

HEALTH CARE AND HOSPITAL WASTE (MEDICAL WASTE)

RELEVANCE OF WASTE STREAM

- Healthcare and hospital waste contains various materials including also infectious components. Infectious components account for approx. 3 percent of the total medical waste originating from hospitals and other healthcare facilities. Healthcare and hospital waste is defined as hazardous based on its risk of infection. Hence, it shall be subject to a special treatment.

COMPOSITION/ MAIN MATERIAL COMPONENTS

Healthcare and hospital waste is classified according to the European waste catalogue. Definitions of single waste streams from health care and hospital waste are laid down in the guideline for disposal of wastes from healthcare facilities (Mitteilung 18) established by German Bund/Länder-Arbeitsgemeinschaft Abfall (LAGA, Federal/State Waste Committee) (www.laga-online.de/servlet/is/23874/). A similar differentiation exists also from the WHO.

Medical waste, depending on the type, composition, properties and arising quantities, can be classified into different main categories. The European classification is derived from the origin of the waste, mainly. All wastes that are considered hazardous and/or potentially harmful wastes in accordance with the EWC are marked with a star symbol (*).

Table 1: Healthcare and hospital waste classified according to the European waste catalogue (EWC)

Specification	Waste index according to EWC
sharps (except 18 01 03)	18 01 01
body parts and organs including blood bags and blood preserves (except 18 01 03)	18 01 02
wastes whose collection and disposal is subject to special requirements in order to prevent infection	18 01 03*
wastes whose collection and disposal is not subject to special requirements in order to prevent infection (for example dressings, plaster casts, linen, disposable clothing, diapers)	18 01 04
chemicals consisting of or containing dangerous substances	18 01 06*
chemicals other than those mentioned in 18 01 06	18 01 07
cytotoxic and cytostatic medicines	18 01 08*
medicines other than those mentioned in 18 01 08	18 01 09
amalgam waste from dental care	18 01 10*

Beside these wastes which depict “very typical” fractions of medical waste there are also other kinds and amounts of waste generated in hospitals. Generation intensity and quantities of these other wastes vary heavily and are strongly linked to the specific features of the health care facility (size, type, specialization) where they arise.

Typically waste from health care activities and medical treatment in hospitals make up around 30% of the overall waste generation while about 60% are household-like waste. Another 10 % can be categorized as potentially harmful wastes of which about 3 % are infectious in nature and 7 % waste with hazardous components.

EUROPEAN LEGISLATION AND REFERENCE DOCUMENTS

The proper management and safe disposal of medical waste within Europe is regulated by a broader set of ordinances covering different sectors such as the general waste management law and regulations concerning infection prevention, labour protection, the chemical law and law on dangerous sub-stances.

The framework for the legal stipulations governing the different components comprising medical waste is provided through the Council Decision 2001/119/EG of 22 January 2001 on establishing a list of wastes pursuant to Council Directive 75/442/EEC on waste and Council Decision 94/904/EC establishing a list of hazardous waste pursuant to Council Directive 91/689/EEC on hazardous waste.

NEEDS AND
PRINCIPAL
REQUIREMENTS
FOR HANDLING
THE WASTE
STREAM

To achieve the primary goal of waste avoidance and minimization in hospitals, all options leading to a multiple use and reuse of medical equipment and auxiliary means, a low-waste material acquisition and purchasing policy and an efficient storage and stock keeping shall be examined and when-ever possible adopted.

For the collection, storage, transportation and further disposal/utilization of these waste special requirements concerning hygiene and personal safety need to be observed, in particular to respond to the potential danger caused by the hazardous components it may contain. Reference to these requirements will be made in the descriptions given below for each specific step of managing this waste. Main concerns are the strict separation of the different waste components, especially the source separation of sharps, the separate collection of waste from cytostatic drugs, the source segregation of infectious material from any other waste, the safe storage and transportation, and the material specific treatment and disposal.

APPROPRIATE
COLLECTION
STRATEGIES
AND SCHEMES

18 01 01 – Sharps (except 18 01 03)

- use of unbreakable, puncture proof one-way receptacles/container for collection
- these must be lockable and leak-proof after filling
- recycling that requires an opening of the collection container is not allowed, even though a disinfection was conducted

Figure 1: Example of a collection container for used, potentially infectious one-way items(e.g. syringe)
(Picture source: sudok1/Fotolia.com)



18 01 02 – body parts and organs including blood bags and blood preserves

- source separation and collection in durable receptacles which can be locked up
- any transfer to another container or sorting are forbidden
- storage must be undertaken in a way that no gases can form (storage temperature <math><15^{\circ}\text{C}</math> for a storage over 1 week in the maximum; period can be extended at a storage temperature <math><8^{\circ}\text{C}</math>)
- Frozen materials can be stored for up to 6 months

18 01 03* – wastes whose collection and disposal is subject to special requirements in order to prevent infection

- Collection must be undertaken directly at the point of their generation, the receptacles used must be un-breakable, moisture resistant and leak-proof (e.g. certified container for dangerous substances) and the material is to be handed to central collection points without any transfers or sorting taking place. The containers need to carry the mark for “biohazards”.

Figure 1: Labelling symbol „Biohazard“



- Requirements on collection containers have to be met according to [TRBA 250](#)
- storage must be undertaken in a way that no gases can form in the containers

18 01 04 – Wastes whose collection and disposal is not subject to special requirements in order to prevent infection

- Collection must be undertaken directly at the point of their generation, the receptacles used must be un-breakable, moisture resistant and leak-proof and the material is to be handed to central collection points without any transfers or sorting taking place.

18 01 06* – Chemicals consisting of or containing dangerous substances

- A separate collection for each individual component is to be preferred
- Where large amounts of these wastes accrue, specially ruled waste streams can be generated and separately handled (e.g. acids)

18 01 07 – Chemicals other than those mentioned in 18 01 06

- Certain chemical wastes which accrue in larger amounts can be handled as separate waste streams and a disposal organized for them which corresponds to their specific properties
- Collection and storage must be done in containers which are appropriate for transport purposes as well.
- Storage places need to have an adequate ventilation

18 01 08* – Cytotoxic and cytostatic medicines

- All kinds of waste generated in conjunction with the preparation and application of carcinogenic, gen-modifying and/or reproduction damaging medicines must be included in this group. Further amounts of waste from cytostatica and virostatica for separate treatment are to be expected
- unbreakable, puncture proof one-way receptacles/container with a certification must be used for collection
- the material is to be handed to central collection points without any transfers, sorting or pre-treatment taking place

18 01 09 – Medicines other than those mentioned in 18 01 08

- A separate collection is to be performed
- unauthorized persons shall not have access in order to avoid any kind of misuse during the collection

18 01 10* – Amalgam waste from dental care

- A separate collection and treatment in regular intervals are to be performed

<p>APPROPRIATE RECYCLING TECHNOLOGIES</p>	<p>Health care facilities which generate wastes with household waste like composition and properties shall avail of treatment/recycling options known from the household and commercial waste sector. Prominent examples are the recycling of diverse plastic fractions, such as infusions bottles, unused drain tubes and syringe.</p> <p>Contaminated hospital wastes, which have undergone a thorough disinfection process in treatment plants according to DIN 58949 and/or combined shredding and disinfection, may also be handled as recyclable fractions. A Sorting as well as recycling of non-hazardous waste from healthcare facilities and hospitals is only eligible, if specific requirements on the work safety are met. Single chemical wastes can be recycled, too.</p> <p>Amalgam waste can for example be subject of material recycling processes too where attention is being paid on its separation during dental operations.</p>
<p>APPROPRIATE TREATMENT AND RECOVERY SCHEMES</p>	<p>18 01 01 – Sharps (except 18 01 03)</p> <ul style="list-style-type: none"> - The waste shall not become subject of sorting operations, a material recycling requiring the collection containers to be opened is therefore forbidden - The applied technical processes shall make sure that there won't be any dangers/risks associated with the treatment of this waste - A joint disposal with wastes of category 18 01 04 is possible, provided that certain safety measures are applied - An incineration of the waste is to be preferred <p>18 01 02 – body parts and organs including blood bags and blood preserves</p> <ul style="list-style-type: none"> - The waste must be incinerated in the approved facilities without any prior compression or comminution and while still in the containers used for collection - single containers filled with blood or liquid blood products can be emptied using appropriate drains, if requirements of local waste water regulations are met - A recovery of single blood components is allowed by the pharmaceutical industry <p>18 01 03* – wastes whose collection and disposal is subject to special requirements in order to prevent infection</p> <ul style="list-style-type: none"> - The waste must be incinerated in the approved facilities without any prior compression or comminution and while still in the containers used for collection - The utilisation of this waste shall be prohibited - The Waste can be subject to a disinfection and a joint disposal with waste of waste code 18 01 04, if foreseen treatment plants meet the requirements (structural and functionally) of DIN 58949 and if the effectiveness of foreseen treatment plants is proofed (see "Disinfectants and disinfection procedures tested and recognized by Robert-Koch-Institute / DGHM") <p>18 01 04 – Wastes whose collection and disposal is not subject to special requirements in order to prevent infection</p> <ul style="list-style-type: none"> - Waste of this kind must be separated from other ordinary wastes and forwarded to the appropriate treatment installations - A sorting or material recycling shall not be allowed for hygienic reasons - Receptacles containing human liquids may be emptied into proper sewer systems by taking account of the hygienic and infection-preventing aspects in this act. <p>18 01 06* – Chemicals consisting of or containing dangerous substances</p> <ul style="list-style-type: none"> - The hazardous material is to be forwarded for treatment to an approved installation such as a waste incinerator or chemical-physical waste treatment facility. - The specific waste code of the chemicals concerned shall be made available to the disposal operator <p>18 01 07 -- Chemicals other than those mentioned in 18 01 06</p> <ul style="list-style-type: none"> - Disposal routes approved for the specific composition of the waste shall be used <p>18 01 08* – Cytotoxic and cytostatic medicines</p> <ul style="list-style-type: none"> - This waste has to be de-activated at temperatures of 1000°C and hence need to be forwarded to specialized incineration facilities.

18 01 09 – Medicines other than those mentioned in 18 01 08

- A joint disposal with wastes of other categories (e.g. 18 01 04) is possible, provided that unauthorized persons do not get access to the material
- Combustion in an approved incinerator shall be the preferred option

18 01 10* – Amalgam waste from dental care

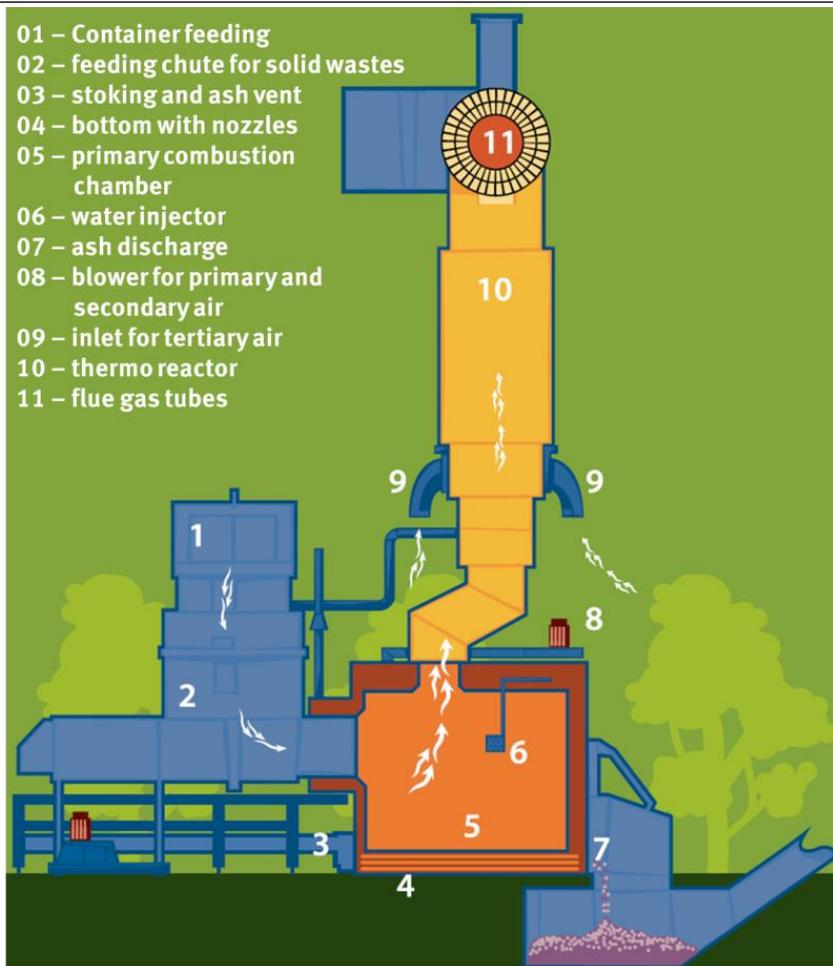
- There exists the possibility for a material recycling by the manufacturer or distributor of the amalgam or any third company specialized in this sector, however, a disinfection need to be undertaken beforehand.

Following hereafter an incineration facility which can be run by hospitals shall be briefly described. In this installation the incineration is performed as a two-step process:

Primary combustion chamber: In the primary combustion chamber the waste is set alight by means of a pilot burner and subsequently combusted at temperatures of 400 °C to 800 °C and with a lack of oxygen. The smoulder coke produced that way is incinerated under optimal oxygen supply hereafter.

Thermo reactor: The combustible gases generated in the primary combustion chamber are mixed with air in surplus concentrations and the mixture is then incinerated at temperatures of about 1.000 °C. Through this step is ensured that all organic compounds are completely burned out and oxidized. The flue gas can be directed through additional combustion chambers, which may have been set up to thermally treat the household waste fraction for example. Before being released to the atmosphere, they have to pass through a five-stage flue gas cleaning [see also fact sheet “[Flue gas cleaning](#)“].

Figure 2: Constructional scheme of an incineration facility for medical waste (modified according to AVA Augsburg)



REFERENCES AND PROVIDER FIRMS

(important note: the list of firms does not constitute a complete compilation of companies active in the specified fields)

Many places in Germany operate facilities for the dedicated treatment and disposal of medical waste. Some prominent examples are:

for municipal waste incinerators operating special installations for a thermal treatment of infectious wastes:

- Abfallverwertung Augsburg GmbH, Augsburg www.ava-augsburg.de
- Abfallheizkraftwerk der MVA Bielefeld-Herford GmbH, Bielefeld-Heepen www.mva-bielefeld.de

German manufacturers of special devices needed to safely manage medical wastes are for example:

for certified collection and transport containers:

- Firma Brosch, Winterbach www.brosch-pe.de
- Firma Infa Lentjes, www.infa-lentjes.de

Incineration plants for medical wastes:

- IFZW, Zwickau www.ifzw.de
- Michaelis, Veitshöchheim www.michaelis-umwelttechnik.de
- Ruppmann Verbrennungsanlagen Stuttgart www.ruppmann.de

Major principles, approaches and techniques for managing healthcare and hospital waste contain also the publications provided, inter alia, by

- World Health Organization (WHO):
 - “Safe management of wastes from health-care activities” 2nd edition (2014)
 - “WHO core principles for achieving safe and sustainable management of health-care waste” (2007)
- United Nations Environment Programme (UNEP)
 - “Compendium of Technologies for Treatment/Destruction of Healthcare Waste“ (2012)