

Designing and operating material recycling facilities (MRFs) safely

Introduction

- 1 This 'good practice' guidance was written in consultation and with the support of the Waste Industry Safety and Health Forum (WISH) to help the waste management industry achieve improvements in critical safety areas.
- 2 This guidance is for designers/manufacturers, installers and users involved in developing and operating material recycling facilities (MRFs), also sometimes called material recovery or reclamation facilities. It does not aim to be a comprehensive, 'stand-alone' document, but gives examples of health and safety concerns that should be considered. It also points to some sources of information, but in some cases you may need to refer to a health and safety professional.
- 3 Changes in waste management operations have resulted in an increase in the use of MRFs in the UK and this brief guide is intended to highlight the major health and safety issues that should be addressed when designing, installing, making alterations to, or operating a MRF.

Risk assessment

- 4 Under the Management of Health and Safety at Work Regulations 1999, employers are legally required to carry out a risk assessment to identify the measures they need to have in place to comply with their duties under health and safety law. This document highlights some of the issues you should consider during this process.
- 5 The risks, and their scale, likelihood and consequences, should be identified before work commences. The choices and selections made at all parts of the decision-making process affect the risks that can arise. Appropriate risk-reducing techniques should be used. Co-operation and co-ordination between clients and contractors at all stages, from design to operation, is important.
- 6 Risk assessments aim to:
 - **eliminate** the main risks identified wherever reasonably practicable;
 - **assess** the risk if they cannot be eliminated; and
 - **reduce** the risks that remain by implementing risk-reducing techniques.
- 7 It is important that work is **monitored** at appropriate intervals. This will help you identify potential flaws in your systems.
 - Do employees follow your agreed systems of work? If not, why not?
 - Are your systems adequate to control the risk? Do they need revising?
 - Is the procedure you have instituted sufficiently frequent? Do you need to do certain tasks more (or less) frequently?

8 Managers should consult with staff on health and safety issues. The support of site staff is essential to running a safe site. It is important that safety representatives and other staff are supported to raise or maintain their level of competence to carry out their duties safely and effectively. They can contribute positively to achieving the desired outcomes by:

- identifying problems;
- indicating whether activities can be carried out safely under prevailing conditions;
- generating sound practical ideas and solutions.

Transport

9 Traffic routes for MRFs (for both the site and its buildings) should be properly designed to permit safe traffic movement.

10 It is vitally important to **segregate** pedestrians from moving plant and vehicles – pedestrian/vehicle collisions are the biggest single cause of fatalities at recycling premises.

- Suitably marked, dedicated pedestrian walkways should be provided where they are needed and it is reasonably practicable to do so, both inside and outside buildings.
- The layout and mapping of the site should permit clear, unambiguous routes and safe passage for pedestrians, vehicles and plant.
- The layout of traffic routes and accompanying working systems should eliminate or minimise reversing (ie the number of reversing manoeuvres required, the time spent reversing, the distance reversed).
- Mixing different types of traffic, eg delivery vehicles, forklifts and private vehicles, should be avoided where reasonably practicable.
- The speed of vehicles on site should be restricted.

11 If you apply the following hierarchy you can reduce the risks from moving plant and vehicles significantly:

- **Safe site:** the design and layout of the site to ensure, so far as is reasonably practicable, pedestrian/traffic segregation;
- **Safe vehicle:** the selection of the correct vehicle for the task incorporating the desired features, the incorporation of appropriate safety-related devices (eg appropriate mirrors, CCTV, reversing radars, reversing alarms, beacons) and maintaining the vehicle to an appropriate standard;
- **Safe ways of working:** the use of appropriate working systems to minimise the potential for vehicle/plant and pedestrian interaction. Pedestrian and vehicle/plant segregation can be achieved, for example, by time – where the times that vehicle/plant movements or pedestrian activities in specified areas are permitted and controlled are different;
- **Safe personnel:** the selection, training and competence of staff. The monitoring systems in place to ensure that staff are carrying out their duties as expected.

12 Further web-based guidance written specifically for the waste industry can be found in *Safe transport in waste management and recycling facilities*.¹ HSE also has a set of web pages specifically dedicated to reducing the risks associated with workplace transport (www.hse.gov.uk/workplacetransport). HSE guidance *Workplace transport safety: Guidance for employers*² may also prove useful.

Machinery

13 The designer should ensure work equipment is suitable for its intended purpose. Where different machines are put together to form a process or line then the supplier and user should consider their interactions. It may be necessary to consult someone with sufficient expertise in safety matters. The HSE guidance on this is available in HSE leaflet *Buying new machinery*.³

14 When selecting machinery, take the following considerations into account.

- Provide effective guards to prevent access to the dangerous parts of a machine, or to protect against falling or ejected items.
- Consider the operators and operational needs, as well as the plant interfaces, when installing plant lines using pieces of machinery that were not originally designed to work together.
- Provide adequate emergency stop arrangements for conveyors and other moving machinery.
- It is important that the interlock chosen is appropriate to the level of risk posed by a specific danger zone. This is particularly important where guards need to be regularly removed for cleaning, or for clearing blockages.
- Consider machinery siting (especially access, lighting and maintenance arrangements) and in particular:
 - adequate access to maintenance points or by ensuring that service points such as lubrication points can be reached from the ground or secure working platform rather than a ladder. Working platforms should have adequate side protection and no open edges at platform level (eg the benchmark should be at least that of guardrails and toeboards to the standards found at scaffolding);
 - access to what has to be cleaned and how to get access.
- Permit to work systems and effective isolation may be required for cleaning, blockage clearing or maintenance and repair operations.

15 You can find further useful advice in HSE leaflet *Buying new machinery*.³

Ergonomics

16 MRFs have specific ergonomic demands when workers are hand-sorting materials and these should be fully considered at the design stage.

- Picking conveyors should be designed so that the belt height and width do not require excessive reaching or bending.
- The speed of the belt should not be too fast to avoid undue operator stress.
- Transfer points should not require operators to bend or twist excessively when taking items from the belt and placing it in the transfer chute.
- Consider the types of materials operators are expected to throw – very light materials require a lot of effort, very heavy materials can be very tiring.
- Avoid people having to stand on cold/hard floors with no facility to rest or change position. Where it is advantageous, and reasonably practicable, consider providing seats, foot bars and anti-fatigue insulated matting.
- Ensure adequate lighting of picking lines.
- Don't expose sorters or operators to excessive vibration.

17 Further information on this is given in *Ergonomic Considerations for Designing and Selecting Conveyor Belt Systems*.⁴

Working environment for 'pickers'

18 It is preferable for proper isolated 'picking cabins' to be provided, rather than operate from picking belts exposed to hazards from other parts of the process, such as:

- noise;
- moving vehicles;
- tipping and loading operations;
- excessive dust;
- vibration.

19 Providing picking cabins provides a degree of isolation from the above hazards and enables economical heating to be provided for staff.

Dust and noise

20 Segregation of pickers from the general environment by providing picking cabins also makes it easier to provide any necessary effective local exhaust ventilation to deal with dust and bioaerosols. Some picking cabins feature a separate ventilation system of fresh air exchange or positive pressure to effectively prevent the ingress of dust and bioaerosols from any nearby tipping, screening or similar operation that liberates dust into the atmosphere.

21 Options you can consider include:

- providing a suitably ventilated picking cabin;
- providing local exhaust ventilation where required and good design of general building ventilation to prevent any liberated dust from accumulating in the working atmosphere;
- ensuring that machinery design and location does not compromise ventilation or expose operators to excessive noise;
- providing suitable ventilation/air filtration fitted vehicles (particularly in the tipping area);
- providing facilities to enable rejection of heavily contaminated loads;
- providing suitable cleaning equipment (ie use of vacuum cleaners rather than using compressed air or manual sweeping which can create dust clouds).

22 Further guidance on the legal requirements and practical methods for reducing exposure to dusts and bioaerosols can be found on HSE's Waste management and recycling webpages (www.hse.gov.uk/waste/health.htm) and Control of Substances Hazardous to Health (COSHH) webpages (www.hse.gov.uk/coshh).

23 Noise is also of concern in MRFs. Items of machinery and operations which produce noise should, so far as is reasonably practicable, be located and operated away from where people are routinely required to work. Examples include:

- overband magnets;
- eddy-current devices;
- changes in conveyor direction/level (where one conveyor drops waste onto another);
- screens (vibrating, trommel etc).

24 Further guidance on the legal requirements and practical methods for reducing noise exposure can be found on HSE's 'Noise at work' webpages (www.hse.gov.uk/noise).

Space and access

25 Adequate room for material storage, and for vehicles to operate and access these areas, are important considerations in MRF design. When designing facilities, it may be worth providing storage that can cope with periods when materials cannot be moved from site or as capacity increases.

26 Lack of space can also lead to inappropriate means of access being used, such as vertical fixed ladders rather than staircases, or working platforms with insufficient space to allow ergonomically sound postures to be adopted.

27 Here are some issues worth bearing in mind when thinking about space and access.

- Provide sufficient space for, and suitable access to, storage areas.
- Provide suitable access to high-level operating areas. For example, try to avoid access steps to working stations that are excessively steep, or elevated working platforms that need to be accessed by vertical ladders, or having insufficient headroom above the working station.
- Design pick-up and drop points to make sorting materials easy.
- Provide adequate fixed access and space for cleaning, blockage clearing, materials observation, repair and maintenance operations.
- Provide adequate space for fire escapes.
- Eliminate blind corners round which vehicles must operate.
- Provide separate vehicle and pedestrian access points to buildings and operational areas to ensure pedestrian/vehicle separation.
- Provide suitable storage space for staff to keep their PPE and other essential items (respirators, gloves, vacuum cleaners etc) in a clean state.

Welfare

28 In MRFs there are important environment and welfare considerations.

- A 'reasonable' working temperature should be provided at workstations. Where the work involves physical effort then the temperature should be at least 13 degrees Celsius and at least 16 degrees Celsius otherwise.
- Adequate lighting should be provided. Good lighting is less fatiguing for staff and also makes tasks easier to perform (eg better waste segregation, faster blockage clearance meaning less plant downtime etc).
- Floor materials should be suitable and fit for purpose. In MRFs, they should be sufficiently durable given the work carried out, and minimise the slip/trip risks. It should also be remembered that open steel gridwork is not always the preferred option since it can make the consequences of any fall more severe. Anti-fatigue flooring materials should be considered where a substantial part of the work is done standing.
- Consider the quality and location of toilet and washing facilities. They should also be designed to be easily cleaned because of the amount of waste, dust and other residues that will be deposited.
- Good personal hygiene is vital for waste and recycling workers to prevent infections and other ill health that may be caused by working with waste. The quality of the washing facilities should reflect this need and be of a high standard.
- Provide adequate education and training to ensure workers understand the importance of hygiene and use the facilities that are available.

29 Further guidance is available in HSE leaflet *Workplace health, safety and welfare: A short guide for managers*.⁵ The Waste Industry Safety and Health Forum (WISH) has produced some basic health guidance with HSE for waste and recycling

workers in the form of an illustrated pocket card: *Stay clean – stay healthy: Looking after your health in the waste/recycling industry (INDG415)*.⁶

Fire

30 There is a risk of fire in many MRFs, and this risk can increase depending upon the materials processed and the manner in which they are processed. Paper and timber can ignite readily, plastics and rubber give off toxic smoke. Some materials can become explosive if in a fine condition (eg certain dusts).

31 Sources of ignition can include:

- poorly installed and/or maintained electrical equipment that can spark or overheat;
- poorly installed and/or maintained mechanical equipment, such as bearings, that can overheat;
- smoking;
- batteries and accumulators;
- 'tramp' metal that finds its way into moving machinery and causes localised 'hot spots'. Metal should be prevented from getting into moving machinery by pre-sorting and/or extraction by a magnet/eddy current separator, especially when ignitable or explosive materials are present;
- poorly controlled hot work (welding, burning etc). Where flammable materials are present, hot work should be risk assessed and effective measures put into place to reduce the risk of fire. It may be necessary to carry out hot work under a rigorous permit-to-work system;
- some materials, such as rubber crumb, have been reported to have ignited spontaneously (see <http://www.hse.gov.uk/rubber/spontaneous.htm>). Paper and other cellulose-based materials have reportedly been known to self-heat, and have even ignited where stocks are so large that the heat cannot radiate safely. The product trade associations for these materials may be able to provide you with further guidance on the precautions to take.

References

- 1 *Safe transport in waste management and recycling facilities* HSE 2007 www.hse.gov.uk/pubns/waste09.pdf
- 2 *Workplace transport safety: An employers' guide* HSG136 (Second edition) HSE Books 2005 ISBN 978 0 7176 6154 1
- 3 *Buying new machinery: A short guide to the law and some information on what to do for anyone buying new machinery for use at work* Leaflet INDG271 HSE Books 1998 (single copy free or priced packs of 15 ISBN 978 0 7176 1559 9) www.hse.gov.uk/pubns/indg271.htm
- 4 *Ergonomic Considerations for Designing and Selecting Conveyor Belt Systems* HSE www.hse.gov.uk/waste/conveyorbelt.pdf
- 5 *Workplace health, safety and welfare: A short guide for managers* Leaflet INDG244(rev2) HSE Books 2007 (single copy free or priced packs of 15 ISBN 978 0 7176 6277 7) www.hse.gov.uk/pubns/indg244.pdf
- 6 *Stay clean – stay healthy: Looking after your health in the waste/recycling industry* Pocket card INDG415 HSE Books 2007 (single copy free or priced packs of 25 ISBN 978 0 7176 6262 3) www.hse.gov.uk/pubns/indg415.pdf

Further reading

Safe working with flammable substances Leaflet INDG227 HSE Books 1996 (single copy free or priced packs of 15 ISBN 978 0 7176 1154 6) www.hse.gov.uk/pubns/indg227.pdf

Fire and explosion: How safe is your workplace? A short guide to the Dangerous Substances and Explosive Atmospheres Regulations Leaflet INDG370 HSE Books 2002 (single copy free or priced packs of 5 ISBN 978 0 7176 2589 5) www.hse.gov.uk/pubns/indg370.pdf

Fire and explosion risks from pentane in expandable polystyrene (EPS) PPIS1 www.hse.gov.uk/pubns/ppis1.pdf (Advice regarding fire-fighting equipment, means of escape etc is available from your local fire authority.)

Further information

The Waste Industry Safety and Health (WISH) forum is a committee formed of representatives from the waste management and recycling industry. It exists as a forum to exchange information, and discuss and resolve prevailing health and safety problems existing within the industry. It consists of representatives from the main trade associations, professional associations, trade unions, recycling organisations and national and local government bodies involved in waste management and recycling. Further information is available at: <http://www.hse.gov.uk/waste/wish.htm>

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For information about health and safety ring HSE's Infoline Tel: 0845 345 0055 Fax: 0845 408 9566 Textphone: 0845 408 9577 e-mail: hse.infoline@natbrit.com or write to HSE Information Services, Caerphilly Business Park, Caerphilly CF83 3GG.

This document contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do.

This document can be found at: www.hse.gov.uk/pubns/waste13.pdf.

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