

TEMPORARY WASTE STORAGE

APPLICATION OBJECTIVE: - The objective of this technique is a temporary storage of waste material awaiting further treatment. The temporary storage may be needed to buffer capacity bottlenecks in the subsequent treatment lines (long-term storage sites) or set up in case of plant inspections or breakdowns (short-term storage sites).

OUTLINE ON APPLICATION FRAMEWORK

PARTICULARLY APPLICABLE FOR WASTE TYPES

Glass		Light-weight packaging		Biowaste	
Paper/paperboard		Mixed household waste	X	Bulky waste	X ¹
Lamps		Textiles		Electrical & electronic waste	
Scrap metals		Wood waste		C&D waste	
Waste oil		Old paint & lacquer		Waste tires	
Hazardous wastes					
Branch specific waste	X				
Other waste materials					

SPECIAL CHARACTERISTICS AND REQUIREMENTS OF THE APPLICATION:

Pretreatment of the input material:

The material subject to a temporary storage must be down-sized to give it a manageable composition. Alternatively, a pre-treatment of the required type may have been performed in conjunction with upstream treatment processes already (e.g. MBT).

Options for the utilization of the generated output:

in accordance with the utilization processes following

Aftercare requirements:

restoration of the storage area into the original state and conditions

Protective needs:

An air and water-resistant wrapping of the waste material should be ensured. Once put to storage the material must be monitored for gas generation and temperature development. The storage ground is to be sealed and a general protection against fire hazards must be undertaken.

The loose storage in open heaps or storage of unwrapped bales is not advisable as there is a great danger of self-ignition and fire hazards due to the exposure to air and available concentrations of oxygen.

RESTRICTIONS OR INFLUENCE OF EXTERNALITIES ON THE APPLICATION:

Infrastructural conditions:

A good accessibility to the storage site should be ensured. Permitted landfill sites do generally offer the necessary conditions for a temporary storage particularly the storage of untreated MSW.

A minimum requirement for the storage in wrapped bales is the availability of a staple geological underground with a sealed surface.

Climatic conditions:

basically there are no limitations, however, temporary waste storage sites in warm climates and with a high exposure to sunlight do have a higher risk of self-ignition and fire outbreaks

Availability of (qualified) workforce:

no extra need of specially qualified personnel

¹ only shredded bulky waste

TECHNICAL DETAILS										
GENERAL OVERVIEW										
ABSTRACT	Temporary waste storage facilities can be necessary for waste like untreated MSW or high-calorific waste due to an unexpected shortage of available treatment capacity as a result of plant inspections or breakdowns. The storage in wrapped bales described more thoroughly in this fact sheet is widely approved. Also possible is the temporary storage of untreated MSW in thin-layers with high built-in density and covering on landfill sites. This procedure is similar to the disposal of waste in thin-layers on a sanitary landfill (see also fact sheet on " Landfill for non-hazardous wastes "). Strictly not advisable is the storage in open heaps and unwrapped bales due to the extreme fire hazards because of the influence of oxygen.									
BASIC REQUIREMENTS	<ul style="list-style-type: none"> - area on staple ground and with a sealed surface or regular landfill site - waste material which is not bulky and ready to be compacted 									
EXPECTED RESULTS	<ul style="list-style-type: none"> - Output: waste material suitable for further processing or treatment, which can be recycling or thermal utilization 									
SPECIFIC ADVANTAGES	<ul style="list-style-type: none"> - avoiding the disposal or utilization in third-party facilities 									
SPECIFIC DISADVANTAGES	<ul style="list-style-type: none"> - additional cost - demand on area - decrease of the suitability of high calorific waste for thermal utilization, after-treatment is necessary 									
APPLICATION DETAILS										
TECHNICAL SCHEME	Table 1: Differentiation of the main baling techniques used to facilitate a temporary waste storage									
	<table border="1"> <thead> <tr> <th>Round bales</th> <th>Square-shape bales</th> </tr> </thead> <tbody> <tr> <td colspan="2" style="text-align: center;">Bale properties:</td> </tr> <tr> <td> <ul style="list-style-type: none"> - better compaction - better protection of the outer surface by complete wrapping with geotextiles - more complicated transportation and storage due to the round shape of the bales - bales easier to re-open - weight: 400-1,450 kg per bale </td> <td> <ul style="list-style-type: none"> - less complicated transportation and storage due to the square shape of the bales - higher storage density - lower stability of the bale because of wire winding and outer foil layer as the only means for baling </td> </tr> <tr> <td colspan="2" style="text-align: center;">Machinery/equipment needs</td> </tr> <tr> <td> <ul style="list-style-type: none"> - wrapping station - portable, mobile - stout machine w./ low abrasion - energy consumption: approx. 1,5 kWh per bale - throughput 20-35 bales per hour - no need of machine chassis </td> <td> <ul style="list-style-type: none"> - container or channel compactor - often static - usually high abrasion - energy consumption: approx. 15 kWh per bale - throughput 20-30 bales per hour - need of machine chassis or container </td> </tr> </tbody> </table>	Round bales	Square-shape bales	Bale properties:		<ul style="list-style-type: none"> - better compaction - better protection of the outer surface by complete wrapping with geotextiles - more complicated transportation and storage due to the round shape of the bales - bales easier to re-open - weight: 400-1,450 kg per bale 	<ul style="list-style-type: none"> - less complicated transportation and storage due to the square shape of the bales - higher storage density - lower stability of the bale because of wire winding and outer foil layer as the only means for baling 	Machinery/equipment needs		<ul style="list-style-type: none"> - wrapping station - portable, mobile - stout machine w./ low abrasion - energy consumption: approx. 1,5 kWh per bale - throughput 20-35 bales per hour - no need of machine chassis
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<p>Baling of the material can be done at the place of its generation or directly at the storage site. The material must be down-sized prior to baling in order to give it a good handling and to avoid damages at the baler and the wrapping. Baling can be performed by means of round bale wrapping or a compression into square-shaped bales.</p> <p>Especially long-term storage sites (storage time > 1 year) should have a base sealing made of asphalt to protect the underground from possible leachate outflow. This has the additional advantage of good accessibility of the site also in the case of rainfall and a generally weak underground. The storage at a regular landfill site with drainage and leachate collection (see fact sheet on "Landfill for non-hazardous wastes") can be an alternative. Leachate collection can be done via collection troughs set up on the baseline sealing. From there, the leachate flows into a collection basin or a leachate treatment station.</p>										

<p>TECHNICAL SCHEME - CONTINUATION</p>	<p>Sections where the piling up of bales has come to an end shall be covered with a PE-foil to divert precipitation water away from the bales and obtain an additional protection against UV-light. An earth cover can be additionally installed (see pictures below). Both measures can prevent or reduce the occurrence of airstream channels which pose a potential risk for self-ignition and fire outbreaks.</p> <p>Figure 1: left: foil covering /right: additional earth covering (Picture source: INTECUS GmbH)</p>  <p>The total height of the storage pile is determined from the length of the crane cantilever arm or gripper arm used for the storage operations and the static properties of the bales. To date, storage sites with a maximum height of the pile equivalent to twelve bales set up one above the other have been erected.</p> <p>The storage site must be divided into fire protection zones (each of a maximum area size of 2,000 m²) with fire proof embankments in between. The erecting of these fire embankments shall be completed simultaneously as the piling of bales progresses.</p>				
<p>QUANTITY ASPECTS</p>	<table border="0"> <tr> <td style="vertical-align: top;"> <p>Input</p> <ul style="list-style-type: none"> - solid waste material - wrapping film, geo-textile, wrapping wire - PE foil and soil for covering </td> <td style="vertical-align: top; padding-left: 20px;"> <p>Output</p> <ul style="list-style-type: none"> - solid waste material - used soil from covering - used wrapping film, waste from geo-textile and PE foil, scrap wire </td> </tr> </table>	<p>Input</p> <ul style="list-style-type: none"> - solid waste material - wrapping film, geo-textile, wrapping wire - PE foil and soil for covering 	<p>Output</p> <ul style="list-style-type: none"> - solid waste material - used soil from covering - used wrapping film, waste from geo-textile and PE foil, scrap wire 		
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<p>SCALE OF APPLICATION</p>	<p>The range of applications of this technology goes from a minimum of 1,000 tons/a (storage during plant inspections nearby the plant) up to a maximum of 400,000 tons/a.</p>				
<p>INTEROPERABILITY</p>	<p>A temporary waste storage might be necessary before the waste material can be forwarded to further treatment or final disposal. Prior to the erection of the storage site it has to be ensured that the treatment or disposal capacities needed for the waste are eventually available once the permitted storage time comes to an end. Unnecessary storage or storage over very long periods must be strictly avoided.</p>				
<p>OPERATIONAL BENCHMARKS: RESOURCE CONSUMPTION</p>					
<p>ENERGY BALANCE</p>	<p>Input: fuels/energy needed for operation of the technical equipment and security measures</p>				
<p>CO₂-RELEVANCE</p>	<p>- low emission on CO₂ and methane may occur but are negligible in quantity</p>				
<p>AIDS AND ADDITIVES NEEDED</p>	<ul style="list-style-type: none"> - wrapping film, geo-textile, wrapping wire - PE foil and soil for covering 				
<p>HUMAN RESOURCES NEEDED</p>	<ul style="list-style-type: none"> - 2 persons for baling and admission into the storage facility - additional personnel for monitoring and gate control 				
<p>SPATIAL NEEDS</p>	<table border="0"> <tr> <td style="vertical-align: top;"> <p>Baling equipment:</p> </td> <td style="padding-left: 20px;"> <p>Round bales: 18x3x5 m Square-shaped bales: 35x5x6 m</p> </td> </tr> <tr> <td style="vertical-align: top;"> <p>Storage area:</p> </td> <td style="padding-left: 20px;"> <p>0.1–0.8 m²/Mg (depending on the material features, overall design, storage height and fire protection needs)</p> </td> </tr> </table>	<p>Baling equipment:</p>	<p>Round bales: 18x3x5 m Square-shaped bales: 35x5x6 m</p>	<p>Storage area:</p>	<p>0.1–0.8 m²/Mg (depending on the material features, overall design, storage height and fire protection needs)</p>
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AFTERCARE DEMANDS	- controlled dismantling - Renaturation of the storage site or re-establishment of original conditions
OPERATIONAL BENCHMARKS: COST DIMENSIONS	
INVESTMENT COSTS	- usually low as the temporary character of the storage facility allows for the renting of the equipment and storage area
OPERATING COSTS	- 20 to 50 EUR/Mg in dependency of amount and type of stored wastes (status of 2008)
POSSIBLE PROCEEDS	- only in cases where temporary storage is undertaken for third parties in the form of kind of a reception charge or “tipping”/treatment fees
MASS SPEC. OVERALL COSTS	- 20 to 50 EUR/Mg in dependency of amount and type of stored wastes (status of 2008)
MISCELLANEOUS	
MARKET INFORMATION	
REFERENCE FACILITIES <i>(important note: the list of firms does not constitute a complete compilation of companies active in the specified fields)</i>	<p>The erection of temporary waste storage facilities is a measure which is very commonly performed by large waste disposal companies or facility operators when they fall short of available treatment capacities or it comes to facility breakdowns or inspections. Actual applications of this technique can best be requested from organizations of the said type, directly.</p> <p>Temporary waste storage facilities can be found around the world, Germany had a total erected capacity in the range of 2–4 million tons in 2006 for a short period, since 2009 all temporary storages were shut down. To refer here to a specific facility will not be helpful since their character is a temporary one and the removal of the site very likely after some time.</p>
RECOGNIZED PRODUCER AND PROVIDER FIRMS <i>(important note: the list of firms does not constitute a complete compilation of companies active in the specified fields)</i>	<p>Producer/provider firms for:</p> <p><u>Press- and baling equipment:</u></p> <ul style="list-style-type: none"> - Schuster Engineering www.schusterengineering.de - EuRec Technology Sales & Distribution GmbH www.eurec-technology.com - PTF Häuser GmbH www.ptf-haeusser.de <p><u>Wrapping foil:</u></p> <ul style="list-style-type: none"> - FRANPACK GmbH www.franpack.de - Manuli Stretch Deutschland GmbH www.manulistretch.com - R&S Kunststoff-Verarbeitungs GmbH www.rs-kunststoffverarbeitung.de <p><u>Bale manipulator and gripper equipment:</u></p> <ul style="list-style-type: none"> - C. Steffenewers GmbH & Co.KG www.steffenewers.de - Kurschildgen GmbH Hebezeugbau www.tigerhebezeuge.de - Kock & Sohn www.kock-sohn.de - Liebherr-International Deutschland GmbH www.liebherr.com