programme which includes the provision for a dedicated waste management team who manage all aspects of hazardous and non-hazardous waste from the site. The TWM contract is managed using a centralised onsite team and back up vendor support team (based off-site). All arrangements for collection, dispatching, disposal, recording, documentation etc for both hazardous and non-hazardous waste are managed by the TWM team.

Hazardous Waste

As outlined in the internal standard operating procedure (SOP) *"Management of hazardous waste- EMS-J3"* hazardous waste is stored in designated areas which are appropriately protected against spillages and leachate run-off. Waste packages/ receptacles stored in these areas are clearly labelled and segregated. All waste loads are classified, packaged, labelled and documented in accordance with all relevant national and European legislation. The mixing of a hazardous wastes from different categories or with non-hazardous wastes is prohibited unless approved in writing from the Agency.

Examples of how some hazardous waste streams are collected and segregated by the onsite TWM team are outlined below.

- Solvent waste streams are stored in suitable storage containers/ drums and transferred to either the tank farm in the Production Services area or an EPA approved external storage facility pending further treatment such as onsite or offsite solvent recovery, incineration etc.
- Empty solvent drums are stored on pallets in designated areas and are labelled as required.
- Fluorescent tubes and non-fluorescent broken lamps are collected from various areas onsite and stored in designated coffins. Coffins are transported offsite by a suitable contractor and ultimately recycled at a suitable facility.

- Waste electrical and electronic equipment arising from site activities are stored in the onsite Recycling centre prior to shipment offsite. This equipment is collected by a waste contractor holding a valid collection permit and recycled at a suitable facility.

Non-hazardous wastes

All waste streams generated on site are managed by the TWM team to ensure compliance with relevant regulatory and legislative requirements. The site operates a dedicated Recycling Centre which functions within the framework of the sites TWM programme. All non-hazardous waste is collected, separated and consolidated in the recycling centre. The centre has facilities for the segregation and bailing of cardboard and soft plastic, shredding of paper, dechimbing of metal rings, crushing of metal drums and collection of timber, metal, waste electrical and electronic equipment and fluorescent tubes. Waste is subsequently transported off site to suitably licensed/permitted facilities for final recycling. Examples of how non-hazardous waste stream are collected and segregated on site are outlined below:

- Uncontaminated packaging, suitable glass, plastic, plastic drums, cardboard, fibre kegs, wooden pallets, cans and other uncontaminated packing are transported to approved recycling centres.
- Waste metal is collected in designated skips and collected by licenced metal recycling companies.
- Office waste paper is collected, shredded in the on-site recycling centre and transported to an approved recycling company.
- Designated bins are provided for kitchen / compostable waste in the office and canteen areas.
- Mixed municipal waste, comprising residual non-recyclable and non-biodegradable material, is collected in bins from various location on site. The

bins are emptied into a compactor and the contents sent to a licenced facility. Where skips are used these are covered during transport.

Wastes sent for recovery by incineration (waste-to-energy) or disposal by incineration or landfill:

As previously mentioned Pfizer Ringaskiddy manages waste streams, where practicable, in line with the waste hierarchy. However, waste streams which cannot be eliminated, recovered, reused or recycled are transported offsite for incineration or if necessary, disposal to landfill. In 2018, the Pfizer Ringaskiddy site achieved *'zero-to-landfill'* and will continue to pursue this target insofar as possible.

Incineration

Incineration of waste streams containing organic solvents is carried out when all beneficial reuse options have been exhausted. The solvents selected for off-site incineration are those that have been demonstrated to be or are strongly suspected of being problematic in the site's existing biological treatment operations (WWTP). Compatible waste streams containing acceptable concentrations of organic solvents are transferred to the waste water treatment plant for biological treatment. When offsite incineration is necessary, facilities with energy recovery systems are favoured. Some of the solvent- containing waste streams and solid waste materials sent off site for incineration include the following:

- Distilled residues containing a mixture of solvents.
- Spent filter aid, activated carbon, packaging materials and protective clothing that are contaminated with pharmaceutical compounds or organic solvents are drummed prior to shipment.
- Raw materials, intermediates and pharmaceutical product that fail quality specifications and are unsuitable for rework products are drummed prior to shipment.

Landfill

As mentioned in Attachment C.1, in 2014 Pfizer Ringaskiddy successfully commissioned a project whereby waste streams, which were previously sent to landfill, were recategorised as Refuse Derived Fuel (RDF) and used as a fuel source in cement kilns. Since 2014, over 32,000 tonnes of waste, both hazardous and non-hazardous, have been recovered and used as a fuel and/or energy source.

However certain wastes cannot be recovered and require deposit onto landfill. As can be seen in ***Table 1*** in 2014 and 2015 approximately 114 tonnes of hazardous mixed municipal waste were sent to landfill. In 2017, following construction works on site, 0.38 tonnes of construction materials which contained asbestos were sent to landfill. Since 2014 the volume of waste sent to landfill accounts for 0.1% of the overall waste generated at Pfizer Ringaskiddy site.